



third **canadian** edition

# psychologicalscience

michael **gazzaniga** / todd **heatherton** / diane **halpern** / steven **heine**

# A UNIQUE FOCUS ON VISUAL LEARNING

Throughout this edition, new figures bring abstract concepts to life for students. The third edition supports visual learners with clear, attractive graphics that stimulate students' thinking skills and drive home their understanding of key concepts.

**FIGURE 6.24 Scientific Method: Bandura's Bobo Doll Studies**

**Hypothesis:** Children can acquire behaviours through observation.

**Research Method:**

- 1 Two groups of preschool children were shown a film of an adult playing with a large inflatable doll called Bobo.
- 2 One group saw the adult play quietly with the doll (activity not shown below).
- 3 The other group saw the adult attack the doll (activity shown in top row below).



**Result:** When children were allowed to play with the doll later, those who had seen the aggressive display were more than twice as likely to act aggressively toward the doll.

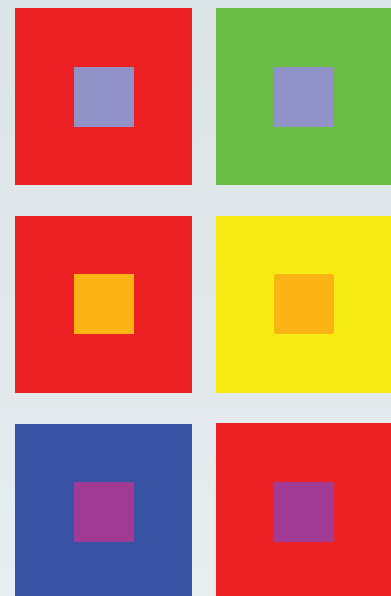
**Conclusion:** Exposing children to violence may encourage them to act aggressively.

**Scientific Method** illustrations carefully and consistently lead students through the steps of some of the most interesting experiments and studies.

**Try for Yourself** figures allow students to be their own research subjects and to experience the methods of psychological science.

**FIGURE 5.28 Try for Yourself: Simultaneous Contrast**

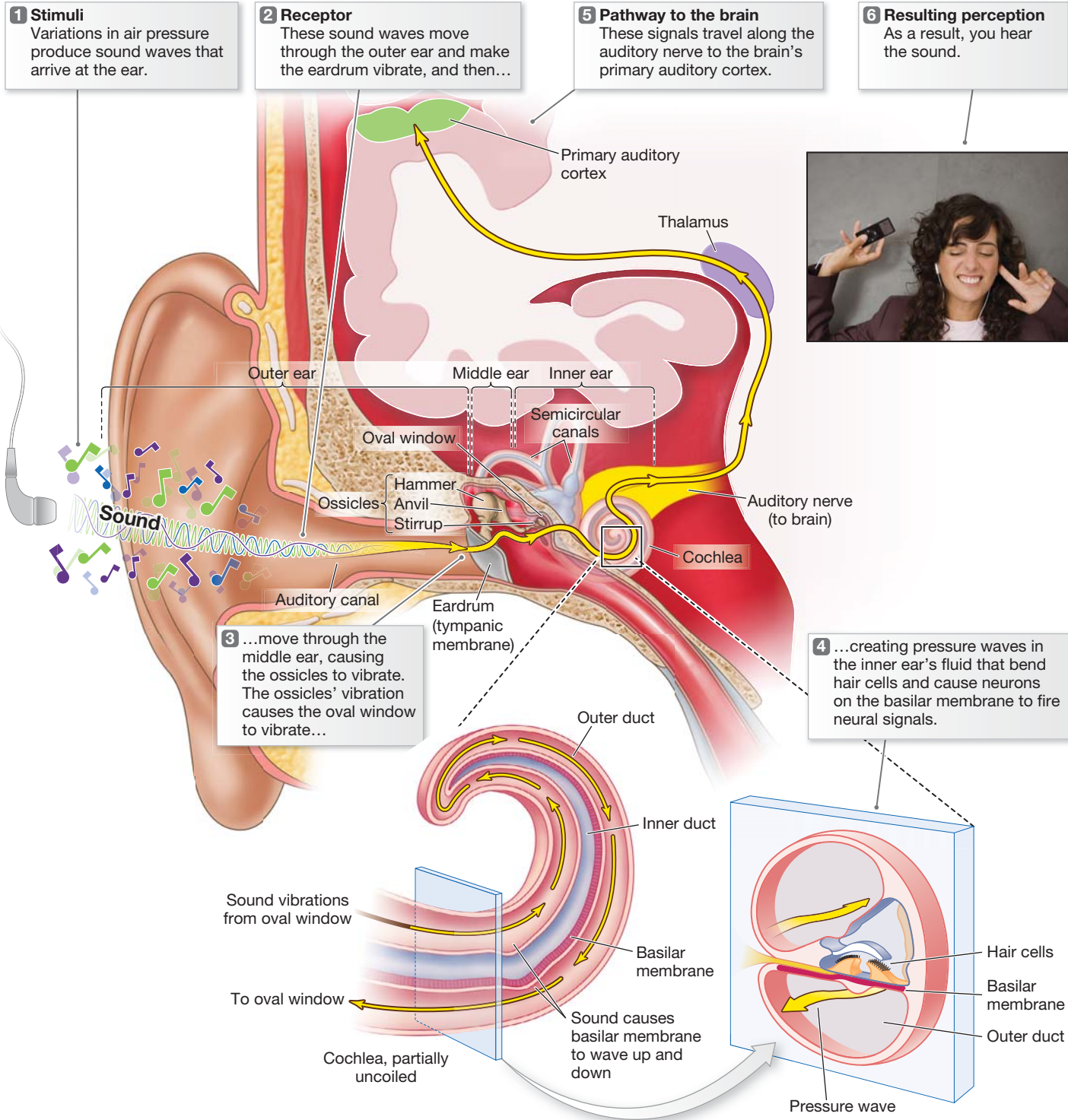
Look at the colours of the central squares in each pair. Do they look the same or different?



**Result:** The central squares in each pair are identical, but they look different because of the different background colours. For example, most people see the grey square that is surrounded with red as lighter than the grey square surrounded with green. If you doubt that the central squares are identical, cover the surrounding portions of each square.

How We . . . figures take students step by step through complex processes such as how we hear and how we see.

FIGURE 5.14 How We Hear



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# Psychological Science

Third Canadian Edition

W.W. Norton & Company has been independent since its founding in 1923, when William Warder Norton and Mary D. Herter Norton first published lectures delivered at the People's Institute, the adult education division of New York City's Cooper Union. The firm soon expanded its program beyond the Institute, publishing books by celebrated academics from America and abroad. By mid-century, the two major pillars of Norton's publishing program—trade books and college texts—were firmly established. In the 1950s, the Norton family transferred control of the company to its employees, and today—with a staff of four hundred and a comparable number of trade, college, and professional titles published each year—W.W. Norton & Company stands as the largest and oldest publishing house owned wholly by its employees.

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# Psychological Science

## Third Canadian Edition

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*We dedicate this book to*

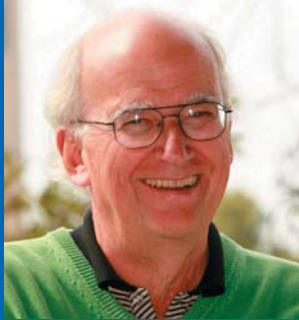
Lilly, Emmy, Garth, and Dante Tretheway  
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and Jaye, Danny, and Belle Halpern-Duncan  
Nariko Takayanagi, Seiji Heine, and Kokoro Heine

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# ABOUT THE AUTHORS



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**Todd F. Heatherton** (Ph.D., University of Toronto) is the Lincoln Filene Professor of Psychological and Brain Science at Dartmouth College. His recent research takes a social brain sciences approach, which combines theories and methods of evolutionary psychology, social cognition, and cognitive neuroscience to examine the neural underpinnings of social behaviour and personality. He was elected president of the Society for Personality and Social Psychology (for 2011), and he has served on the executive committees of the Association of Researchers in Personality and the International Society of Self and Identity. He is associate editor of the *Journal of Cognitive Neuroscience* and serves on many editorial boards and grant review panels. He received the Petra Shattuck Award for Teaching Excellence from the Harvard Extension School in 1994, the McLane Fellowship from Dartmouth College in 1997, and the Friedman Family Fellowship from Dartmouth College in 2001. He is a Fellow of the American Psychological Association, the Association for Psychological Science, and the Society for Personality and Social Psychology.



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**Steven J. Heine** (Ph.D., University of British Columbia) is Professor of Psychology and Distinguished University Scholar at the University of British Columbia. His research largely focuses on cultural psychology. In particular, he has explored how cultural experiences shape the ways that people understand themselves and the world around them. He has been on the faculty at the University of Pennsylvania, and he has had visiting positions at Kyoto University and Tokyo University. He has received the Distinguished Scientist Early Career Award for Social Psychology from the American Psychological Association and the Early Career Award from the International Society of Self and Identity. He is also the author of the textbook *Cultural Psychology*, published by Norton.

# PREFACE

When we, Mike and Todd, began the First Edition of this book, more than a decade ago, our primary motivation was to write a textbook that presented ongoing revolutionary changes in the field. Thus we focused on cutting-edge psychological and brain sciences. Instead of an encyclopedic and homogenized textbook that dutifully covered worn themes and tired topics, we tried to create a readable book that captured the excitement of contemporary research and yet was respectful to the rich tradition of scientific scholarship accumulated by the field. We sought and received excellent advice from countless colleagues across the globe about what was most important to them in introductory psychology courses and what they believed was of greatest value to students.

The Canadian Edition is an embodiment of this endeavour and a labour of love for two Canadian authors (Todd and Steven). We sought to do much more than simply add a few references to Canadian research and pop culture. In talking with instructors we found that many were skeptical about editions that replace American nationalism with Canadian nationalism. After all, the rich history of psychological science reflects contributions from scholars around the globe, such as Wundt's original work in Germany. Should students not learn about the best psychological science, no matter where it originates? Our goal with the Third Canadian Edition is to present a global perspective on contemporary psychological science. The new edition fully represents the rich and exciting research being done in Canada, but each chapter also includes at least one new research example from outside North America. We also tailored the presentation for Canadian students by providing specifically Canadian examples, cultural references, current events, and demographics, all of which help show how psychology applies to everyday life. For instance, many of the On Ethics features deal with current events and ethical issues ongoing in Canada. In one feature, we discuss the case of Samuel Golubchuk, from Manitoba, and physicians' need to decide when to end medical care for those who are in coma. In another feature, we consider the use of cochlear implants in deaf Canadian children.

It was great fun to be working on the Canadian Edition while the Winter Olympics were being held in Vancouver. Steve Heine works at the University of British Columbia and had front row seats for the excitement that takes place in a host city. Across the continent and a little south, Todd, who spent much of his childhood in the suburbs of Vancouver, watched with great pride and joy (and a lot of nostalgia) as Canadian athletes put in such spectacular performances and brought home gold (hooray for Sidney Crosby!). Naturally, many of our examples were inspired by the recent Olympics events, and at least for this edition we hope that readers and instructors will allow us to indulge our national pride a bit. We are

grateful to Mike and Diane and our publishing team at W. W. Norton for encouraging us to do so, even in the face of more typical Canadian modesty. Throughout the edition, we sought examples that were truly Canadian in spirit and meaningful to the students reading the book, since the ultimate goal of using any examples is to reinforce the material in a way that makes it more familiar and easier to learn.

## Guiding Principles for the Third Edition

### A Global Perspective on Psychological Science

From the earliest days of psychology's history, Canadian psychological scientists have made numerous important contributions to the field. Readers of this book will discover that much of the most foundational research in psychology took place in Canada. The milestones discussed here include groundbreaking research on memory done at the University of Toronto, incredible achievements in understanding functional neuroanatomy from McGill University, and exhaustive research on psychopathy done at the University of British Columbia. Today, a tremendous amount of exciting research is taking place at Canadian universities, and each chapter also presents many examples of that work.

It is unfortunate that so many psychology textbooks focus almost completely on research from North America. Our goal was to present the best psychological research regardless of country, and so each chapter includes new important research from many corners of the globe. For example, we discuss the fascinating work coming out of Belgium and England that demonstrates researchers' ability to communicate with people who are in coma by examining patterns of brain activity as the apparently unconscious patients are asked questions. We describe research from Australia that provides an elegant description of how working memory is updated to take into account new information. We include a superb experiment from Sweden that provides a novel way to test the theory that dopamine depletion in the frontal lobes may be the reason that working memory tends to decline with age.

### A Focus on Culture Throughout

Steve Heine joined our author team to help seamlessly integrate a significant amount of research and historical material from Canadian psychologists across the discipline as well as real world examples from cultures around the world. Steve brought special magic to the book through revising many of the chapters, integrating cultural examples and research throughout, and creating a chapter about cultural psychology. As far as we know, this is the first chapter fully dedicated to cultural psychology to appear in a mainstream introductory psychology textbook. It serves two important purposes in this book. First, it serves as a capstone, reinforcing the authors' belief that a levels-of-analysis approach is the best way to understand human behaviour. Second, by elevating cultural psychology to a chapter-level subject, it reinforces our goal of presenting students with the most cutting-edge material from this dynamic, research-driven field. Each of the other chapters in the book introduces students to different cultural perspectives so that the students keep their horizons as broad as possible.

### A Relevant Presentation for Canadian Students

This book was written first and foremost for Canadian students. Having attended university in Canada, Steve and Todd know first-hand that textbooks that focus excessively on American examples are distracting, disorienting, and occasionally annoying. Therefore, whenever possible we focus on Canadian culture, heritage, and current

events to draw students in and connect psychology to their own lives. We wanted more CBC and CTV than ABC and NBC; more MuchMusic than VH1; more Hockey Night in Canada than Monday Night Football. Our chapter opening vignettes focus primarily on Canadian events, such as the Chapter 1 vignette on Robert Dziekański, the Polish man who was tragically killed at the Vancouver airport by RCMP officers. We made sure to have the latest numbers from Statistics Canada and Health Canada on daily life, such as recent findings that Canadian women sleep about 11 minutes longer on average than Canadian men, that 3.3 million Canadians experience problems with insomnia, and that more people use marijuana in British Columbia than in Prince Edward Island. Our book is Canadian to the core and consistent with Canadian values, such as the importance of multiculturalism and social justice.

### Our Science of Learning System

Over the past few decades, by conducting empirical studies, researchers have discovered the best practices for learning. Researchers have studied the way people think, learn, and remember, yet this knowledge is not often applied to student learning. We are thrilled to have Diane Halpern join us as a co-author on the third edition. Diane is a past president of the American Psychological Association; a leader in the study of the science of learning; the author of many critically acclaimed articles and books on cognition, culture, and gender; an organizer of many important committees for examining learning objectives and training students in psychology; and the acknowledged guru of critical thinking. Diane's expertise in these areas brought many new, science-based learning features, such as an enhanced ask-and-answer approach and Critical Thinking Skills modules that show students how to put critical thinking into action. Using scientific evidence about the cognitive, individual, and environmental factors that influence learning, the Third Edition brings this science into the classroom. Learning Objectives focus students on the central questions they should be able to answer after reading the chapter. The Learning Objectives are explicitly tied to the corresponding Summing Up/Measuring Up features at the end of each main section, which give students take-home messages as well as questions with which they can test their understanding. Practice Tests at the end of the chapters help students consolidate their knowledge. Thus we used knowledge from scientific research to design the pedagogical elements of the book. That, after all, is the point of our book: We learn how things work through careful scientific study.

### The Visual Program

Active learning is not stimulated by text alone. The Third Edition supports visual learners with clear, attractive graphics that stimulate students' thinking and drive home key concepts. Because we value the scientific approach, we sought out one of the world's leading educational psychologists, Richard Mayer, whose research focuses on how people can learn more effectively using visual materials. Indeed, for his pioneering research in science education, Rich won the 2008 Distinguished Contribution of Applications of Psychology to Education and Training Award from the American Psychological Association. Fortunately, Rich was just down the hall from Mike's new office in Santa Barbara, so we met in Santa Barbara to seek Rich's advice and counsel. During this enormously productive meeting, Rich helped us conceptualize new presentations of visual information in ways that will help students learn. Throughout this edition, new figures bring abstract concepts to life for students. Try for Yourself features encourage students to engage in demonstrations on their own, and Scientific Method illustrations carefully and consistently lead students through the steps of some of the most interesting experiments and studies. We are especially pleased with the

new How We figures, in Chapter 5, which take students step by step through complex processes such as how we hear and how we see. We also carefully considered each piece of visual material in the book, making sure that captions were informative rather than descriptive. We also eliminated many figures that were simply uninspired, replacing them with art that is more meaningful for students.

## The Third Edition Comes to Life

After considerable time, thought, and effort, we are pleased to present our new edition. We believe that our book gives students a thorough and interesting overview of contemporary psychological research using the best practices from the science-of-learning research. It develops psychological literacy by presenting the material in a way that is directly related to their lives. The Third Edition also invites students to consider the difficult new ethical dilemmas stemming from advances in psychological research. Mike's book *The Ethical Brain* raised many fundamental questions about how society needs to consider the implications of research in psychological and brain sciences. For each chapter of *Psychological Science*, Mike wrote a feature describing an ethical issue central to the theme of the chapter. Given the success of *The Ethical Brain*, we expect that students will find these features engaging and thought-provoking.

We feel that the revisions we have made to our textbook will have great appeal for students and instructors. We conducted focus sessions and surveyed a large number of users and potential users to canvass their thoughts, and we took these into careful consideration as we crafted this new edition. There have been major changes to nearly every chapter; in particular, we have added more material related to gender, culture, and international issues. At the same time, we stayed true to our primary goal: creating an accessible book that focuses on contemporary research approaches within psychological science. This is an exciting time to work in psychological science, and we hope that our excitement is contagious to our students and readers. We are energized and inspired by the many undergraduate and graduate students we have the pleasure to interact with each day. This book is written for them, with our respect for their intelligence and our admiration for their inquisitiveness.

## Acknowledgements

We begin by acknowledging the unwavering support we have received from our families. Writing a textbook is a time-consuming endeavour, and our family members have been generous in allowing us the time to focus on writing. We are also extremely grateful to the many colleagues who gave us constructive feedback and advice. Some individuals deserve special recognition. We are especially grateful to Dan Levitin, at McGill University, who not only provided excellent advice for each chapter, but inspired us with his words about the magic that comes from processing sounds that make up music. Toni Schmader, at UBC, was a graceful source of inspiration and was instrumental in helping us revise material in social and cultural psychology. Steve Joordens, at University of Toronto, Scarborough, helped us make our decision to take a global perspective on psychological science rather than a "Canadian only" version. For both the Canadian and U.S. Editions, we have benefited greatly from the expertise of faculty from UBC Okanagan and St. Francis Xavier, particularly Mark Holder and Karen Brebner. Heather Schellinck, at Dalhousie University, has been instrumental to us in offering wisdom and helping us develop strong support materials for instructors. We are also particularly indebted to Debra Mashek for creating the Practice Tests and Psychology and Society questions and contributing richly to the learning system, including advising us on



Learning Objectives and other pedagogical features. We also benefited from the astute guidance of many reviewers and consultants over the past three editions, particularly Elizabeth Phelps, Howard Hughes, Peter Tse, Richard Mayer, Jamie Pennebaker, Wendi Gardner, Tara Callaghan, Jim Enns, David Barlow, Lisa Best, Erin Hardin, Katherine Gibbs, Dana Dunn, Dawn Strongin, Gene Ouellette, and numerous others who took the time to share with us their views about what works in teaching introductory psychology. We have been very pleased with the warm reception our book has received internationally and would like to recognize the thoughtful guidance and advice of our UK advisor, Jamie Ward, University of Sussex.

Producing a textbook requires a small army of people who are crucial at each step of the way. For instance, our ancillary team was instrumental in producing first-rate materials that will assist students and instructors in having a rich experience with the material. Georgina Archbold and Anna Tirovolas, both of McGill, joined Gary Lewandowski, Brett Beck, and Eileen Astor-Stetson as authors of the Third Canadian Edition's Study Guide. Georgina and Anna, along with Brett and Eileen, also authored superb new content for the student StudySpace website. Pat Carroll once again assembled wonderful video offerings that contribute so much to classroom instruction. Likewise, Erin White (McGill) and Caton Roberts created brilliant PowerPoint lectures to accompany the text. Deborah Matheson (Vancouver Island University), Sue Franz, Robin Morgan, and Patrick Dyer wrote a truly spectacular Instructor's Manual, which also benefited from design ideas by Katherine Gibbs. We are so grateful to all these individuals for lending their talent and time to create a strong support package for the Third Edition.

A special mention needs to be made of the Test Bank, which, as every instructor knows, is crucial to a successful course. Inadequate test banks with uneven or ambiguous items can frustrate students and instructors alike. For the Third Edition, we used a science-of-learning approach to assessment. First, we convened a focus group of leading assessment researchers in July 2007 in La Jolla, California, to discuss best practices for test item construction and assessment. Valerie Shute and Diego Zapata-Rivera then wrote guidelines for assessment that were useful for all print and media support materials to ensure quality and consistency throughout. Subsequently, the highly accomplished team of Mark Holder (University of British Columbia, Okanagan), Wendy Domjan, Bernard Beins, Valeri Farmer-Dougan, and Jessica Shryack did an amazing job of assembling the items. We cannot express the depth of our appreciation for their efforts.

## The Norton Team

In the modern publishing world, where large multinational corporations produce most books, W. W. Norton stands out as a beacon to academics and authors. Its employees own the company, and therefore every individual who worked on our book has a vested personal interest in its success; it shows in the great enthusiasm they bring to their work. Jon Durbin, a born motivational speaker, was our first editor. Jon absorbed so much psychological knowledge and came to know so many people in the field that at times it was easy to forget he was not a psychologist. Unfortunately for psychology, Jon's first love is history, and he decided to shift his full-time attention to editing books in that field. However, he needs to be recognized as the person responsible for bringing Steve Heine and Diane Halpern onto the team. We missed Jon's exuberant enthusiasm as we completed the Third Edition, and we wish him well as he toils away with all those dreary historians.

We are indebted to Roby Harrington for his unwavering support of our book, but we are especially grateful to him for hiring Sheri Snavely to head the psychology list and to serve as our new editor. Sheri is a highly experienced science editor,

and she brought many excellent ideas to the book, particularly in terms of reconsidering the entire art program. We are grateful for her dedication to the project and for her unflagging commitment to its success. She has a way of bringing out our best work, and her care and passion show throughout this Third Edition. Sheri is one of a kind, and we are honored to have worked with her the past three years. Senior developmental editor Kurt Wildermuth, who served as lead manuscript editor and project editor, is a wordsmith of the highest order and one of the most organized people we have met. He possesses the rare talent to stay completely focused, even when dealing with the potential vagaries of jury duty.

As senior production editor, Christopher Granville managed to keep us all on track in meeting critical timelines and did so without complaining about the authors' erratic and never-ending travel schedules. Sarah England did an amazing job creating the visual art program for the Third Edition. She worked with Rich Mayer to develop new interactive figures that encourage student involvement, and she created wonderful new illustrations throughout the book. Students will be forever grateful to her for visual art that helps them understand some of the more complex and technical aspects of psychological science. We are grateful to psychology editorial assistant Mary Dudley, a McGill graduate, for working long hours to make sure we had all the materials we needed right when we needed them. We also thank Matthew Freeman for taking charge of the media and ancillaries to make sure we have the strongest possible support package. Peter Lesser played an especially important role on the assessment initiative, and we appreciate the efforts he made on our behalf.

Not only did Sarah England push us to excel with our visual program, but she played an incredibly important role in bringing together the materials for this Canadian Edition. She worked with us to ensure an international perspective and, on a more mundane level, cracked the whip throughout to keep us on schedule. Along with Sheri Snavelly, Sarah worked with us nearly daily to make sure the Canadian Edition lived up to its potential. We also thank Elyse Rieder and Trish Marx for working with our Canadian photo researcher, Robyn Craig, to create a meaningful and visually pleasing photo program.

Special thanks go to our Canadian marketing manager, Amber Chow, who has racked up enough frequent flyer points traveling for our book that she could probably fly to the moon and back. A McGill graduate and former Norton traveler for Eastern Canada and the Maritimes, Amber is a tremendous resource for putting together wonderful materials and strategies to demonstrate key features of the book. Indeed, the entire sales and marketing team at Norton—led by Director of Sales Michael Wright, Director of Marketing Stephen Dunn, and Canadian Sales Manager Kym Silvasy-Neale—has been supportive and inspiring. We would like to thank the Norton Canadian travelers, Peter McCullough, Matthew Ronald, Teagan Towhey, and Cody Baker, who have huge territories and travel tirelessly on our behalf. We are especially grateful to them for taking the time to learn about our book in order to introduce it to our fellow instructors. Finally, we acknowledge Norton president Drake McFeely for inspiring a workforce that cares so deeply about publishing and for having continuing faith in us.

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# MEDIA & PRINT RESOURCES FOR INSTRUCTORS AND STUDENTS

## For Instructors

### **Instructor's Resource Manual**

by Deborah Matheson (Vancouver Island University), Sue Franz (Highline Community College), Robin Morgan (Indiana University Southeast), and Patrick Dyer (Kennesaw State University)

The Instructor's Resource Manual has been comprehensively integrated with the new edition of the text. The manual equips you with new Concept Maps for each chapter that are completely integrated with emedia features.

### **Test-Item File**

by Mark Holder (University of British Columbia, Okanagan), Wendy Domjan (University of Texas at Austin), Bernard Beins (Ithaca College), Valeri Farmer-Dougan (Illinois State University), and Jessica Shryack (University of Minnesota)

This file has been completely revised, using an evidence-centred approach designed by Valerie Shute, of Florida State University, and Diego Zapata-Rivera, of the Educational Testing Service. It includes over 3,000 questions structured around a Concept Map that is consistent with the Study Guide and Instructor's Resource Manual. Use it to evaluate student knowledge on factual, applied, and conceptual levels. The Test-Item File is available in print, ExamView<sup>®</sup> Assessment Suite, and Word formats.

### **The Norton Psychology DVD**

This diverse collection of over 60 minutes of video clips, ranging from 3 to 7 minutes each, shows the science of psychology in action. The updated DVD includes a host of new clips that incorporate the Learning Objectives of the text with Critical Thinking questions to create a truly effective teaching tool. Free to qualified adopters.

### **Instructor's Resource DVD**

by Erin White (McGill University)

The Instructor's Resource DVD provides an array of resources for instructors to create easy and effective lecture presentations:

- Lecture PowerPoints with Clicker Questions
- Art PowerPoints
- Image Gallery of art from the text

### **Instructor's Resource Site**

The Instructor's Resource Site is an online source of instructional content for use in lectures, modified classrooms, and distance education courses. The site includes:

- Lecture PowerPoints
- Clicker Questions in PowerPoint format

- Art PowerPoints
- Image Gallery of art from the text
- BlackBoard/WebCT Coursepack
- BlackBoard/WebCT Web Quizzes and Test Bank
- Computerized Test Bank and ExamView® Assessment Suite Software

## For Students



### StudySpace

by Georgina Archbold and Anna Tirovolas (McGill University)

[www.norton.com/studyspace](http://www.norton.com/studyspace)

This free student website provides a rich array of multimedia resources and review materials within a proven, task-oriented study plan. Each chapter is arranged in an effective Organize, Learn, and Connect structure, with review materials such as chapter summaries, flashcards, and quizzes. The Norton Quiz+ Assessment Program gives students customized chapter-by-chapter study plans that target specific content areas for review. The StudySpace offers:

- **Chapter Audio Podcasts** that serve as chapter overviews and discussions of key concepts. The content is chapter-specific and is organized around the key Learning Objectives.
- **Scientific Method Tours with Review Questions** that help students understand the basic processes of psychological phenomena such as vision and hearing. Each process tour incorporates the new Scientific Method features in the text and is accompanied by review questions.
- **New Animations** that cover more topics and psychological processes in the text. They appear on StudySpace and can be accessed and launched from the ebook.
- **Drag-and-Drop Labelling Exercises** that use the line art from the text to help students understand key diagrams and complex structures.
- **Visual Quizzes** that integrate the revised art program from the text to help students review the details of important figures and diagrams.



### Ebook

[nortonebooks.com](http://nortonebooks.com)

Same great content, one-third the price!

The ebook links to StudySpace and offers many useful electronic tools, such as highlighting and sticky notes.

### Study Guide

by Georgina Archbold and Anna Tirovolas (McGill University),

Gary Lewandowski (Monmouth University), Brett Beck and Eileen Astor-Stetson (Bloomsburg University)

The thoroughly revised Study Guide is based on new assessment principles. A Concept Map gives students a tour of each chapter; Learning Objectives and self-tests are also included. Exercises include quizzes in various question formats (with answer key), graphical concept models, key terms, and Critical Thinking questions based on the Critical Thinking Skills in the text.

## ZAPS

[www.norton.com/zaps](http://www.norton.com/zaps)

The Norton Psychology Labs are online labs that allow students to participate in classic studies in psychology. ZAPS online gives students the theoretical background for each psychological experiment within an interactive, data-driven format.

# STUDENT PREFACE

## How Psychology Can Help You Learn

In this increasingly fast-paced world, we are constantly bombarded with information: News stories reach us in minutes from around the globe, new technologies replace old ones, and groundbreaking scientific studies alter long-held beliefs about the physical world. To succeed in university and in your career, you will need to develop powerful learning strategies that produce durable and flexible learning—learning that lasts well into the future and that you can transfer to new situations. The following study skills, based on psychological research, will help you work more productively, learn more efficiently, and apply what you have learned in a variety of settings. (You will find more about learning in several chapters in this book, especially in Chapter 7, “Attention and Memory,” and Chapter 8, “Thinking and Intelligence.”)

### 1. The Right Goals Lead to Success

Throughout your life, you will set countless short-term and long-term goals for yourself: to get that enormous pile of laundry done, to run an eight-minute mile, to have a family, to succeed in your career. It is important to choose goals that are challenging yet attainable. If your goals are unrealistically high, you set yourself up for failure and discouragement. If they are too low, you will not achieve your greatest potential. Divide each goal into specific, achievable steps, or subgoals, and reward yourself when you reach a milestone. Even a small achievement is worth celebrating!

### 2. A Little Stress Management Goes a Long Way

Stress is a fact of life. A moderate amount of stress can improve your performance by keeping you alert, challenged, and focused. However, too much stress has the opposite effect and can diminish your productivity, interfere with your sleep, and even take a toll on your health. When the pressure is on, seek healthy ways to manage your stress, such as exercising, writing in a journal, spending time with friends, practicing yoga, or meditating.

### 3. Cramming Does Not Work

You have a busy life, and it is always tempting to postpone studying until the night or two before an exam. But in all of your classes there is too much to learn to cram your learning into a few days or late nights. You might be able to remember enough information to get a passing grade on an exam the following day, but plenty of



research has shown that cramming does not produce learning that lasts. To make learning stick, you need to space out your study sessions over the semester and build in plenty of time for active reviews.

#### 4. Learning Is Not a Spectator Sport

The more effort you put into your studying, the more benefit you will receive. Merely rereading a chapter or your class notes is not as effective as actively trying to remember what you have learned. Every time you learn something, you create “memory traces” in your brain. By retrieving the information that was learned, you strengthen the memory traces so that you will be more likely to recall the memory in the future. In this book, to encourage active studying, every major section heading is in the form of a question. When you go back to study each section, begin by writing out an answer to the question in the heading without looking at the book. Then check the accuracy and completeness of what you wrote.

#### 5. Explaining Enhances Understanding and Memory

As you learn, focus on trying to explain and describe complicated topics in your own words, as opposed to just memorizing terms and definitions. For example, simply using flashcards to learn about visual perception may help you memorize individual parts of the eye and their functions, but doing so will not help you put the pieces together to understand the incredible process of how we see and recognize objects in the world. Memorizing isolated bits of information is also likely to result in shallow learning that is easily forgotten. A deeper level of learning based on explanation and description would give you a more holistic understanding and a greater ability to generalize the information.

#### 6. There Is More Than One Way to Learn

As you will read in Chapter 7, people process information in two channels—visual and verbal. Another strategy for creating durable learning is to use both of these information formats. Try to supplement the notes you take with visual and spatial displays such as concept maps, graphs, flowcharts, and other types of diagrams. Doing so not only makes you more likely to remember the information but also helps you gain a better understanding of the big picture by emphasizing the connections among important ideas.

A knowledge of psychology can be useful to you in many ways, even if you do not pursue a career in the field. For this reason, we have tried to make all the material in *Psychological Science* accessible and interesting for you as well as directly applicable to your life. As you gain an integrated grounding in traditional and new approaches within psychological science, we hope that this book spurs your curiosity about psychological phenomena. We hope that, by thinking critically about issues and themes in psychological science and in aspects of your life, you will develop a greater understanding of yourself and others.

Mike, Todd, Diane, and Steve

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# Psychological Science

Third Canadian Edition



# Introduction

ON OCTOBER 13, 2007, Robert Dziekański, a construction worker from Poland, arrived at Vancouver International Airport to meet his mother, who had moved to BC before him. He spoke no English, and after a long series of meetings with immigration officers, Dziekański finally emerged from the Customs Hall 10 hours later. Unable to find his mother, or communicate with anyone at the airport, Dziekański was looking visibly agitated. He tried to prop open a door to the public lounge with a chair and, in frustration, threw a computer and table to the floor. When four RCMP officers arrived shortly afterwards, they found a defiant man who could not be understood (FIGURE 1.1). When Dziekański picked up a stapler the RCMP moved in to subdue him, and they Tasered him five times. At this point, Dziekański's heart stopped, and when paramedics arrived 15 minutes later they were unable to revive him. He

## What Are the Seven Themes of Psychological Science?

- Psychology Is an Empirical Science
- Nature and Nurture Are Inextricably Entwined
- The Brain and Mind Are Inseparable
- A New Biological Revolution Is Energizing Research
- The Mind Is Adaptive
- Psychological Science Crosses Levels of Analysis
- We Often Are Unaware of the Multiple Influences on How We Think, Feel, and Act

## How Did the Scientific Foundations of Psychology Develop?

- Experimental Psychology Begins with Structuralism
- Functionalism Addresses the Purpose of Behaviour
- Gestalt Psychology Emphasizes Patterns and Context in Learning
- Women Made Pioneering Contributions to Psychology
- Freud Emphasized the Power of the Unconscious
- Most Behaviour Can Be Modified by Reward and Punishment

- Cognition Affects Behaviour
- Social Situations Shape Behaviour
- Psychological Therapy Is Based on Science

## How Can We Apply Psychological Science?

- Psychological Knowledge Is Used in Many Professions
- People Are Intuitive Psychological Scientists
- Psychological Science Requires Critical Thinking
- Psychologists Adhere to a Code of Ethics
- Psychology Is Relevant to Every Person's Life

was pronounced dead at the scene. An inquiry ruled that the officers acted like they were “responding to a barroom brawl” and were not justified in using Tasers.

Psychologists seek to understand how people perceive, think, and act in a wide range of situations, including horrific ones such as the Dziekański case. Among the psychological phenomena involved in this case are emotion, memory, decision making, social interaction, cultural differences, prejudice, group behaviour, and mental trauma. Psychologists would be interested in knowing, for example, how the officers’ emotional states affected their decision making at the scene. They would be interested in knowing whether Dziekański’s frustration with not being understood led to his aggressive outbursts. They also would want to study the accuracy of the defendants’ and eyewitnesses’ accounts of the incident. In addition, they would want to examine group behaviour. Did the fact that the officers arrived at the scene together affect individual behaviour? Were the officers competing among themselves to see who could earn a reputation as the toughest officer? Did media coverage influence the inquiry? Did prejudice affect the way the officers interpreted how much of a threat Dziekański posed? Did being the potential target of prejudice affect Dziekański’s reaction to the police? How could we know if prejudice was a factor in people’s behaviours?

It is difficult to study the factors that underlie prejudice because most people deny holding such socially unacceptable beliefs. How, then, can we “peek inside” the mind to discover what people are thinking and feeling? Over recent decades—by employing strategies such as the self-reports of research participants, observational studies, and experiments—researchers have made numerous important discoveries about prejudice. For instance, prejudice not only influences the beliefs and behaviours of the prejudiced person but also has strong negative psychological effects on the targets of prejudice, whose behaviours are shaped in part by others’ beliefs about them. Perhaps most important, psychological scientists have discovered methods for reducing stereotyping and prejudice.



(a)



(b)

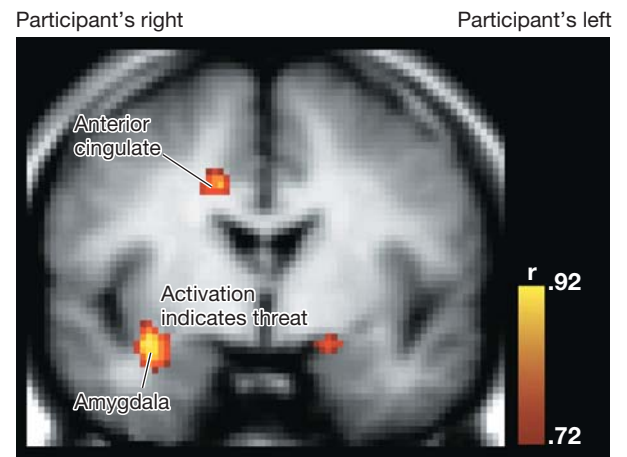
**FIGURE 1.1 Asking Why** (a) Robert Dziekański was highly agitated and combative at Vancouver International Airport after spending several hours trying to communicate (unsuccessfully) with immigration officers. (b) Dziekański died after RCMP officers attempting to subdue him Tasered him repeatedly. Did prejudice play a role in his tragic death?

Several important developments in study methods are deepening psychological science's understanding of the human mind and human behaviour. Methods now exist for observing the working brain in action. Various techniques known collectively as *brain imaging* show which parts of the brain are involved in particular behaviours or particular mental activities. For instance, the cognitive neuroscientist Elizabeth Phelps, at New York University; the social psychologist Mahzarin Banaji, at Harvard; and their colleagues used brain imaging to study racial attitudes. In one study, they showed white university students pictures of unfamiliar black and white faces while, using *functional magnetic resonance imaging (fMRI)*, they scanned the students' brains (Phelps et al., 2000). For some of the research participants, the unfamiliar black faces activated a structure in the brain called the *amygdala*, which is involved in detecting threat; this activation indicates a negative emotional response (FIGURE 1.2). These findings alone do not mean, however, that the (white) students who responded in this way necessarily are afraid of unfamiliar black people. This response occurred only in those participants whose scores on the *Implicit Association Test (IAT)* indicated negative attitudes toward blacks. The IAT, taken on a computer, measures reaction times (how quickly people respond) to assess indirectly whether people associate positive and negative words with certain groups of people. In a second study, the researchers showed a new group of white students pictures of famous black people, such as Denzel Washington and Michael Jordan; this time, the amygdala was not activated. This encouraging news suggests that increasing familiarity reduces the fear response, and this reduction in turn might reduce the likelihood of prejudice and discrimination.

The research on prejudice is one example of how psychologists explain human behaviours in real-life contexts. Most of us have a strong desire to figure out other people, to understand their motives, thoughts, desires, intentions, moods, actions, and so on. We want to know whether others are friends or foes, leaders or followers, likely to spurn us or fall in love with us. Our social interactions require us to use our impressions of others to categorize them and to make predictions about their intentions and actions. We want to know why they remember some details and conveniently forget others, or why they engage in self-destructive behaviours. Essentially, we constantly try to figure out what makes other people tick. People who do this for a living are *psychological scientists*.

**Psychological science** is the study of mind, brain, and behaviour. But what exactly does each of these terms mean? *Mind* refers to mental activity. The perceptual experiences a person has while interacting with the world (sight, smell, taste, hearing, and touch) are examples of the mind in action—as are the person's memories, the person's thoughts, and the person's feelings. Mental activity results from biological processes—the actions of *nerve cells*, or *neurons*, and their associated chemical reactions—within the brain. Later, this chapter will discuss scholars' long-standing debate about the relationship between the brain and the mind. For now, note that the “mind is what the brain does” (Kosslyn & Koenig, 1995, p. 4). In other words, the physical brain enables the mind.

The term *behaviour* is used to describe a wide variety of actions, from the subtle to the complex, that occur in all organisms. For many years, psychologists focused on behaviour rather than on mental states, largely because they had few objective techniques for assessing the mind. The advent of technology to observe the working brain in action has allowed psychological scientists to study mental states such as consciousness and has led to a fuller understanding of human behaviour.



**FIGURE 1.2 Brain Imaging and Racial Attitudes** Phelps, Banaji, and their colleagues showed white university students pictures of unfamiliar black and white faces. When some of the participants viewed unfamiliar black faces, brain scans showed activation of the amygdala, a brain region associated with threat detection, and also of the anterior cingulate, which is associated with emotional response.

## Real World PSYCHOLOGY

**psychological science** The study of mind, brain, and behaviour.

### LEARNING OBJECTIVE

List and explain the seven themes of psychological science.

## What Are the Seven Themes of Psychological Science?

This book highlights seven themes. Some of these themes traditionally have defined psychology, and all of them guide psychological scientists' study of the mind, brain, and behaviour.

1. Psychology is an empirical science.
2. Nature and nurture are inextricably entwined.
3. The brain and mind are inseparable.
4. A new biological revolution is energizing research.
5. The mind is adaptive.
6. Psychological science crosses levels of analysis.
7. We often are unaware of the multiple influences on how we think, feel, and act.

### Psychology Is an Empirical Science

Psychological scientists use the *scientific method* to understand how people think, feel, and act. As discussed in Chapter 2, the scientific method is the use of objective, systematic procedures that lead to an accurate understanding of what is being studied. It involves careful observations of the natural world to examine how things work. Although most people are not scientists, most people consume scientific research in some form, and to be savvy consumers of that research they must be able to distinguish between “good science,” meaning well-conducted research, and “bad science,” meaning flawed research. Understanding how science is conducted makes it possible to tell which studies are credible—that is, use sound scientific methods—and which ones are not. By understanding that psychology is an empirical science, in other words, you begin to learn how psychologists work and how you can become an intelligent consumer of research (FIGURE 1.3).



**FIGURE 1.3 Psychology in the News** Most people consume scientific research without even being aware of it, when it is presented in the latest intriguing news headline. Being a savvy consumer of scientific information means separating “good science” from “bad science.”



## Nature and Nurture Are Inextricably Entwined

From the time of the ancient Greeks, people have debated whether the individual's psychology is attributable more to *nature* or to *nurture*. That is, are psychological characteristics biologically innate or acquired through education, experience, and **culture** (the beliefs, values, rules, norms, and customs existing within a group of people who share a common language and environment). This **nature/nurture debate** has taken one form or another throughout psychology's history, and psychologists now widely recognize that both nature and nurture are important to humans' psychological development. Psychological scientists now study, for example, the ways that nature and nurture influence each other in shaping the brain, mind, and behaviour. Many researchers explore how thoughts, feelings, and behaviours are influenced by genes and by culture. In examples throughout this book, nature and nurture are so enmeshed that they cannot be separated.

As an example of changing beliefs about the influences of nature and nurture, consider two mental disorders that are discussed further in Chapter 14: *Schizophrenia* causes a person to have unusual thoughts, such as believing he or she is God, or experience unusual sensations, such as hearing voices. *Bipolar disorder* causes a person to have dramatic mood swings, from feeling extremely sad (depressed) to feeling euphoric (manic). Before the 1950s, it was generally believed that these two mental disorders, among others, resulted from bad parenting or other environmental circumstances—that is, the causes were believed to be all nurture. But in the late 1950s and the 1960s, various drugs were discovered that could alleviate the symptoms of these disorders; more-recent research has shown that these conditions are heritable. Psychological scientists now believe that many mental disorders result as much from the brain's "wiring" (nature) as from how people are reared and treated within particular cultures (nurture). However, that schizophrenia and bipolar disorder are more likely in certain environments suggests they can be affected by context. People's experiences change their brain structures, which in turn influence people's experiences within their environments. Rapid advancements in understanding the biological and environmental bases of mental disorders are leading to effective treatments that allow people to live normal lives.

Take as another example *post-traumatic stress disorder (PTSD)*, a mental disorder generally believed to result from traumatic events that people experience, such as during military duty or in accidents. Sufferers of PTSD have intrusive and unwanted memories of their traumatic experiences. Although PTSD seems to arise from specific situations, recent research indicates that some people inherit a genetic predisposition to developing it—in this case, nurture activates nature (**FIGURE 1.4**). The social environment also plays an important role in whether treatment for these and other disorders is successful; for example, family members' negative comments tend to decrease a treatment's effectiveness. Psychological science depends on understanding human nature's genetic basis and how environment shapes any particular human's nature.

## The Brain and Mind Are Inseparable

Close your eyes and think about your thoughts for a second. Where do your thoughts reside? If you are like most people, you have a subjective sense that your mind is floating somewhere in or near your head—perhaps inside your skull or a few inches above your forehead. Throughout history, the mind has been viewed as residing in many organs of the body, including the liver and the heart. What is the relationship between the mind's (mental) activity and

**culture** The beliefs, values, rules, and customs that exist within a group of people who share a common language and environment and that are transmitted through learning from one generation to the next.

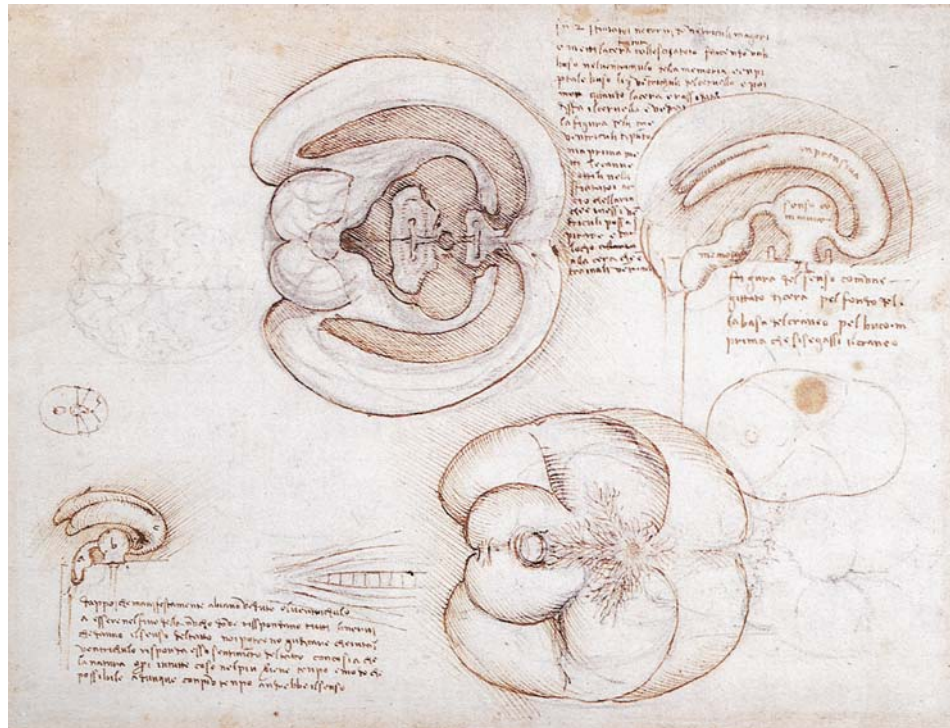
**nature/nurture debate** The arguments concerning whether psychological characteristics are biologically innate or acquired through education, experience, and culture.

### FIGURE 1.4 Nurture and Nature

Post-traumatic stress disorder (PTSD) seems to arise from traumatic events, but recent research indicates that some people inherit a genetic predisposition to developing it. Here, Sean McTeague comforts his son Mike, who was seriously wounded by a roadside bomb in Afghanistan. Sean has founded a charity called WoundedWarriors.ca that seeks to help victims of PTSD.



**FIGURE 1.5 Da Vinci and the Brain** This drawing by Leonardo da Vinci dates from around 1506. Using a wax cast to study the brain, da Vinci found that the various sensory images arrived in the middle region of the brain, which he called the *sensus communis*.



**mind/body problem** A fundamental psychological issue that considers whether mind and body are separate and distinct or whether the mind is simply the subjective experience of the physical brain.

**FIGURE 1.6 René Descartes** According to Descartes' theory of dualism, the mind and the body are separate yet intertwined. As discussed throughout this book, psychological scientists now reject that separation.



the body's (physical) workings? The **mind/body problem** is perhaps the quintessential psychological issue: Are the mind and body separate and distinct, or is the mind simply the physical brain's subjective experience?

Through most of history, scholars believed the mind is separate from and in control of the body. They held this belief partly because of the strong theological belief that a divine and immortal soul separates humans from nonhuman animals. Around 1500, the artist Leonardo da Vinci challenged this doctrine when he dissected human bodies to make his anatomical drawings more accurate. (These experiments also offended the Church because they violated the human body's presumed sanctity.) Da Vinci's dissections led him to many conclusions about the brain's workings, such as that all sensory messages (vision, touch, smell, etc.) arrived at one location in the brain. He called that region the *sensus communis*, and he believed it to be the home of thought and judgment; its name may be the root of the modern term *common sense* (Blakemore, 1983). Da Vinci's specific conclusions about brain functions were not accurate, but his work represents an early and important attempt to link the brain's anatomy to psychological functions (FIGURE 1.5).

In the 1600s, the philosopher René Descartes promoted the first influential theory of *dualism*, the idea that mind and body are separate yet intertwined (FIGURE 1.6). The way Descartes connected mind and body was at the time quite radical. The body, he argued, was nothing more than an organic machine, governed by "reflex." For Descartes, many mental functions, such as memory and imagination, resulted from bodily functions. Linking some mental states with the body was a fundamental departure from earlier views of dualism, in which all mental states were separate from bodily functions. In keeping with prevailing religious beliefs, however, Descartes concluded that the rational mind, which controlled volitional action, was divine and separate from the body. Thus his view of dualism maintained the distinction between mind and body, but he assigned to the body many of the mental functions previously considered the mind's sovereign domain. As noted above, psychological scientists largely reject dualistic

thinking, believing instead that the mind is what the brain does. (The link between brain activity and conscious experience is considered more fully in Chapter 4, “The Mind and Consciousness.”)

## A New Biological Revolution Is Energizing Research

A new and profoundly significant biological revolution is in progress, involving a deeper and somewhat different understanding of the human mind and human behaviour as compared to views held only a few decades ago. Since the time of the ancient Greek philosopher Aristotle, scholars have asked questions about basic psychological phenomena. But they lacked the methods to examine scientifically many of these fundamental questions, such as *What is consciousness? Where does emotion come from? How does emotion affect cognitive processes? How are memories stored in the brain?* These early thinkers were left with philosophical speculation. This situation began to change around the beginning of the twentieth century, and the last 20 years or so have seen tremendous growth in the understanding of mental activities’ biological bases. This interest in biology permeates all areas of psychological science: locating the *neural*, or brain, correlates of how we identify people; discovering the neurochemical problems that produce particular psychological disorders; and so on. As discussed below, three developments in particular have set the stage for the biological revolution and are contributing to the understanding of psychological phenomena.

**BRAIN CHEMISTRY** The first major development in the biological revolution is a growing understanding of brain chemistry. The brain works through the actions of *neurotransmitters*, chemicals that communicate messages between nerve cells (**FIGURE 1.7**). Over the last 30 years, psychological scientists have made tremendous progress in identifying these chemicals and their functions. Although it was long believed that only a handful of neurotransmitters were involved in brain functions, in fact hundreds of substances play critical roles in mental activity and behaviour. For instance, people have better memories for events that happen when they are aroused than when they are calm, because chemicals involved in responding to the world influence the neural mechanisms involved in memory. Their understanding of the brain’s chemical processes has provided researchers with many insights into both mental activity and behaviour, and it has enabled them to develop treatments for various psychological disorders.

**THE HUMAN GENOME** The second major development in the biological revolution is the enormous progress in understanding genetic processes’ influence on life. Scientists have mapped the *human genome*—the basic *genetic code*, or blueprint, for the human body—and they have developed various techniques for discovering the links between genes and behaviour. For instance, to study particular genes’ effects on memory, researchers bred mice that lacked a specific gene (and showed impaired memory—thus the gene is related to memory) and ones that included an additional specific gene (and showed improved memory—more evidence). By identifying the genes involved in memory, researchers soon may be able to develop therapies, based on genetic manipulation, that will assist people who have memory problems, including people with Alzheimer’s disease.

Of course, the idea that a single gene causes a specific behaviour is overly simplistic. No one gene is solely responsible for memory, racist attitudes, and so on. Almost all psychological and biological activity is affected by multiple genes’ actions. Nonetheless, as discussed in Chapter 3, many physical and mental characteristics are inherited to some degree. Scientists are beginning to understand how situational



**FIGURE 1.7 Human Nerve Cell** Nerve cells, or neurons, like this one are the basic units of the human nervous system. The growing understanding of their chemistry has led to better explanations of mental activity and of behaviour.

contexts, such as the presence or absence of particular people, influence how genes are expressed and therefore how they affect behaviour. Mapping the human genome has given scientists the foundational knowledge for studying how specific genes affect thoughts, actions, feelings, and disorders. Although many possible corrections for genetic defects are decades away, the scientific study of genetic influences is providing fresh insights into mental activity.

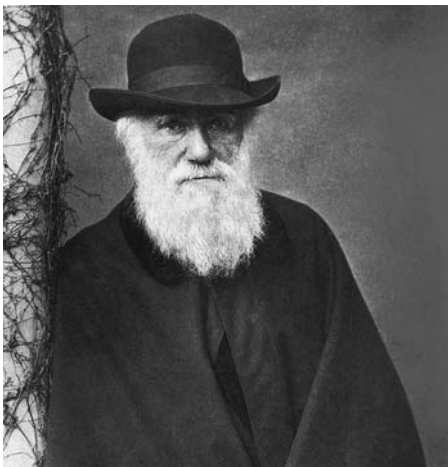
**WATCHING THE WORKING BRAIN** The development of methods for assessing the brain in action has provided the third major force fueling the biological revolution in psychology. The way the brain influences behaviour has been studied with increasing effectiveness for more than a century, but only since the late 1980s have researchers been able to study the working brain as it performs its vital psychological functions. Using the methods of *neuroscience*, psychological scientists can now address some of the most central questions of human experience, such as how different brain regions interact to produce perceptual experience, how various types of memory are similar or different, and how conscious experience involves changes in brain activity.

Knowing where in the brain something happens does not by itself reveal much, but the finding that consistent patterns of brain activation are associated with specific mental tasks suggests the two are connected. For over a century, scientists had disagreed about whether psychological processes are located in specific parts of the brain or distributed throughout the brain. We now know that there is some *localization* of function (some areas are important for specific feelings, thoughts, and actions) but that many brain regions participate to produce behaviour and mental activity. Brain imaging has allowed researchers to make tremendous strides in understanding the mental states involved in many psychological abilities (Posner & DiGirolamo, 2000). The progress in understanding the neural basis of mental life has been rapid and dramatic. For good reason, the 1990s were labelled the decade of the brain.

**evolutionary theory** In psychological science, a theory that emphasizes the inherited, adaptive value of behaviour and mental activity throughout the history of a species.

**adaptations** In evolutionary theory, the physical characteristics, skills, or abilities that increase the chances of reproduction or survival and are therefore likely to be passed along to future generations.

**natural selection** Darwin's theory that those who inherit characteristics that help them adapt to their particular environments have a selective advantage over those who do not.



**FIGURE 1.8 Charles Darwin** Introduced in *On the Origin of Species*, Darwin's theory of evolution has had a huge impact on how psychologists think about the mind. This portrait reportedly was Darwin's favourite picture of himself.

## The Mind Is Adaptive

The human mind has been shaped by evolution. That is, from the perspective of **evolutionary theory**, the brain has evolved over millions of years to solve problems related to survival and reproduction. The accumulating evidence indicates that the mind is adaptive in biological and cultural terms: In addition to helping us overcome challenges, it provides a strong framework for our shared social understandings of how the world works. During the course of human evolution, random genetic mutations endowed some of our ancestors with **adaptations**—physical characteristics, skills, and abilities—that increased their chances of survival and reproduction and ensured that their genes were passed along to future generations.

Among the major intellectual events that shaped the future of psychological science was the publication in 1859 of Charles Darwin's *On the Origin of Species* (**FIGURE 1.8**). Earlier philosophers and naturalists, including Darwin's grandfather, Erasmus Darwin, had discussed the possibility that species might evolve. But Charles Darwin first presented the mechanism of evolution, which he called **natural selection**: the process by which organisms' random mutations that are adaptive are passed along and random mutations that hinder survival (and therefore reproduction) are not. Thus as species struggle to survive, those better adapted to their environments will leave more offspring, those offspring will produce more offspring, and so on. This idea has come to be known as the *survival of the fittest*.

Darwin's ideas have profoundly influenced many scientific fields, philosophy, and society. Modern evolutionary theory has driven the field of biology for years,

but it has only recently begun to inform psychology. Rather than being a specific area of scientific inquiry, evolutionary theory is a way of thinking that can be used to understand many aspects of mind and behaviour (Buss, 1999).

**SOLVING ADAPTIVE PROBLEMS** Over the last five million years, adaptive behaviours and specialized mechanisms have been built into our bodies and brains through evolution. For instance, a mechanism that produces calluses has evolved to protect the skin from the abuses of the physical labour that humans sometimes need to engage in to survive. Likewise, specialized circuits, or structures, have evolved in the brain to solve adaptive problems (Cosmides & Tooby, 1997).

Evolutionary theory is especially useful for considering whether human mechanisms are adaptive—in other words, whether they affect survival and reproduction. For example, psychologists have known for decades that situational and cultural contexts influence the development of social behaviours and of attitudes. Now evidence is accumulating that many behaviours and attitudes can also be considered adaptive solutions to recurring human problems. For example, humans have a fundamental need to belong to a group, and therefore all societies discourage behaviours that may lead to social exclusion (Baumeister & Leary, 1995). People who lie, cheat, or steal may drain group resources and thereby decrease the chances of survival and reproduction for other group members. Some evolutionary psychologists believe humans have “cheater detectors” on the lookout for this sort of behaviour in others (Cosmides & Tooby, 2000).

Another classic example of the way adaptive mechanisms develop involves the “visual cliff” (FIGURE 1.9). When infants old enough to crawl are placed on top of a clear piece of plastic that covers both a firm surface (such as a table) and a dropped surface (the clear plastic extends over the edge of the table), the infants may pat the surface that extends over the cliff and even accidentally back onto it, but they will not willingly crawl over the cliff, even if their mothers are standing on the other side of the cliff encouraging them to do so. Infants become wary of heights at about the same age they learn to crawl, even though they have little personal experience with heights or gravity. This fear of heights is surely an adaptive mechanism that will enhance their chances of survival.

**MODERN MINDS IN STONE AGE SKULLS** According to evolutionary theory, we need to be aware of the challenges our early ancestors faced if we want to understand much of our current behaviour, whether adaptive or maladaptive. Humans began evolving about five million years ago, but modern humans (*Homo sapiens*) can be traced back only about 100,000 years, to the Pleistocene era. If the human brain slowly adapted to accommodate the needs of Pleistocene hunter-gatherers, scientists should try to understand how the brain works within the context of the environmental pressures humans faced during the Pleistocene era. For instance, people like sweet foods, especially those high in fat. These foods are highly caloric, and in prehistoric times eating them would have had great survival value. In other words, a preference for fatty and sweet foods was adaptive. Today, many societies have an abundance of foods, many of them high in fat and sugar. That we still enjoy them and eat them, sometimes to excess, may now be maladaptive in that it can produce obesity. Nonetheless, our evolutionary heritage encourages us to eat foods that had survival value when food was relatively scarce. Many of our current behaviours, of course, do not reflect our evolutionary heritage. Reading books, driving cars,

**FIGURE 1.9 Adaptive Mechanism**

Despite the plastic covering over the visual cliff, infants will not crawl over the cliff even if their mothers call to them from the other side.



using computers, instant messaging, and watching television are among the human behaviours that we have displayed only recently. (Further complexities in the evolutionary process are discussed in Chapter 3, “Biological Foundations.”)

**CULTURE PROVIDES ADAPTIVE SOLUTIONS** For humans, many of the most demanding adaptive challenges involve dealing with other humans. These challenges include selecting mates, co-operating in hunting and in gathering, forming alliances, competing for scarce resources, and even warring with neighbouring groups. This dependency on group living is not unique to humans, but the nature of relations among and between ingroup and outgroup members is especially complex in human societies. The complexity of living in groups gives rise to culture, and culture’s various aspects are transmitted from one generation to the next through learning. For instance, our musical and food preferences, our ways of expressing emotion, our tolerance of body odours, and so on are strongly affected by the cultures we are raised in. Many of a culture’s “rules” reflect adaptive solutions worked out by previous generations.

In contrast to human biological evolution, which has taken place over several million years, cultural evolution has occurred much faster, and the most dramatic cultural changes have come in the last few thousand years. Although humans have changed only modestly in physical terms in that time, they have changed profoundly in regard to how they live together. Even within the last century, there have been dramatic changes in how human societies interact. The flow of people, commodities, and financial instruments among all regions of the world, often referred to as *globalization*, has increased in velocity and scale over the past century in ways that were previously unimaginable. Even more recently, the Internet has created a worldwide network of humans, essentially a new form of culture with its own rules, values, and customs.

Over the past decade, recognition has grown that culture plays a foundational role in shaping how people view and reason about the world around them—and that people from different cultures possess strikingly different minds. For example, research by the social psychologist Richard Nisbett, at the University of Michigan, has demonstrated that people from most Asian countries have a worldview quite different from that of people from most European and North American countries. Metaphorically speaking, Nisbett’s work has suggested that Westerners tend to miss the forest for the trees, focusing on single elements in the forefront, whereas those from Eastern cultures tend to overlook single trees, focusing on the entire forest in the background (**FIGURE 1.10**). Nisbett and his colleagues (2001) have documented many differences in these groups’ thinking styles. The general pattern is that Westerners are much more analytic—they break complex ideas into simpler components, categorize information, and use logic and rules to explain behaviour. Easterners tend to be more holistic

in their thinking, seeing everything in front of them as an inherently complicated whole, with all elements affecting all other elements. In his book *The Geography of Thought* (2003), Nisbett argues that these essential cultural differences date back to ancient Greek and Chinese societies from roughly the eighth through the third centuries BCE. He characterizes the Greeks of that time as focusing on personal freedom, logic, and debate; their Chinese contemporaries as focusing on harmonious relationships with family and with other villagers. Indeed, cross-cultural research has found that “family orientation” and “harmony” are two major dimensions of personality for the Chinese but not for people from Western cultures (Cheung, Cheung, & Leung, 2008). Moreover, the psychologist Steven Heine (2003), at the University of British Columbia, has found that Westerners are more likely to

**FIGURE 1.10 Cultural Differences**

Westerners tend to be “independent” and autonomous, stressing their individuality. Easterners—such as this Cambodian family—tend to be more “interdependent,” stressing their sense of being part of a collective.



emphasize their personal strengths whereas Easterners are more likely to emphasize their need for self-improvement. As psychological scientists come to better understand the relationship between culture and behaviour, they make clear the importance of considering behavioural phenomena in their cultural contexts.

## Psychological Science Crosses Levels of Analysis

Throughout the history of psychology, studying a phenomenon at one level of analysis has been the favoured approach. Only recently have researchers started to explain behaviour at several levels of analysis, providing an increasingly complete picture of behavioural and mental processes. Because mind and behaviour can be studied on many levels of analysis, psychologists often collaborate with researchers from other scientific fields, such as biology, computer science, physics, anthropology, and sociology. *Interdisciplinary* efforts share the goal of understanding how biological, individual, social, and cultural factors influence our specific behaviours.

Four broadly defined levels of analysis reflect the most common research methods for studying mind and behaviour (FIGURE 1.11). The *biological level of analysis* deals with how the physical body contributes to mind and behaviour, as in the neurochemical and genetic processes occurring in the body and brain. The *individual level of analysis* focuses on individual differences in personality and in the mental processes that affect how people perceive and know the world. The *social level of analysis* involves how group contexts affect people’s ways of interacting and influencing each other. The *cultural level of analysis* explores how people’s thoughts, feelings, and actions are similar or different across cultures. Differences between cultures highlight the role that cultural experiences play in shaping psychological processes, whereas similarities between cultures reveal evidence for universal phenomena that emerge regardless of cultural experiences.

To understand how research is conducted at the different levels, consider the many ways psychological scientists have studied listening to music, a pastime important to

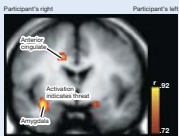



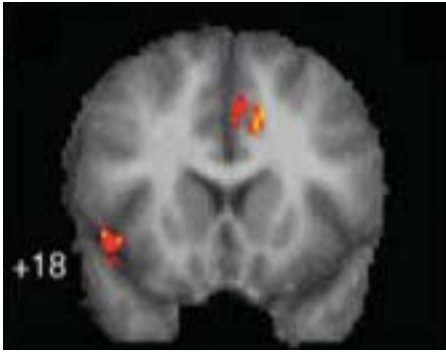
	LEVEL	FOCUS	WHAT IS STUDIED?
	Biological	Brain systems Neurochemistry Genetics	Neuroanatomy, animal research, brain imaging Neurotransmitters and hormones, animal studies, drug studies Gene mechanisms, heritability, twin and adoption studies
	Individual	Individual differences Perception and cognition Behaviour	Personality, gender, developmental age groups, self-concept Thinking, decision making, language, memory, seeing, hearing Observable actions, responses, physical movements
	Social	Interpersonal behaviour Social cognition	Groups, relationships, persuasion, influence, workplace Attitudes, stereotypes, perceptions
	Cultural	Thoughts, actions, behaviours—in different societies and cultural groups	Norms, beliefs, values, symbols, ethnicity

FIGURE 1.11 Levels of Analysis



**FIGURE 1.12 Your Brain on Music**

Certain regions of the frontal cortex are more active for music than for scrambled sounds. The highlighted region on the left is associated with listening to spoken language. Noise does not activate that region, but music, like language with syntax, does.

most people (Renfrow & Gosling, 2003). Researchers have examined how musical preferences vary among individuals and across cultures, how music affects emotional states and thought processes, and even how the brain perceives sound as music rather than noise. For instance, studies of music's effects on mood at the biological level of analysis have shown that pleasant music may be associated with increased activation of one brain chemical, serotonin, that is known to be relevant to mood (Evers & Suhr, 2000). Other researchers have used *brain systems analysis* to study music's effects (Peretz & Zatorre, 2005). Does perceiving music use the same brain circuits as, say, perceiving the sounds of spoken language (Levitin & Menon, 2003; **FIGURE 1.12**)? Processing musical information turns out to be similar to general auditory processing, but it also may use different brain mechanisms. *Case studies* have indicated that some patients with certain types of brain injury become unable to hear tones and melody but not speech or environmental sounds. One 35-year-old woman who had brain damage lost the ability to recognize even familiar tunes—a condition known as *amusia*—even though other aspects of her memory system and language system were intact (Peretz, 1996).

In studies conducted at the individual level of analysis, researchers have used laboratory experiments to study music's effects on mood, memory, decision making, and various other mental states and processes (Levitin, 2006). They have discovered, for instance, that “Russia under the Mongolian Yoke” from Prokofiev’s *Field of the Dead*, played at half speed, reliably puts people into negative moods. Mood may be affected not only by the tempo of the music but also by whether the music is in major or minor mode. At least in Western music, major mode is typically associated with positive moods and minor mode is associated with sad moods. This emotional response appears to be learned, at least in part, because very young children do not discriminate between modes. By age seven or eight, however, children can reliably distinguish the mood effects of major and minor modes (Gregory, Worrall, & Sarge, 1996).

A study of music at the social level of analysis might compare the types of music people prefer when they are in groups with the types they prefer when alone, or how group preferences for some types of music influence individuals’ preferences when they are not in a group. For instance, when people are alone they might like quiet, contemplative music, whereas with others they might like more upbeat music that encourages dancing.

The cross-cultural study of music preferences has developed into a separate field, *ethnomusicology*. An ethnomusicologist has noted, for example, that African music has rhythmic structures different from those in Western music (Agawu, 1995), and these differences in turn may reflect the important role of dancing and drumming in African folk tales. Ethnomusicologists also note that, as mentioned above, the influences of major and minor modes on mood hold only within certain cultures, because these associations are not innate and must be learned.

As these examples show, research across the levels of analysis is creating a greater understanding of the psychology of music. Adding to that understanding is innovative research combining two or more levels of analysis.

## We Often Are Unaware of the Multiple Influences on How We Think, Feel, and Act

An important lesson from psychological research is that people are influenced by subtle factors in their environments, even when they largely are unaware of those influences. That is, some factors influence our thoughts, feelings, and behaviours at an unconscious level: They happen without our awareness and therefore leave us without knowledge (retrievable memories) of them. The idea that we are influenced by events and memories we are not consciously aware of has a long history in



psychology; it is often associated with Sigmund Freud, whose work is discussed in more detail later in this chapter. More recently, the psychologist John Bargh, at Yale, and his colleagues (Bargh, 2006; Bargh & Chartrand, 1999) have referred to these unconscious influences as the “automaticity of everyday life,” because they occur automatically—without effort or intent. For example, in a pair of studies, Dutch participants were asked to consider stereotypes about professors (usually thought of as high in intelligence), secretaries (usually thought of as neutral in intelligence), or soccer hooligans (usually thought of as low in intelligence). After this exercise, they were asked to play a modified game of Trivial Pursuit. Quite remarkably, those participants who thought about professors got more of the trivia answers correct than did those who thought about secretaries. The latter, in turn, performed better than those who thought about soccer hooligans (Dijksterhuis & van Knippenberg, 1998). Once ideas regarding intelligence were *primed*, or activated, people seemed to have different levels of confidence in their own knowledge. These levels affected the recall strategies that they subsequently used. Likewise, in a recent study, participants who were shown negative facial expressions very quickly, so quickly that they did not know they had seen them, reported being in worse moods than those reported by participants shown neutral facial expressions (Ruys & Stapel, 2008).

Priming can be done with a smell or a tactile (touch) sensation. In one study (Williams & Bargh, 2007), research participants held a cup of coffee for the researcher while he juggled an armful of textbooks, clipboards, and so on. Half the participants held a cup of hot coffee, and half held a cup of iced coffee. None of the participants believed that just holding the cup would affect their thoughts, feelings, or actions, but it did: The participants who held the hot coffee rated a third person as “warmer” and less selfish than did those who held the iced coffee. In short, as you will see throughout this book, we are aware of only a fraction of the environmental factors that influence us.



## SUMMING UP

### What Are the Seven Themes of Psychological Science?

Psychological science is the study of mind, brain, and behaviour. This book focuses on seven major themes that characterize psychological science: (1) Psychology is an empirical science that uses research methods as a way of knowing about how we think, feel, and behave. (2) Nature and nurture are inextricably entwined: We cannot consider either influence separately, because they work together. (3) The brain and mind are inseparable. (4) A biological revolution has been energizing psychological research into how the brain enables the mind. Among the revolutionary developments are increasing knowledge of the neurochemistry of mental disorders, the mapping of the human genome, and the invention of imaging technologies that allow researchers to observe the working brain in action. (5) The mind is adaptive. In recent years, psychological science has been influenced heavily by evolutionary psychology, which argues that the brain has evolved to solve adaptive problems. (6) Psychological scientists share the goal of understanding mind, brain, and behaviour, but they do so by focusing on the same problems at different levels of analysis—biological, individual, social, and cultural. Most problems in psychology require studies at each level. (7) We often are unaware of the multiple influences on how we think, feel, and behave. Events can prime our minds so that we think, feel, and behave in ways suggested by the priming stimuli, even though we may not be aware of or remember those influences.



**FIGURE 1.13 Confucius** Ancient philosophers such as Confucius studied topics that remain important in contemporary psychology.

## MEASURING UP

For each example below, indicate which of the seven themes of psychological science apply. For some examples, more than one theme may apply.

Themes:

1. Psychology is an empirical science.
2. Nature and nurture are inextricably entwined.
3. The mind and brain are inseparable.
4. A biological revolution is energizing psychological research.
5. The mind is adaptive.
6. Psychologists use different levels of analysis in their research.
7. We often are unaware of the influences on how we think, feel, and behave.

Examples:

- a. In one study, some participants were asked to graph lines between endpoints near each other (e.g.,  $-1, -3$ ), and other participants were asked to graph lines between endpoints far from each other (e.g.,  $-5, +12$ ). All were then asked to judge the closeness of their relationship with a loved one. Participants who graphed short lines rated their relationship as closer than did those who graphed long lines (Williams & Bargh, 2008).
- b. To understand the development of genius, psychologists study the heritability of genius and the experiences that help it develop.
- c. Psychologists are skeptical of astrology as a way of knowing about a person's personality, because astrology violates a central principle in psychological science.
- d. In a study of prejudice, psychologists used an attitudes test and brain imaging when participants looked at pictures of the faces of blacks and Caucasians.
- e. When psychologists study a disorder of the mind, they frequently look at genetic factors that might be involved in causing the disorder.
- f. Descartes' notion of dualism was replaced with this general theme.

### LEARNING OBJECTIVE

Trace the development of psychology since its formal inception in 1879, including differences among major schools of thought.

## How Did the Scientific Foundations of Psychology Develop?

People have always wanted to know why people do the things they do, so psychology as a field of inquiry has an extensive history, roots in every corner of the globe, and intellectual origins dating back to long before it was established as a formal discipline. Ancient Greek philosophers such as Aristotle and Plato pondered many of the same questions considered by contemporary psychological scientists. Physicians in ancient Greece and Rome, such as Hippocrates (c. 460–c. 377 BCE) and Galen (129–c. 199 CE), recognized that the brain was important for mental activity. In China, the philosopher Confucius (551–479 BCE) emphasized human development, education, and interpersonal relations, all of which remain contemporary topics in psychology around the world (Higgins & Zheng, 2002; **FIGURE 1.13**). During the Han dynasty (206 BCE–220 CE), the Chinese developed multiple tests to select candidates for government jobs, and by the time of the Ming dynasty (1368–1644), multi-stage testing was used throughout the country. Only those with the highest test scores could serve in public office (Higgins & Zheng, 2002).

Similarly, there is a long history of psychological thought in Muslim countries; in fact, some scholars claim that Western notions of psychology can be found in

the writings of early Muslim scholars (Haque, 2004). For example, Al-Kindi (801–866 CE) produced hundreds of writings about sorrow and grief. To combat depression, he used cognitive strategies—many of them similar to a type of psychotherapy, *cognitive therapy*, commonly used today. At-Tabari (838–870 CE) wrote about child psychology and emphasized the need for psychotherapy.

In the mid-1800s in Europe, psychology arose as a separate field of study using the experimental method. In *A System of Logic* (1843), John Stuart Mill declared that psychology should leave the realm of speculation and of philosophy and become a science of observation and of experiment. Indeed, he defined psychology as “the science of the elementary laws of the mind” and argued that only through the methods of science would the processes of the mind be understood. As a result, throughout the 1800s early psychologists increasingly studied mental activity through careful scientific observation. This was evident in 1891, when James Mark Baldwin founded the first psychological laboratory in the British Commonwealth at the University of Toronto. Like the shift from philosophy to experimentation, rapid increases in knowledge about basic physiology were central to the development of psychological science—though, as discussed above, the field is only now drawing on biology’s full power to explain psychological phenomena.

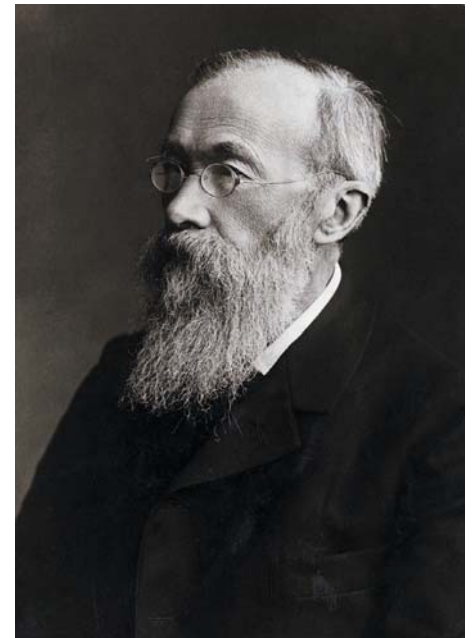
As psychology developed from a young discipline to a vital field of science and a vibrant profession, different ways of thinking about the content of psychology emerged. These ways of thinking are called *schools of thought*. As is true in every science, one school of thought would dominate the field for a while; there would then be a backlash, and a new school of thought would take over the field. Today, as multiple levels of analysis are used to understand psychology, researchers rely on the scientific method to support their theories and to decide what is most likely true. The following section discusses some major figures and major schools of thought in the history of psychology.

## Experimental Psychology Begins with Structuralism

In 1879, Wilhelm Wundt (FIGURE 1.14) established the first psychology laboratory and institute. At this facility, in Leipzig, Germany, for the first time students could earn advanced academic degrees in psychology. Wundt trained many of the great early psychologists, many of whom then established psychological laboratories throughout Europe, Canada, and the United States.

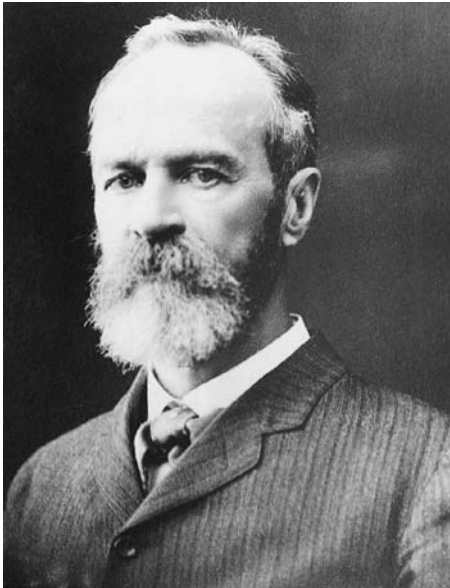
Wundt realized that psychological processes, the products of physiological actions in the brain, take time to occur. Therefore, he would present each research participant with a simple psychological task and a related but more complex one. By subtracting the time a participant took to complete the simple task from the time that participant took to complete the more complex task, Wundt could infer how much time a particular mental event—the common factor between the two tasks—took to occur. Researchers still widely use *reaction time* to study psychological processes, but their equipment is of course more sophisticated than Wundt’s. Wundt was not satisfied with simply studying mental reaction times, however; he wanted to measure conscious experiences. To do so, he developed the method of **introspection**, a systematic examination of subjective mental experiences that requires people to inspect and report on the content of their thoughts. Wundt asked people to use introspection in comparing their subjective experiences as they contemplated a series of objects—for example, by stating which one they found more pleasant.

Edward Titchener, a British psychologist who spent most of his career at Cornell University and was a student of Wundt’s, used methods such as introspection to



**FIGURE 1.14 Wilhelm Wundt** Wundt founded modern experimental psychology.

**introspection** A systematic examination of subjective mental experiences that requires people to inspect and report on the content of their thoughts.



**FIGURE 1.15 William James** James was highly influenced by Darwin and (among many other accomplishments) is credited with “naturalizing” the mind.

**structuralism** An approach to psychology based on the idea that conscious experience can be broken down into its basic underlying components or elements.

**stream of consciousness** A phrase coined by William James to describe one’s continuous series of ever-changing thoughts.

**functionalism** An approach to psychology concerned with the adaptive purpose, or function, of mind and behaviour.

pioneer a school of thought that became known as **structuralism**, which is based on the idea that conscious experience can be studied when it is broken down into its underlying components. Titchener believed that an understanding of the basic elements of consciousness would provide the scientific basis for understanding the mind. He argued that one could take a stimulus such as a musical tone and by introspection analyze its “quality,” “intensity,” “duration,” and “clarity.” Wundt ultimately rejected such uses of introspection, but Titchener relied on the method throughout his career. The general problem with introspection is that experience is subjective; each person brings to introspection a unique perceptual system, and it is difficult for researchers to determine whether study participants are applying introspection to a study’s criteria in similar ways. Accordingly, over time psychologists largely abandoned introspection, because it was not a reliable method for understanding psychological processes. Nonetheless, Wundt, Titchener, and other structuralists were important due to their goal of developing a pure science of psychology with its own vocabulary and set of rules.

## Functionalism Addresses the Purpose of Behaviour

One critic of structuralism was William James, a brilliant scholar whose wide-ranging work has had an enormous, enduring impact on psychology (**FIGURE 1.15**). In 1873, James abandoned a career in medicine to teach physiology at Harvard University. He was among the first professors at Harvard to openly welcome questions from students rather than having them listen silently to lectures. James’s personal interests were more philosophical than physiological; he was captivated by the nature of conscious experience. In 1875, he gave his first lecture on psychology, and he later quipped that it was also the first lecture on psychology he had ever heard. To this day, psychologists find rich delight in reading James’s penetrating analysis of the human mind, *Principles of Psychology* (1890), the most influential book in the early history of psychology. Many of the book’s central ideas have held up over time.

In criticizing structuralism’s failure to capture the most important aspects of mental experience, James argued that the mind was much more complex than its elements and therefore could not be broken down. For instance, he noted that the mind consisted of an ever-changing, continuous series of thoughts. This **stream of consciousness** could not be frozen in time, according to James, so the structuralists’ techniques were sterile and artificial. He likened psychologists who used the structural approach to people trying to understand a house by studying each of its bricks individually. More important to James was that the bricks together formed a house and that a house has a particular function. The mind’s elements mattered less than the mind’s usefulness to people.

Heavily influenced by Charles Darwin’s thinking, James argued that psychologists ought to examine the *functions* served by the mind—how the mind operates. According to his approach, which became known as **functionalism**, the mind came into existence over the course of human evolution, and it works as it does because it is useful for preserving life and passing along genes to future generations. In other words, it helps humans adapt to environmental demands.

Many functionalists applied psychological research to the real world. If a behaviour serves a purpose, they argued, that purpose ought to be reflected in daily human life. Thus, for example, James applied the functional approach to the study of phenomena such as the nature of religious experience. The American educator John Dewey tested functionalist theories in his classrooms, teaching according to how the mind processes information. This *progressive* approach to education emphasized divergent thinking and creativity rather than the repetitive drill learning of conventional knowledge (which might, after all, be incorrect; Hothersall, 1995). Yet the

broad-ranging subjects to which functionalism was applied led to criticism that this school was not sufficiently rigorous, and therefore functionalism slowly lost momentum as a movement within psychology. Within the past few decades, however, the functional approach has returned to psychological science, as more and more researchers consider the adaptiveness of the behaviours and mental processes they study.

## Gestalt Psychology Emphasizes Patterns and Context in Learning

Another school of thought that arose in opposition to structuralism was the *Gestalt* school, founded by Max Wertheimer in 1912 and expanded by Wolfgang Köhler in Germany, among others. According to **Gestalt theory**, the whole of personal experience is not simply the sum of its constituent elements; or in other words, *the whole is different from the sum of its parts*. So, for example, if a researcher shows people a triangle, they see a triangle—not three lines on a piece of paper, as would be the case for the trained observers in one of Titchener’s structuralist experiments. (When you look at **FIGURE 1.16**, do you see the parts or the whole?) In experimentally investigating

**Gestalt theory** A theory based on the idea that the whole of personal experience is different from simply the sum of its constituent elements.

*Many principles of psychological science are easy to experience. In each chapter of this book, **Try for Yourself** features will present you with the chance to be your own research participant.*

**FIGURE 1.16 Try for Yourself: What Do You See?**



The fragments make up a picture of a dog sniffing the ground.

**Explanation:** The mind organizes the picture’s elements automatically to produce the perception of the dog. The picture is processed and experienced as a unified whole. Once you perceive the dog, you cannot choose to not see it.

FIGURE 1.17 Try for Yourself: What Do You See?



This drawing by the psychologist Roger Shepard can be viewed as either a face behind a candlestick or two separate profiles.

**Explanation:** The mind organizes the scene into one or another perceptual whole, so the picture looks a specific way each time it is viewed, but it is difficult to see both the single face and two profiles at the same time.

subjective experience, the Gestalt psychologists relied not on the reports of trained observers but on ordinary people's observations. This unstructured reporting of experience was called the *phenomenological* approach, referring to the totality of subjective conscious experience.

The Gestalt movement reflected an important idea that was at the heart of criticisms of structuralism: The perception of objects is subjective and dependent on context. Two people can look at an object and see different things. Indeed, one person can look at an object and see it in completely different ways. (When you look at **FIGURE 1.17**, how many possible views do you see?) The Gestalt perspective has influenced many areas of psychology, such as the study of vision and the understanding of human personality.

## Women Made Pioneering Contributions to Psychology

Women's contributions to psychological science, like women's contributions to many other fields of science, were long underappreciated and for many years even ignored. Consider Mary Whiton Calkins. At Smith College, she studied philosophy and classics; at Wellesley College, she was employed initially on a temporary basis as a Greek instructor, then invited to become a professor of the new field of philosophical psychology, contingent on her completing advanced training in psychology. At the time, her options were quite limited because psychology was relatively new to North America. After canvassing the possibilities, she decided that studying with William James at Harvard University would provide her with the best training. James was enthusiastic about

having her as a student. Unfortunately, Harvard's president, Charles Eliot, did not believe in coeducation, and only after great pressure from James, Calkins's father, and the president of Wellesley did Eliot relent and let Calkins enroll in the seminar as a guest. The male students withdrew from the seminar in protest, leaving Calkins with a private tutorial "at either side of a library fire," as she describes in her autobiography.

Calkins continued her psychological studies with several other mentors at Harvard, including the famous psychophysicist Hugo Münsterberg. With him, in 1895 she completed all the requirements for a Ph.D. Although she scored higher than her male classmates on the qualifying exam, Harvard denied her the degree, offering instead a Ph.D. from Radcliffe, the women's school affiliated with Harvard. Calkins refused the degree, bristling at the unequal treatment she received and describing the differential education of men and women as artificial and illogical. Efforts to have Harvard overturn its earlier decision continue to this day, as does Harvard's refusal to grant her the degree she earned. (Harvard did not grant a Ph.D. to a woman until 1963.)

Calkins had a productive career as a professor at Wellesley and wrote an introductory psychology textbook in 1901. She was the first woman to set up a psychology laboratory, published more than 100 articles, and in 1905 was elected the first woman president of the American Psychological Association. Calkins's major research interest was the self, which she believed could be studied using the methods of science. She made several other important contributions to the early science of psychology, although in her later years she became somewhat disenchanted by the rise of behaviorism and its dismissal of the concept of self.

Margaret Flay Washburn was the first woman to be officially granted a Ph.D. in psychology. She was awarded her doctorate in 1921 at Cornell University, where she studied with Edward Titchener. In the same year, Washburn became the second woman president of the American Psychological Association. She spent most of her career at Vassar College, which she had attended as an undergraduate. Her passion for teaching was rewarded by her students, who raised \$15,000 as a gift to celebrate her 25 years at Vassar. In keeping with her devotion to students, Washburn used the gift to set up a scholarship fund for women. The first Canadian woman to be awarded a Ph.D. for psychological research was likely Emma S. Baker, at the University of Toronto. The philosophy department, however, granted her the degree; the psychology department was not yet established. Baker, who completed her work in the early 1900s, went on to become principal at a number of colleges, including Mount Allison in New Brunswick (Green, 2002). Of course, many other women contributed to the history of psychology, and their contributions are now readily acknowledged (FIGURE 1.18). Today, women make up approximately 70 percent of psychology majors and nearly half of all new psychology doctorates in the workforce (Frincke & Pate, 2004).

### Freud Emphasized the Power of the Unconscious

Twentieth-century psychology was profoundly influenced by one of its most famous thinkers, Sigmund Freud (FIGURE 1.19). Freud, who was trained in medicine in his native Austria, began his career working with people who had neurological disorders such as paralysis of various body parts. He found that many of his patients had few medical reasons for their paralysis, and he soon came to believe their conditions were caused by psychological factors.

Psychology was in its infancy at the end of the nineteenth century, when Freud deduced that much of human behaviour is determined by mental processes operating below the level of conscious awareness, at the level of the **unconscious**. Freud believed these unconscious mental forces, often sexual and in conflict, produced psychological discomfort and in some cases even apparent psychological disorders. From his theories, Freud pioneered the clinical case study approach (discussed in Chapter 2, “Research Methodology”) and developed the therapeutic method of **psychoanalysis**, which involves trying to bring the contents of a patient’s unconscious into conscious awareness so their conflicts can be dealt with constructively. For example, he analyzed the apparent symbolic content in a patient’s dreams in search of hidden conflicts. He also used *free association*, a technique in which a patient simply would talk about whatever he or she wanted to for as long as he or she wanted to. Freud believed that through free association, a person eventually would reveal the unconscious conflicts causing the psychological problems. He eventually extended his theories to account for general psychological functioning.

Freud’s influence was considerable, affecting the psychologists who followed him as well as the public’s view of psychology. The basic problem with many of Freud’s original ideas, such as the meaning of dreams, is that they are extremely difficult to test using the methods of science. But although contemporary scientists no longer accept many of Freud’s theories, Freud’s idea that mental processes occur below the level of conscious awareness is now widely accepted in psychological science.

### Most Behaviour Can Be Modified by Reward and Punishment

In 1913, the American psychologist John B. Watson challenged psychology’s focus on conscious and unconscious mental processes as inherently unscientific

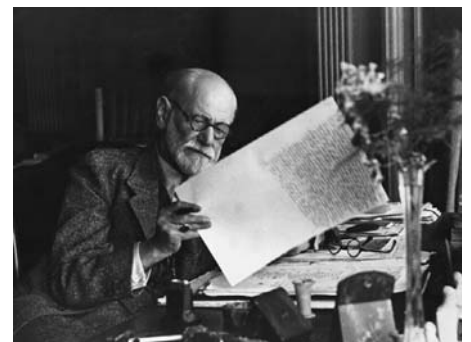


**FIGURE 1.18** Mary Salter Ainsworth Ainsworth received her Ph.D. from the University of Toronto, in 1939. With John Bowlby, she went on to launch the study of attachment theory—a seminal theory in developmental psychology that is discussed at length in Chapter 11.

**unconscious** The mental processes that operate below the level of conscious awareness.

**psychoanalysis** A method developed by Sigmund Freud that attempts to bring the contents of the unconscious into conscious awareness so that conflicts can be revealed.

**FIGURE 1.19** Sigmund Freud The father of psychoanalytic theory, Freud hugely influenced psychology in the twentieth century.

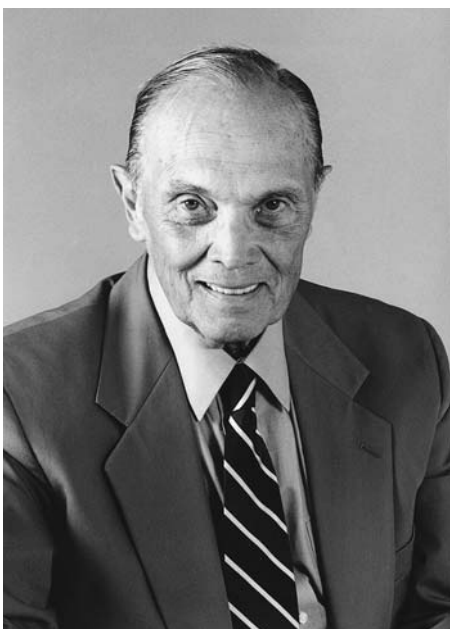




**FIGURE 1.20 John B. Watson** Watson, who spent most of his adult life in advertising, was a proponent of behaviourism. His views were amplified by thousands of psychologists, including B. F. Skinner.

**behaviourism** A psychological approach that emphasizes the role of environmental forces in producing behaviour.

**FIGURE 1.21 George A. Miller** In 1957, Miller launched the cognitive revolution by establishing the Center for Cognitive Science at Harvard University.



(**FIGURE 1.20**). Watson believed that if psychology was to be a science, it had to stop trying to study mental events that could not be observed directly. Scorning methods such as introspection and free association, he developed **behaviourism**, an approach that emphasizes environmental effects on behaviour.

The intellectual issue most central to Watson and his followers was the nature/nurture question. For Watson and other behaviourists, nurture was all. Heavily influenced by the work of the physiologist Ivan Pavlov (discussed further in Chapter 6, “Learning”), Watson believed that animals acquired, or learned, all behaviours through environmental factors: Understanding the environmental *stimuli*, or triggers, was all that was needed to predict a behavioural *response*. Psychologists greeted Watson’s approach with great enthusiasm. Many had grown dissatisfied with the ambiguous methods used by those studying mental processes; instead, they believed, it was only by studying observable behaviours that psychologists would be taken seriously as scientists.

The American psychologist B. F. Skinner became famous for taking up the mantle of behaviourism. Like Watson, Skinner denied mental states’ existence, writing in his provocative book *Beyond Freedom and Dignity* (1971) that concepts referring to mental processes were of no scientific value in explaining behaviour. Rather, Skinner believed that mental states were nothing more than an illusion. He wanted to understand how repeated behaviours were shaped or influenced by the events or consequences that followed them. For instance, an animal would learn to perform a behaviour if doing so in the past had led to a positive outcome, such as receiving food.

Behaviourism dominated psychological research well into the early 1960s. In many ways, these were extremely productive times for psychologists. Many of the basic principles established by behaviourists continue to be viewed as critical to understanding the mind, brain, and behaviour. At the same time, sufficient evidence has accumulated to show that thought processes influence outcomes, and few psychologists today describe themselves as strict behaviourists.

## Cognition Affects Behaviour

Much of psychology during the first half of the twentieth century was focused on studying observable behaviour. But evidence slowly emerged showing that humans’ perceptions of situations could influence behaviour and that learning was not as simple as the behaviourists believed. In the late 1920s, the Gestalt theorist Wolfgang Köhler found that chimpanzees could solve the problem of how to get a banana that was out of reach. The chimpanzees had to figure out how to connect two sticks to form a longer stick, which would then allow them to reach the banana and draw it close. The animals tried various methods, until suddenly they seemed to have insight, as evidenced by their reaching the banana and using the strategy perfectly on subsequent tasks. At around the same time, learning theorists such as Edward Tolman were showing that animals could learn by observation. This finding made little sense (according to behaviourist theory) because the observing animals were not being rewarded—the connections were all being made in their heads. Other psychologists conducting research on memory, language, and child development showed that the simple laws of behaviourism could not explain such things as why cultural influences alter how people remember a story, why grammar develops systematically, and why children go through stages of development during which they interpret the world in different ways. All of these findings suggested that mental functions were important for understanding behaviour.

In 1957, George A. Miller and colleagues launched the *cognitive revolution* in psychology (**FIGURE 1.21**). Ulric Neisser integrated a wide range of cognitive phenomena in his classic 1967 book *Cognitive Psychology*, which named and defined



the field. **Cognitive psychology** (discussed further in Chapter 8, “Thinking and Intelligence”) is concerned with higher-order mental functions such as intelligence, thinking, language, memory, and decision making. Cognitive research has shown that the way people think about things influences their behaviour. Several events in the 1950s set the stage for the rise of cognitive science; perhaps the most important was the growing use of computers. Computers operate according to software programs, which dictate rules for how information is processed. Cognitive psychologists such as Alan Newell and the Nobel laureate Herbert Simon applied this process to their explanation of how the mind works. These *information processing* theories of cognition viewed the brain as the hardware that ran the mind, or mental processes, as the software; the brain takes in information as a code, processes it, stores relevant sections, and retrieves stored information as required. Some early cognitive psychologists recognized that the brain was important to cognition, but many cognitive psychologists preferred to focus exclusively on the software, with little interest in the specific brain mechanisms involved. In the early 1980s, cognitive psychologists joined forces with neuroscientists, computer scientists, and philosophers to develop an integrated view of mind and brain. The field of **cognitive neuroscience** emerged during the 1990s as one of the most exciting fields of science.

**cognitive psychology** The study of how people think, learn, and remember.

**cognitive neuroscience** The study of the neural mechanisms that underlie thought, learning, and memory.

## Social Situations Shape Behaviour

At the turn of the twentieth century, many psychologists came to appreciate that people’s behaviours were affected by the presence of others. During the 1920s, scholars such as Floyd Allport began to examine how people were affected by their social worlds. This approach received a boost as people sought to understand the atrocities committed in World War II. The behaviour of Nazi soldiers led a number of psychologists to focus their research on topics such as authority, obedience, and group behaviour. These topics are the province of **social psychology**, which focuses on the power of situation and on the way people are shaped through their interactions with others.

In 1962, Adolf Eichmann, one of Adolf Hitler’s chief lieutenants, was hanged for “causing the killing of millions of Jews.” Shortly before his death, Eichmann claimed, “I am not the monster I am made out to be. I am the victim of a fallacy.” The atrocities committed in Nazi Germany compelled psychologists to consider whether evil is an integral part of human nature. Why had apparently normal Germans, Poles, Austrians, and many other people from the Axis nations during World War II willingly participated in the murders of innocents—men, women, and children? Why did some people in these countries resist and put their own lives at risk to save others? Researchers, many influenced by Freudian ideas, initially sought to understand what types of people would commit evil acts. They concluded that certain types, especially those raised by unusually strict parents, display a slightly greater willingness to follow orders. But as discussed in Chapter 12, almost everyone is strongly influenced by social situations. His behaviour cannot be excused, but Eichmann was correct that people were overlooking the power of the situation in explaining his heinous actions.

In the 1930s and 1940s, Kurt Lewin, who was trained as a Gestalt psychologist, emphasized a scientific, experimental approach to social psychology (**FIGURE 1.22**). His *field theory* emphasized the interplay between people (biology, habits, beliefs) and their environments, such as social situations and group dynamics. This perspective allowed psychologists to begin examining some of the most complex forms of human mental activity, such as how people’s attitudes shape behaviour,

**social psychology** The study of group dynamics in relation to psychological processes.



**FIGURE 1.22 Kurt Lewin** Lewin was born in Poland (at the time Prussia) and became famous for his work at the Massachusetts Institute of Technology. He founded modern social psychology, pioneering the use of experimentation to test hypotheses and thus to form theories.

why they are prejudiced against other groups, how they are influenced by other people, and why they are attracted to some people and repelled by others. Human beings navigate within a social world, and psychological science recognizes the importance of fully considering a situation to predict and understand the behaviour within it.

## Psychological Therapy Is Based on Science

In the 1950s, a humanistic approach to the treatment of psychological disorders, led by Americans Carl Rogers and Abraham Maslow, emphasized how people can come to know and accept themselves in order to reach their unique potentials. Some of the techniques developed by Rogers, such as specific ways of questioning and listening during therapy, are staples of modern treatment. Only in the last four decades, however, has a scientific approach to the study of psychological disorders emerged.

Throughout psychology's history, the methods developed to treat psychological disorders mirrored advances in psychological science. For instance, behaviourism's rise led to a group of therapies designed to modify behaviour rather than address underlying mental conflicts. Behavioural modification methods continue to be highly effective in a range of situations, from training those with intellectual impairments to treating patients who are especially anxious and fearful. The cognitive revolution in scientific thinking led therapists to recognize the important role of thought processes in mental disorders. Pioneers such as Aaron T. Beck developed therapies to correct faulty cognitions (faulty beliefs about the world); these cognitive therapies are especially effective for treating conditions such as anxiety disorders, depression, and eating disorders. For some mental disorders, such as schizophrenia, the most effective treatments are drugs that alter brain chemistry. For people with these disorders, the biological revolution in psychological science has helped immensely. But for people with other disorders, drug therapy is less preferable than cognitive and behavioural therapies because drugs can produce side effects or lead to reliance on the drugs. In many situations, a combination of drugs and cognitive-behavioural therapy is the best treatment plan.

Today, most therapeutic approaches to dealing with psychological disorders consist of two key factors that reflect the field's origins: adopting a widely recognized treatment of choice that scientific research has demonstrated to be clinically effective and recognizing that each person is a unique individual with specific issues and needs. As discussed in Chapter 15, probably the greatest change in clinical psychology over the course of the twentieth century has come from the realization, through scientific research, that no universal treatment or approach fits all psychological disorders—contrary to the thinking of the early giants such as Freud, Skinner, and Rogers (Kazdin, 2008).



### SUMMING UP

#### How Did the Scientific Foundations of Psychology Develop?

Although people around the world have pondered psychological questions for thousands of years, the formal discipline of psychology began in Wilhelm Wundt's laboratory in Germany in 1879. Wundt believed it necessary to reduce mental processes into their constituent, "structural" parts, by using an approach known

as structuralism. Other early psychologists argued that it was more important to understand how the mind functions than what it contains. During this period, most research was aimed at understanding the subjective mind. Freud, for example, emphasized the unconscious, and the Gestalt movement focused on perception. The behaviourists then claimed that the study of the mind was too subjective and therefore unscientific. Accordingly, for the first half of the twentieth century, most psychologists studied only observable behaviours. The cognitive revolution in the 1960s returned the mind to centre stage, and research on mental processes such as memory, language, and decision making blossomed. Throughout the last century, some psychologists have emphasized the social contexts of behaviour and of mental activity. Advances in psychological science have informed the treatment of psychological disorders.



## MEASURING UP

Identify the school of thought that each of the following statements characterizes. The options here are behaviourism, functionalism, cognitive, social, Gestalt, structuralism, and psychoanalysis.

- a. To be a respectable scientific discipline, psychology should be concerned with what people and other animals do—in other words, with observable actions.
- b. Psychology should be concerned with the way behaviour helps us adapt to environment.
- c. Psychology should be concerned with the way thoughts affect behaviour.
- d. To understand behaviour, psychologists need to understand the contexts in which people live and act.
- e. Because the sum is greater than the parts, psychologists should study the entirety of how we make sense of the world.
- f. Psychologists should study the “pieces” that make up the mind.
- g. To understand behaviour, psychologists should study people’s unconscious mental processes.

## How Can We Apply Psychological Science?

Psychology is one of the most popular majors at many universities. The general usefulness of understanding mental activity may explain psychology’s popularity as a major: This field can help you understand your motives, your personality, and even why you remember some things and forget others. Psychological science is more than fascinating and personally relevant, however; it also serves as excellent training for many professions. As you will discover, psychological science covers broad ground, touching on all aspects of human life.



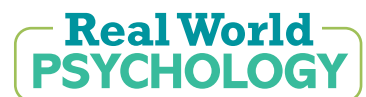
### LEARNING OBJECTIVES

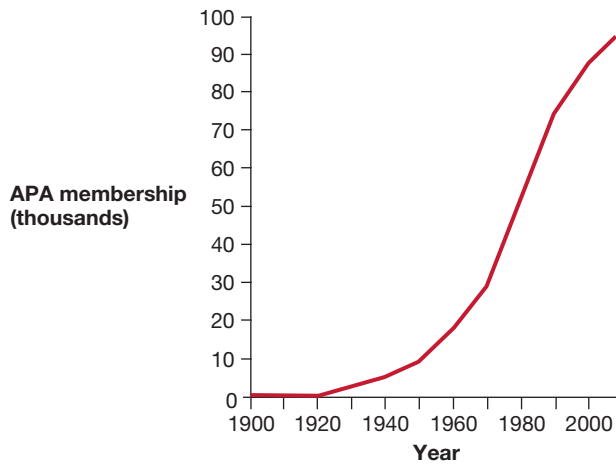
Define critical thinking.

Provide examples of psychology’s relevance to every person’s life.

## Psychological Knowledge Is Used in Many Professions

Many types of researchers study the mind, brain, and behaviour at different conceptual levels. For instance, physicians need to know much more than anatomy and chemistry; they need to know how to relate to their patients, how patients’ behaviours are linked to health, and what motivates or discourages patients from seeking medical care or following treatment protocols. Understanding the aging brain





**FIGURE 1.23 Growth of the Field** This graph, adapted from data published by the American Psychological Association (APA), shows the great increase in this professional organization's membership from 1900 to 2004. The APA is the world's largest organization of psychologists and includes members from several countries around the world.

and how it affects visual perception, memory, and motor movement is vital for those who treat elderly patients. Indeed, psychological scientists make major contributions to research on human physical and mental health.

Psychological science is equally useful for anyone whose career involves understanding people. To persuade jurors, lawyers need to know how groups make decisions. Advertisers need to know how attitudes are formed or changed and to what extent people's attitudes predict their behaviour. Politicians use psychological techniques of impression management to make themselves attractive to voters.

If you are thinking about a career in psychology or a related field, there is good news. According to one governmental survey (U.S. Bureau of Labor Statistics, 2007), opportunities for people with graduate degrees in psychology are expected to grow approximately 15 percent between now and 2016. In Canada, more women than

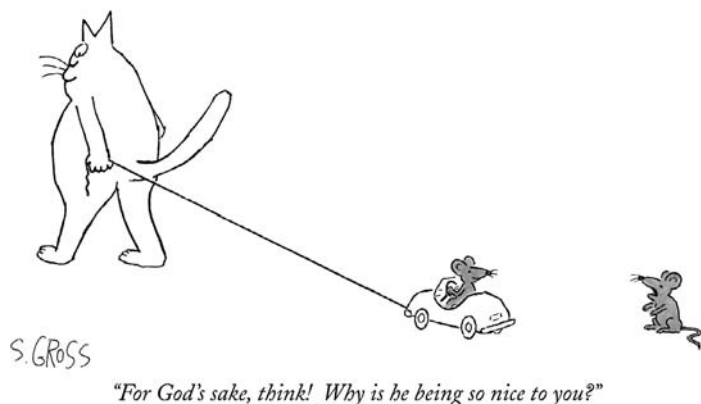
men are going into graduate training in psychology (O'Neill, 2005). If you are wondering what you can do with an undergraduate degree in psychology, the answer is "almost everything." Prospective employers want their employees to have data analysis skills, communication skills, critical thinking skills, and the abilities to learn and to get along with others. These skills are all developed in psychology curricula. One survey of university graduates with bachelor's degrees in psychology found that they held a wide range of positions requiring psychological knowledge, including attorney's assistant, police officer, social worker, personnel director, hospital counsellor, store manager, and research assistant (Morgan, n.d.).

People study psychology for many reasons, and some students become so fascinated by psychological science that they devote their lives to studying the mind and behaviour (FIGURE 1.23). Psychological science is an exciting field—researchers are unravelling the very nature of what it means to be a human being. Although the scientific principles of brain, mind, and behaviour have been established, the foundations of psychological science continue to grow, and there is still a tremendous amount to learn about issues such as how nature and nurture interact and how the brain enables the mind. Indeed, contemporary psychological science is providing new insights into problems and issues that the great scholars of the past struggled to solve.

## People Are Intuitive Psychological Scientists

By nature, humans are intuitive psychological scientists, developing hypotheses about and trying to predict others' behaviour. For example, people choose marriage partners they expect will best meet their emotional, sexual, and support needs. Defensive drivers rely on their intuitive senses of when other drivers likely will make mistakes. People seek to predict whether others are kind, are trustworthy, will make good caretakers, will make good teachers, and so on. But people cannot intuitively know if taking certain herbs will increase memory, for example, or whether playing music to newborns makes them more intelligent, or whether mental illness results from too much or too little of a certain brain chemical.

One of this textbook's most important goals is to provide a basic education about the methods of psychological science



for students whose only exposure to psychology will be through an introductory course. Readers will become psychologically-literate, with a good understanding of the major issues, theories, and controversies and the ability to apply that learning in a wide variety of settings. Psychologically literate people will also avoid common misunderstandings about psychological science. Although psychologists make important contributions to understanding and treating mental illness, most psychological science has little to do with such therapeutic clichés as couches and dreams. Instead, it is about understanding mental activity, social interactions, and how people acquire behaviours. To understand what makes you tick and what makes other people tick, you need a basic operating manual for the human mind and human behaviour, a manual provided by psychological science.

## Psychological Science Requires Critical Thinking

One of the hallmarks of a good scientist—or a savvy consumer of scientific research—is *amiable skepticism*, which involves a wariness of dramatic new scientific findings in the absence of convincing evidence, as well as an openness to new ideas when good evidence and sound reasoning support them. An amiable skeptic develops the habit of carefully weighing the evidence when deciding what to believe. The ability to think in this way is often referred to as **critical thinking**—a systematic way of evaluating information to reach reasonable conclusions. In other words, the term *critical thinking* “is used to describe thinking that is purposeful, reasoned, and goal directed—the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions, when the thinker is using skills that are thoughtful and effective for the particular context and type of thinking task” (Halpern, 2003, p. 6). Being a critical thinker involves considering alternative explanations, looking for holes in evidence, and using logic and reasoning to see whether the information makes sense. It also involves considering whether the information might be biased, such as by personal or political agendas. Critical thinking involves healthy questioning and keeping an open mind. Most people are quick to question information that does not fit with their worldviews, but as an educated person you also need to think critically about other information—perhaps especially the information that verifies your preconceptions. After all, you may be least motivated to think critically when evaluating such information.

**critical thinking** A systematic way of evaluating information to reach reasonable conclusions.

Does eating too much sugar cause children to become hyperactive? Many people believe this connection has been established scientifically, but in fact a review of the scientific literature reveals that the relationship between sugar consumption and hyperactivity is essentially zero (Wolraich, Wilson, & White, 1995). Many people will argue that they have seen with their own eyes what happens when children eat large amounts of sweets. But consider the contexts of such first-hand observations. Might the children have eaten lots of sweets when they were at parties with many other children? Might the gatherings, rather than the sweets, have caused the children to be very excited and active? People often let their beliefs and their biases determine how they label observations: The highly active children’s behaviour, viewed in connection with the eating of sweets, becomes an example of sugar-induced hyperactivity. A critical thinker would consider such alternative explanations for behaviour and seek quality research that takes such possibilities into account.

As you read this book, you will learn how to separate the believable from the incredible. You will learn to spot badly designed experiments, and you will develop the skills necessary to critically evaluate claims made in the popular media.



**FIGURE 1.24 Think Critically: The Mozart Effect** A much publicized research study done in the early 1990s concluded that infants benefited from the “Mozart effect,” and many products play on the assumption that babies benefit from hearing music. This Baby Einstein rocking chair can connect to CD players or iPods, enabling parents to develop music programs for their children. In 2009, following the publication of research revealing that Baby Einstein products do not foster intellectual development, the company agreed to refund the purchase price of some of its products. Can you think of any other products that promise to enhance their user’s intelligence and whose effectiveness we might similarly question?

The information in this book also provides a state-of-the-art background in psychological science, helping you form a better idea of whether a claim is consistent with current knowledge in psychology. The media love a good story, and findings from psychological research are often provocative. Unfortunately, media reports can be distorted or even flat-out wrong. Throughout your life, as a consumer of psychological science you will need to be skeptical of overblown media reports of “brand new” findings obtained by “ground-breaking” research.

Consider, for instance, a study conducted by a cognitive psychologist that found playing Mozart to research participants led them to score slightly higher on a test loosely related to intelligence. The media jumped onto the so-called Mozart effect with abandon; the result has been that many parents determinedly play Mozart to young infants—and even to fetuses (FIGURE 1.24). Indeed, governors of two U.S. states instituted programs that provided free Mozart CDs to every newborn. Websites make bold claims about the power of Mozart, including fantastical assertions that listening to Mozart can cure neurological illness and other maladies. To understand the true power of Mozart for the developing mind, we need to step back and critically evaluate the research underlying the Mozart effect.

In 1993, researchers played the first 10 minutes of the Mozart Sonata for Two Pianos in D Major (K. 448) to a group of university students. Compared with students who listened to relaxation instructions or who sat in silence, those who heard Mozart performed slightly better on a task that involved folding and cutting paper, a task that was part of a larger overall measure of intelligence. This modest increase lasted for about 10 to 15 minutes (Rauscher, Shaw, & Ky, 1993). However, subsequent research largely failed to get the same results, even when using a similar research design. Having carefully reviewed the studies testing the Mozart effect, the American psychologist Christopher Chabris (1999) concluded that listening to Mozart is unlikely to increase intelligence among listeners. According to Chabris, listening to Mozart appears to enhance only certain types of motor skills, not measures more commonly associated with intelligence. Another important question from a critical thinking perspective is whether it was the music or some other aspect of the situation that led to better performance on the folding and cutting task. A team of Canadian researchers has shown that the effect may occur simply because listening to music is more uplifting than sitting in silence or relaxing, and therefore the increase in positive mood is largely responsible for better performance (Thompson, Schellenberg, & Husain, 2001). Recall from earlier in this chapter that music has been shown to affect mood and cognition.

Also note that all the studies to date have been conducted on university students, yet all the publicity focuses on whether listening to Mozart increases infants’ intelligence. Most likely it does not. Of course, experiences during early life are important; but most of the claims about music go way beyond the data. Now that you are a bit more informed, what do you think?

A wide range of evidence shows that people can learn to improve how they think. For instance, before they have taken a psychology course, many students have false beliefs, or misconceptions, about psychological phenomena. One such false belief is that people use only 10 percent of their potential brain power. (More misconceptions will be discussed in Chapter 2, “Research Methodology.”) In an exemplary study, Kowalski and Taylor (2004) found that students who employ critical thinking

skills will complete an introductory course with a more accurate understanding of psychology than that of students who complete the same course but do not employ the same skills. As you read this book, attend to the critical thinking skills and apply these skills in your other classes, your workplace, and your everyday life.

## Psychologists Adhere to a Code of Ethics

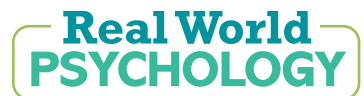
As will be discussed in Chapter 2, ethics is central to psychological science, and all psychologists adhere to a code of ethical behaviour. The Canadian Psychological Association (CPA) publishes a code of ethics that all of its members must respect. The ethical code includes respecting the dignity of all people, caring for them with competence, and maintaining proper relationships with them, while acting in ways that are responsible to society. The psychological associations in many countries around the world have similar codes of ethics.

Many scientific and societal changes are creating new ethical dilemmas for psychologists and for people in related fields such as medicine and anthropology. Some of the new ethical dilemmas arise from the biological revolution, which is causing psychologists to rethink the ethical use of drug therapies, the use of psychological data in the courtroom, and the need for new privacy laws for both data on DNA and the results of brain imaging. The line between right and wrong is often a fine one, because these dilemmas are created by rapid changes in what we know about psychology. In each chapter of this book, an “On Ethics” section discusses a specific ethical dilemma, providing the background information and outlining the problem. As a reader and critical thinker, you are encouraged to consider the possible solutions in each case.

## Psychology Is Relevant to Every Person’s Life

Sometimes people ask why they need to study psychology. After all, the material is just common sense, right? The answer is no. Sometimes, as noted earlier about misconceptions, the results are surprising and run counter to common beliefs. For example, many people at least initially reject the idea that some of what they think, feel, and do is determined by unconscious influences; but hundreds of studies show that such influences happen. We have no conscious knowledge of what is happening in our brains in the first fraction of a second when we see a baby’s face, but we are attending to that baby’s face differently than we attend to an adult’s face (Kringelbach et al., 2008). Throughout this book you will read many such examples of psychology’s surprising nature.

Perhaps the most important reason for studying psychology is that its insights are critical in almost every sphere of our lives and its content—in explicating how humans think, feel, and behave—is universal. It can help us be better parents, understand how our siblings affect our development, work more effectively in groups, and relieve chronic pain, just to name a few examples. As the world becomes smaller, as the Internet extends its reach, and as more people travel to farther places to visit, study, and live, we are moving toward a psychology of all people. Around the world, the popular press covers the topics you will learn about in this book: advances in the brain sciences, how DNA is being used to identify people with particular disorders and cure them of these disorders, how advances in the understanding of the sensory systems are helping people see and hear better, how the new knowledge of taste is being used to create new recipes, how group behaviour can be understood, how the debilitating effects of depression can be alleviated, how memory can be maintained as we age. The list is virtually endless,



but it encompasses important knowledge for helping people lead happier and healthier lives and for creating a healthier and better planet for all of us. Psychological science is about all of us—and therefore about you. We, the authors, invite you to enjoy this book!

## SUMMING UP

### How Can We Apply Psychological Science?

Psychological science's content is of interest and value to many professions. Perhaps for this reason, psychology is one of the most popular majors on many university campuses. Although most people function as intuitive psychological scientists, many of our intuitions and beliefs are wrong, so we need to understand the research methods psychologists use and to think critically about research findings. Psychologists in most places of the world adhere to strict codes of ethics that regulate how they act toward others and how they conduct research. New advances—in science, in society—have created new ethical dilemmas in psychology. The findings from psychological science are relevant to every person's life.

## MEASURING UP

1. Critical thinking is \_\_\_\_\_.
  - a. criticizing the way other people think
  - b. using specific thinking skills to reach reasonable conclusions
  - c. questioning everything you read or hear and refusing to believe anything you have not seen for yourself
  - d. becoming an authority on everything so you never have to rely on other people's judgments
2. Psychology is relevant \_\_\_\_\_.
  - a. in those parts of the world where it is a well-developed science
  - b. in all aspects of life
  - c. for people who are naturally inquisitive
  - d. for the mentally ill but not for people who are mentally healthy

## CONCLUSION

Psychological scientists use the methods of science to study the mind, brain, and behaviour across different levels of analysis. Psychologists have replaced the age-old question about whether a trait or behaviour is due to nature or nurture with the idea that nature and nurture cannot be separated. The rich history of psychology is marked by various schools of thought. The founders of psychology grappled with questions such as *How can we understand the mind? How does the brain function? How many of our traits are predetermined by our genes? How do our personalities affect our lives? What social forces influence personal decisions?*

The concept of natural selection, developed by Darwin over a century ago, is an integral part of psychological science because to understand a particular behaviour, psychologists first must understand what advantage led humans to evolve that behaviour. Did this behaviour solve a problem for our evolutionary ancestors? Once psychologists gain a sense of what a behaviour is for, they can better investigate



how it works. These processes remain at the forefront of psychological research today as scientists seek to unravel the mysteries of brain, mind, and behaviour. The basic questions apply to all levels of analysis: biological, individual, social, and cultural. Furthermore, research across the multiple levels of analysis is invigorating psychological science and providing new insights into age-old questions. In the following chapters, you will practise the skills of critical thinking and ponder ethical dilemmas. You will learn not only how psychological science operates but also many remarkable things about the brain, the mind, and behaviour. It might just be one of the most fascinating explorations of your life.

## CHAPTER SUMMARY

### What Are the Seven Themes of Psychological Science?

- **Psychology Is an Empirical Science:** Psychological science relies on empirical evidence as a way of knowing about how we think, feel, and behave.
- **Nature and Nurture Are Inextricably Entwined:** Nature and nurture depend on each other, and their influences cannot be separated.
- **The Brain and Mind Are Inseparable:** Older dualist notions about the separation of the brain and mind have been replaced with the idea that the (physical) brain enables the mind; brain and mind cannot be separated.
- **A New Biological Revolution Is Energizing Research:** The scientific knowledge of brain activity has been enhanced by the discovery of more neurotransmitters. Mapping of the human genome has furthered genetics' role in analyzing both disease and behaviour. Tremendous advances in brain imaging have revealed the working brain. These advances are changing how we think about psychology.
- **The Mind Is Adaptive:** The brain has evolved to solve survival problems and adapt to environments. Many modern behaviours are by-products of adaptation.
- **Psychological Science Crosses Levels of Analysis:** Psychological scientists examine behaviour from various analytical levels: biological (brain systems, neurochemistry, and genetics), individual (personality as well as perception and cognition), social (interpersonal behaviour), and cultural (within a single culture and across several cultures).
- **We Often Are Unaware of the Multiple Influences on How We Think, Feel, and Act:** Hundreds of studies show that subtle events in the environment can change how we think, feel, and act without our awareness of the way they influence us.

### How Did the Scientific Foundations of Psychology Develop?

- **Experimental Psychology Begins with Structuralism:** Although psychology's intellectual history dates back thousands of years, psychology began as a formal discipline in 1879, in Wilhelm Wundt's laboratory in Germany. Using techniques of introspection, scientists attempted to understand conscious experience by reducing it to its structure.
- **Functionalism Addresses the Purpose of Behaviour:** According to functionalists, the mind is best understood by examining its functions, not its structure.
- **Gestalt Psychology Emphasizes Patterns and Context in Learning:** The assertion that the whole experience (the gestalt) is greater than the sum of its parts led to an approach emphasizing the subjective experience of perception.

- **Women Made Pioneering Contributions to Psychology:** Women's early contributions to psychological science, such as the achievements of Mary Calkins, Margaret Washburn, and Emma S. Baker, have been underacknowledged.
- **Freud Emphasized the Power of the Unconscious:** The psychoanalytic assumption that unconscious processes are not readily available to our awareness but influence our behaviour had an enormous impact on psychology.
- **Most Behaviour Can Be Modified by Reward and Punishment:** Discoveries that behaviour is changed by its consequences caused behaviourism to dominate psychology until the 1960s.
- **Cognition Affects Behaviour:** The computer analogy of the brain and the cognitive revolution led to the information processing perspective.
- **Social Situations Shape Behaviour:** Work in social psychology has highlighted how situations and other people are powerful forces in shaping behaviour.
- **Psychological Therapy Is Based on Science:** Scientific research over the course of the twentieth century taught psychological scientists that there is no universal treatment for psychological disorders. Instead, different treatments are effective for different disorders.

### How Can We Apply Psychological Science?

- **Psychological Knowledge Is Used in Many Professions:** Because psychology focuses on human behaviour, it is of interest to many students and professionals and is used in virtually every profession.
- **People Are Intuitive Psychological Scientists:** Humans naturally explain and predict others' behaviour, but biases and prejudices often lead to wrong conclusions, so we need to use scientific methods.
- **Psychological Science Requires Critical Thinking:** The use of critical thinking skills will improve how we think. Skepticism, an important element of science, requires a careful examination of how well evidence supports a conclusion. Using critical thinking skills and understanding the methods of psychological science are important for evaluating research reported in the popular media.
- **Psychologists Adhere to a Code of Ethics:** In most countries, psychologists are governed by a code of ethics. These codes require psychologists to treat people with respect and dignity and to show utmost concern for people's safety.
- **Psychology Is Relevant to Every Person's Life:** Psychology can help us be better students, parents, employees and employers, team members, peacemakers, and more. The field is broad with applications to all areas of life.

## KEY TERMS

adaptations, p. 10

behaviourism, p. 22

cognitive neuroscience,  
p. 23

cognitive psychology,  
p. 23

critical thinking, p. 27

culture, p. 7

evolutionary theory,  
p. 10

functionalism, p. 18

Gestalt theory, p. 19

introspection, p. 17

mind/body problem,  
p. 8

natural selection, p. 10

nature/nurture debate,  
p. 7

psychoanalysis, p. 21

psychological science,  
p. 5

social psychology, p. 23

stream of consciousness,  
p. 18

structuralism, p. 18

unconscious, p. 21

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## ■ PRACTICE TEST

- When you mention to your family that you enrolled in a psychology course, your family members share their understanding of the field. Which comment best reflects the nature of psychological science?
  - “You’re going to learn how to get in touch with your feelings.”
  - “The concept of ‘psychological science’ is such an oxymoron. It is impossible to measure and study what goes on in people’s heads.”
  - “I think you’ll be surprised by the range of questions psychologists ask about the mind, the brain, and behaviour, not to mention the methods they use to answer these questions.”
  - “By the end of the class, you’ll be able to tell me why I am the way I am.”
- Match each definition with one of the following ideas from evolutionary theory: adaptations, natural selection, survival of the fittest.
  - Gene mutations that endow physical characteristics, skills, and abilities can increase an organism’s chances of survival and of reproduction.
  - Individuals better adapted to their environment will leave more offspring.
  - Organisms’ adaptive random mutations are passed along, and mutations that hinder both survival and reproduction are not.
- Titles of recent research articles appear below. Indicate which of the four levels of analysis—cultural, social, individual, or biological—each article likely addresses.
  - Achievement motivation in adolescents: The role of peer climate and best friends (Nelson & DeBacker, 2008)
  - Circadian affective, cardiopulmonary, and cortisol variability in depressed and nondepressed individuals at risk for cardiovascular disease (Conrad et al., 2008)
  - Schooling in Western culture promotes context-free processing (Ventura et al., 2008)
  - Severity of physical aggression reported by university students: A test of the interaction between trait aggression and alcohol consumption (Tremblay, Graham, & Wells, 2008)
- True or false? Psychology as a field of inquiry developed almost exclusively from Western thinking.
- Indicate which school or schools of thought each of the following scholars is associated with: John Dewey, William James, Wolfgang Köhler, Kurt Lewin, George Miller, B. F. Skinner, Edward Titchener, Edward Tolman, John B. Watson, Max Wertheimer, Wilhelm Wundt.
  - structuralism
  - functionalism
  - Gestalt
  - behaviourism
  - cognitive
  - social
- Match each description with one of the following theoretical ideas: field theory, information processing theory, introspection, phenomenological approach, stream of consciousness.
  - a systematic examination of subjective mental experience that requires people to inspect and report on the contents of their thoughts
  - the interaction of biology, habits, and beliefs with environments to create behaviour
  - examining the totality of subjective conscious experience
  - a continuous series of ever-changing thoughts
  - the view that the brain takes in information as a code, processes it, stores relevant bits, and retrieves stored information as required
- Imagine you have decided to seek mental health counselling. You mention this to a few of your friends. Each friend shares an opinion with you. Based on your understanding of psychological science, which friend offers the strongest advice?
  - “I wouldn’t bother if I were you. All therapy is a bunch of psychobabble.”
  - “I know a therapist who uses this really cool method that can fix any problem. Seriously, she knows the secret!”
  - “That’s great! Psychologists do research to figure out which interventions are most helpful for people with different concerns.”
  - “Well, I guess if you like relaxing on couches and talking, you might get a lot out of therapy.”
- Which of the following practices are hallmarks of critical thinking? Check all that apply.
  - asking questions
  - considering alternative explanations
  - considering the possibility that biases are colouring the evidence
  - keeping an open mind
  - looking for holes in evidence
  - skepticism
  - reasoning logically to see whether information makes sense
- Your brother reads that research shows eating ice cream makes people more intelligent. He starts downing a pint of ice cream every day to increase his intelligence. To help your brother better understand this claim (and avoid obesity), which of the following questions would you ask? Check all that apply.
  - “Does the article mention how much ice cream people had to eat to become more intelligent?”
  - “Does the article say how the researchers measured intelligence?”
  - “Does the article mention whether the person who conducted the research is a famous scholar?”
  - “I wonder how the researchers designed the study. Were they doing good science?”
  - “I’d want to know who sponsored the study. Would you believe these results if the study was paid for and conducted by researchers at the world’s largest ice cream company?”

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## ■ PSYCHOLOGY AND SOCIETY

- Review the seven themes of psychological science. Write a brief essay about which two or three themes you are particularly excited to learn about during this course. Be sure to explain your interest in those themes.
- Make a list of your roles (e.g., student, parent, activist) and interests (e.g., sports, computers, music). Describe at least one way psychology is relevant to each role and interest.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.





# Research Methodology

*when the working day is done  
girls—they want to have fun  
oh girls just want to have fun . . .*

—Cyndi Lauper, “Girls Just Want to Have Fun”  
(released 1981; lyrics by Robert Hazard)

THESE LYRICS FROM CYNDI LAUPER’S SMASH HIT, which made it onto the Top 10 list in 15 countries and has been described as a “feminist anthem” for the 1980s, may seem like a strange opening for a chapter on research methodology. But the lyrics of “Girls Just Want to Have Fun,” like those of most popular songs, tell a story about the way people think, feel, and behave in specific social contexts. In this case, the story is about the thoughts and feelings of women when they finish a day at work. (*Women*, rather than *girls*, because except

## What Is Scientific Inquiry?

- The Scientific Method Depends on Theories, Hypotheses, and Research
- Unexpected Findings Can Be Valuable

## What Are the Types of Studies in Psychological Research?

- Descriptive Studies Involve Observing and Classifying Behaviour
- Correlational Designs Examine How Variables Are Related
- An Experiment Involves Manipulating Conditions
- Critical Thinking Skill: Understanding the Limitations of Correlational Research and the Effects of Confounds

- Random Assignment Is Used to Establish Equivalent Groups
- Critical Thinking Skill: Recognizing That Large Samples Generate More Reliable Results Than Small Samples

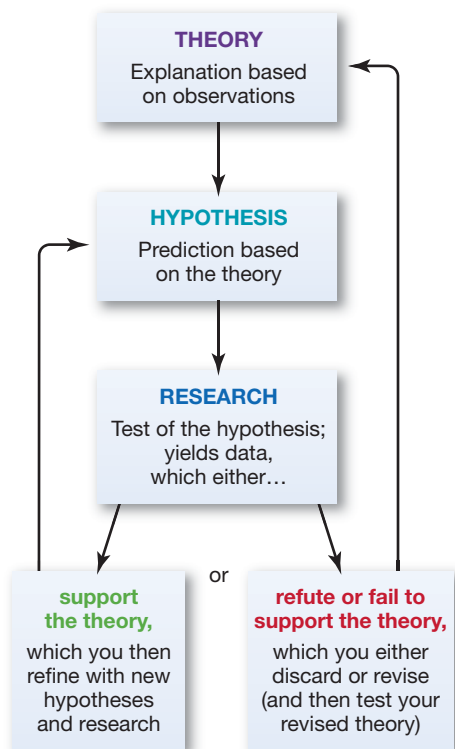
## What Are the Data Collection Methods of Psychological Science?

- Observing Is an Unobtrusive Strategy
- Case Studies Examine Individual Lives and Organizations
- Asking Takes a More Active Approach
- Response Performance Measures Information Processing
- Body/Brain Activity Can Be Measured Directly

- Research with Animals Provides Important Data
- There Are Ethical Issues to Consider

## How Are Data Analyzed and Evaluated?

- Good Research Requires Valid, Reliable, and Accurate Data
- Descriptive Statistics Provide a Summary of the Data
- Correlations Describe the Relationships between Variables
- Inferential Statistics Permit Generalizations



**FIGURE 2.1 The Scientific Method** The scientific method reflects a cyclical relationship among a theory, a testable hypothesis (or testable hypotheses) derived from the theory, research conducted to test the hypothesis, and adjustments to the theory as findings prompt re-evaluation. A good theory evolves over time, and the result is an increasingly accurate model of some phenomenon.

### LEARNING OBJECTIVE

Explain the differences among theories, hypotheses, and research.

**scientific method** A systematic procedure of observing and measuring phenomena to answer questions about *what* happens, *when* it happens, *what* causes it, and *why*.

**theory** A model of interconnected ideas and concepts that explains what is observed and makes predictions about future events.

in unusual circumstances, any female who is at work all day must be an adult.) The idea of working women wanting to have fun probably came from repeated observations, by the lyricist or someone who inspired him, of real people saying and doing things after work.

Of course, psychological researchers usually do not look to the lyrics of popular songs for research ideas. Most researchers have more serious areas of interest, such as understanding how the brain changes when a child or adult experiences a traumatic event, discovering the ways that people learn new information, finding effective treatments for mental disorders, or identifying the age at which children become credible witnesses, to name just a few. But for the purposes of understanding the principles of research methodology, we will use the description of female behaviour heard by countless people around the world in this *Billboard* hit.

Suppose you were asked to analyze this song as your research project. What study would you design to determine whether women just want to have fun after a day at work? Whom would you select as participants for your study? How would you measure “fun”? What theory would you be testing? This chapter addresses these sorts of questions.

During the last century, psychologists made many important discoveries about the mind, brain, and behaviour. These discoveries emerged through careful scientific research. The scientific method is *systematic*, which means that it proceeds in orderly steps that are carefully planned. To answer research questions, scientists use objective procedures so that they can develop an accurate understanding of the phenomena they study. (*Phenomena* are things that can be observed—the singular is *phenomenon*.) An objective procedure is free from bias, so if another researcher uses the same procedure with the same sample of people, he or she would expect the same results.

As you read about research methods in the context of studying human behaviour, here are some key questions to keep in mind.

- What are the goals of research?
- What are the steps for conducting a research study?
- What kinds of ethical issues are involved in conducting research?
- How well do the data support the conclusion?
- Are there alternative explanations?

## What Is Scientific Inquiry?

Scientific inquiry is a way of finding answers to empirical questions—questions that can be answered by observing the world and measuring aspects of it. Scientific inquiry has four basic goals, which correspond to describing *what* happens, predicting *when* it happens, controlling *what causes* it to happen, and explaining *why* it happens. To be more confident in the conclusions drawn from their observations, researchers in the various fields of science use a general approach known as the **scientific method**, which is more objective than casual observations.

## The Scientific Method Depends on Theories, Hypotheses, and Research

Formally speaking, the scientific method reflects a dynamic interaction among three essential elements: theories, hypotheses, and research (FIGURE 2.1). A **theory** is an explanation or a model of how something in the world works, consisting of interconnected ideas and concepts. It is used to explain prior observations and to make predictions about future events.

A good theory should generate a **hypothesis** (or multiple hypotheses), a specific, testable prediction about the outcome that would best support the theory. If the theory is reasonably accurate, the prediction framed in the hypothesis should be supported. To see how theories lead to testable hypotheses, imagine you are beginning a study of the “women and fun” question discussed above. You theorize that working women want to have fun because they need a break from the monotony at work. To test this theory, you might hypothesize that women who have more fun at work will less likely engage in fun activities after work than those who have boring jobs.

Once you have developed hypotheses to test your theory, you must do **research**, which involves the systematic and careful collection of **data**, or objective information that provides a test of whether the hypothesis—and ultimately, the corresponding theory—is likely to be supported. To test the hypothesis about women’s desire for fun after work, for example, you might ask women to rate how much fun they have at work and how often they do something fun after work. Or you could use brain imaging techniques to see if women who have low levels of arousal when they perform work tasks (suggesting they are the most bored while working) are most likely to exhibit fun-seeking behaviours when they finish work for the day.

Once the research findings are in, you would return to the original theory to evaluate the implications of the data that were collected. The findings either support your theory or require that your theory be modified or discarded. Then the process starts all over again, as good research reflects a cyclical process whereby a theory is continually refined by new hypotheses and tested by new research methods (**FIGURE 2.2**). Often, more than one theory can explain human behaviour, so no single study can provide a definitive answer. In general, we can have more confidence in scientific findings when research outcomes are replicated. **Replication** involves repeating a study and getting the same (or similar) results. When the results from two or more studies are the same, or at least support the same conclusion, confidence in the findings increases.

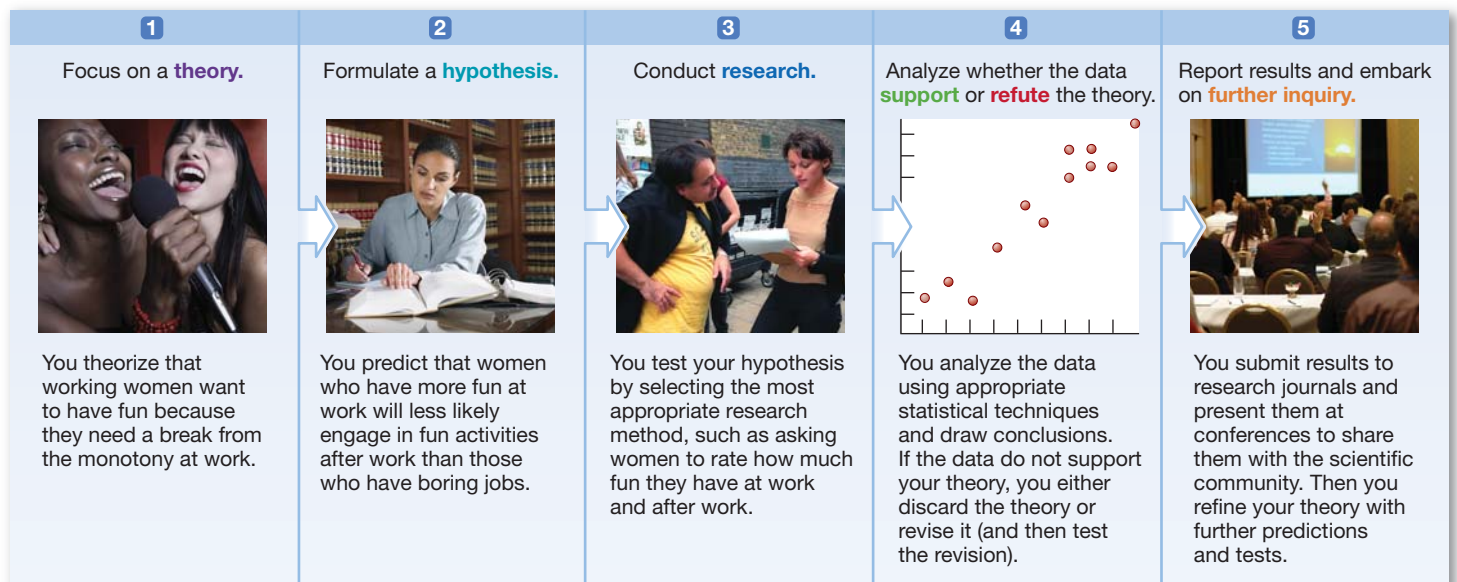
**hypothesis** A specific prediction of what should be observed in the world if a theory is correct.

**research** Scientific process that involves the systematic and careful collection of data.

**data** Objective observations or measurements.

**replication** Repetition of an experiment to confirm the results.

**FIGURE 2.2** The Scientific Method in Action



**THEORIES SHOULD GENERATE HYPOTHESES** How can we decide whether a theory is good? When we talk about a good theory, we do not mean whether it is likely to be supported by research findings. Instead, a good theory produces a wide variety of *testable* hypotheses. For instance, in the early twentieth century, the Swiss developmental psychologist Jean Piaget proposed a theory of infant and child development that suggested that cognitive development occurs in a fixed series of “stages,” from birth to adolescence. From a scientific standpoint, this was a good theory because it led to a number of hypotheses regarding the specific kinds of behaviours that should be observed at each stage of development. In the decades since its proposal, the theory has generated thousands of scientific papers (see Chapter 11, “Human Development”), and our understanding of child development has been enhanced both by studies that supported Piaget’s stage theory and by those that failed to support it.

In contrast, Piaget’s contemporary Sigmund Freud, in his famous treatise *The Interpretation of Dreams*, outlined the theory that all dreams represent the fulfillment of an unconscious wish. From a scientific perspective, Freud’s theory was not a good one, because it generated few testable hypotheses regarding the actual function of dreams. Researchers were left with no way to evaluate whether the wish fulfillment theory was either reasonable or accurate, because unconscious wishes are, by definition, not known to anyone, including the person having the dreams. Indeed, on being presented with a patient’s dream that clearly contained no hint of wish fulfillment, Freud went so far as to claim that the dreamer’s unconscious wish was to prove his theory wrong!

### Unexpected Findings Can Be Valuable

Research does not always proceed in a neat and orderly fashion. On the contrary, many significant findings are the result of *serendipity*—when researchers unexpectedly discover something important. For example, at Harvard in the late 1950s, the physiologists Torsten Wiesel of Sweden and David Hubel of Canada recorded the activity of cats’ nerve cells in brain areas associated with vision. They were studying how information travels from the eye to the brain, and they had hypothesized that certain cells in the visual portion of the brain would respond when the cats looked at dots. After much disappointing work that produced no significant activity in these cells when the cats viewed slides of dot patterns, the projector suddenly jammed between slides, and the cells unexpectedly began to fire at an astonishing rate. The jammed slide had produced a visual “edge” on the screen, leading Wiesel and Hubel to discover that instead of responding to simple dots, the cells in question respond to lines and edges. They received a Nobel Prize for this serendipitous finding. Although this is an example of serendipity, it would be a mistake to think that Wiesel and Hubel were merely lucky folks who stumbled onto a groundbreaking discovery that led to a Nobel Prize. They followed up on their unexpected finding, investing a lifetime of hard work into understanding the implications of the rapid firing of brain cells in response to straight lines but not to other types of visual stimuli.





## SUMMING UP

### What Is Scientific Inquiry?

Our subjective beliefs, such as intuitions, can be useful in suggesting research questions, but they are often biased or based on limited information. To explain behaviour, scientists must use objective, systematic procedures to measure it. The four goals of psychological science are to describe (what), predict (when), control (what causes), and explain (why) behaviour and mental activity. The empirical process is based on the use of theories to generate hypotheses that can be tested by collecting objective data through research. Theories in turn must be adjusted and refined as new findings confirm or disconfirm the hypotheses. Good theories will generate several testable hypotheses. Unexpected findings can suggest new theories.

## MEASURING UP

1. How are theories, hypotheses, and research different?
  - a. Theories ask questions about possible causes of thoughts, emotions, and behaviours; hypotheses provide the empirical answers; and research is used to prove that theories are correct.
  - b. Theories are broad conceptual frameworks, hypotheses are derived from theories and are used to design research that will support or fail to support a theory, and research is a test of the hypotheses.
  - c. Theories are assumed to be true, hypotheses need to be tested with appropriate experiments, and research is the final step.
  - d. Theories do not require data for their verification because they are abstract, hypotheses depend on experimental findings, and research uses human participants to test theories and hypotheses.
2. How does psychological research differ from relying on personal experience or intuition as a way of understanding thought, emotions, and behaviour?
  - a. Personal experience is the most objective method for understanding thoughts, emotions, and behaviours.
  - b. Carefully designed research is the most objective method for understanding thoughts, emotions, and behaviours.
  - c. Research provides theoretical answers that are best verified through individual experience.

## What Are the Types of Studies in Psychological Research?

Once a researcher has defined a hypothesis, the next issue to be addressed is the type of study design to be used. There are three main types of designs: *descriptive*, *correlational*, and *experimental*. These designs differ in the extent to which the researcher has control over the variables in the study and therefore in the extent to which the researcher can make conclusions about causation. All research involves variables. A **variable** is anything that can be measured and that can vary; the term *variable* can refer to something that the experimenter either measures or manipulates. For instance, some of the variables a researcher might use in a study of whether women want to have fun after work include number of hours worked, how much fun the women have at work, what they say they want to do after work, what they actually do after work, whether they rate what they do as having fun, and so on.

### LEARNING OBJECTIVES

List the advantages and disadvantages of different research methods.

Explain why random assignment is important when designing experiments.

**variable** Something in the world that can be measured and that can vary.

Researchers must define variables in precise ways that reflect the methods used to assess them. They do this by using *operational definitions*, which identify and quantify variables so they can be measured. For example, in studying whether women want to have fun after work, how would you define and quantify “wanting to have fun” to judge whether it is affected by how boring a woman’s job is or how many hours a woman works? One option is to ask a group of women as they leave work to use a rating scale in which 1 equals “I do not want to have fun” and 10 equals “I want to have fun more than anything else in the world.” In this example, the operational definition for how much a woman wants to have fun would be the number between 1 and 10 that she assigns in the after-work rating. This concrete definition would help other researchers know precisely what is being measured, so they could replicate the research. Alternatively, how much a woman wants to have fun could be inferred from her after-work behaviour. For example, a researcher could have women rate different activities—such as grocery shopping, taking a class, or dancing—based on how much fun each activity is. Then, by asking a sample group of working women to choose from among these activities after work and keeping track of the women’s choices, the researcher could infer how many women wanted to have fun after work.

## Descriptive Studies Involve Observing and Classifying Behaviour

**Descriptive studies**, sometimes called *observational studies* because of the manner in which the data typically are collected, involve observing and noting behaviour to analyze it objectively (**FIGURE 2.3**). For instance, an observer might take notes on the types of foods that people eat in cafeterias, measure the time that people spend talking during an average conversation, count the number and type of mating behaviours that penguins engage in during their mating season, or tally the number of times poverty or mental illness is mentioned during a parliamentary debate. Some researchers observe behaviour at regular time intervals, spanning durations from as short as seconds to as long as entire lifetimes and across generations. In this manner, the researchers can keep track of what research participants do at particular points in time, and behaviours can be studied that may take years to unfold, as in a study that tracks university graduates’ job histories.

**naturalistic observation** A passive descriptive study in which observers do not change or alter ongoing behaviour.

**participant observation** A type of descriptive study in which the researcher is actively involved in the situation.

There are two basic types of descriptive studies. In **naturalistic observation**, the observer remains separated from and makes no attempt to change the situation. By contrast, in **participant observation**, the researcher is involved in the situation. An example of the latter was conducted by social psychologists who joined a doomsday cult to see how the cult members would respond when the world did not end on the date that was predicted by the cult (Festinger, Riecken, & Schachter, 1956). Some problems with participant observation are related to the observer’s losing objectivity and the participants’ changing their behaviour if they know they are being observed. You can imagine, for example, how bar patrons would respond if researchers entered the bar and announced they were studying the behaviour of people who go to bars to meet potential dates. Such an announcement would interfere with or might even eliminate the behaviour being studied—in this case, the normal interactions that occur in bars. Thus observers need to keep their objectivity and minimize their impact on a situation.

**Descriptive studies** involve observing and classifying behaviour, either with no intervention by the observer (naturalistic observation) or with intervention by the observer (participant observation).

**Advantages** Especially valuable in the early stages of research, when trying to determine whether a phenomenon exists. Takes place in a real-world setting.

**Disadvantages** Errors in observation can occur because of an observer's expectations (observer bias). Observer's presence can change the behaviour being witnessed (reactivity).



Naturalistic observation



Participant observation

### FIGURE 2.3 Descriptive Studies

(left) Employing naturalistic observation, the primatologist Jane Goodall observes a family of chimpanzees. Animals will more likely act naturally in their native habitats than in captivity. (right) The University of British Columbia evolutionary psychologist and anthropologist Joe Henrich has conducted studies using participant observation among the Machiguenga in the Peruvian Amazon, Mapuche Farmers in rural Chile, and Yasawan villagers (pictured) in Fiji.

Descriptive techniques are especially valuable in the early stages of research, when researchers simply are trying to see whether a phenomenon exists. The value of even the simplest observations should not be underestimated. We can learn a great deal about behaviour by just watching and taking careful notes about what we see. For example, if we observed seating patterns during lunch at two high schools and found that at one school the lunch tables were racially segregated but at the other school students sat in mixed-race groups, we would have learned something valuable about racial behaviours at these two schools. We would need different types of research designs to understand what causes student groups to be segregated or integrated, but description would have proved a good first step in documenting this phenomenon.

Some studies are designed specially to examine the developmental changes that occur over time—sometimes with the goal of watching changes unfold naturally as in a descriptive design, but other times to see how different interventions affect future development. **Longitudinal studies** are one type of developmental design (FIGURE 2.4). For example, if you wanted to know how intellectual abilities change over the adult years, you could assess the abilities of a group of young adults, then reassess them every five years, as they progressed toward old age. Alternatively, you could assess the intellectual abilities of young adults and old adults and compare their scores on various measures of intellectual ability. This latter sort of research design, comparing different groups to make inferences about both, is known as **cross-sectional studies** (FIGURE 2.5). Like all research design choices, each of these methods has advantages and disadvantages. Longitudinal designs provide information about the effects of age on the same people, but they are expensive, they take a long time, and they can be jeopardized when (not if) some participants drop out of the experiment over time. By contrast, cross-sectional designs are faster and less expensive, but they include the possibility that some unidentified variable is responsible for any difference between the groups. In the example above, the older

**FIGURE 2.4 Longitudinal Studies** The *Up* series of documentary films is an ongoing longitudinal study that since 1964 has traced the development of 14 British people from various socio-economic backgrounds. New material has been collected every seven years starting when the participants were seven years old. Here, three participants—Jackie, Sue, and Lynn—are pictured from the latest film, *49 Up*.

**Longitudinal studies** involve observing and classifying developmental changes that occur in the same people over time, either with no intervention by the observer or with intervention by the observer.

**Advantages** Provide information about the effects of age on the same people, allowing researchers to see developmental changes.

**Disadvantages** Expensive, take a long time, and may lose participants over time.



**Cross-sectional studies** involve observing and classifying developmental changes that occur in different groups of people at the same time.

**Advantages** Faster and less expensive than longitudinal studies.

**Disadvantages** Unidentified variables may be involved (third variable problem, discussed below).



**FIGURE 2.5** Cross-Sectional Studies

Together, the young adults on the top and the older adults on the bottom might participate in a cross-sectional study.

**observer bias** Systematic errors in observation that occur because of an observer's expectations.

**experimenter expectancy effect** Actual change in the behaviour of the people or animals being observed that is due to observer bias.

**correlational study** A research method that examines how variables are naturally related in the real world, without any attempt by the researcher to alter them.

people might not have received the same amount or type of education as the younger people, and this third variable might account for any differences between the groups.

**OBSERVER BIAS** In conducting observation research, scientists must guard against **observer bias**, systematic errors in observation that occur because of an observer's expectations. Observer bias can be especially problematic if cultural norms favour inhibiting or expressing certain behaviours. For instance, if observers are coding men's and women's facial expressions, they may be more likely to rate female expressions as indicating sadness because they believe that men are less likely to show sadness. Men's expressions of sadness might be rated as annoyance or some other emotion. Likewise, women might be rated as more assertive when exhibiting the same behaviour as men, because in many societies women are generally expected to be less assertive. Cultural norms can affect both the participants' actions and the way observers perceive those actions.

Evidence indicates that observer bias can even change the behaviour being observed, a phenomenon known as the **experimenter expectancy effect**. For example, in a classic study conducted in the 1960s by the German-American social psychologist Robert Rosenthal, university students trained rats to run a maze. Half the students were told that their rats were bred to be very good at running mazes; the other half were not given this expectation. In reality, there were no genetic differences between the groups of rats. Nonetheless, the rats trained by the students who believed that their rats were bred to be fast maze learners did learn the task more quickly. Thus these students' expectations altered how they treated their rats, and this treatment in turn influenced the speed at which the rats learned. The students were not aware of their biased treatment, but it existed. Perhaps they supplied extra food when the rats reached the goal box, or they gave the rats inadvertent cues as to which way to turn in the maze, or they stroked the rats more often. This study exemplified the principle, introduced in the first chapter, that some aspects of our own behaviour are not under our conscious control. We are not always consciously aware of the many factors that affect how we think, feel, and act. In this example, students' beliefs unconsciously affected their behaviour (**FIGURE 2.6**).

To protect against experimenter expectancy effects, it is best if the person running the study is *blind* to, or unaware of, the study's hypotheses. The study above, which seemed to be about rats' speed in learning to run through a maze, was actually designed to study experimenter expectancy effects. Researchers studying two different groups of rats would want to protect against such effects by not telling students that the rats came from different groups or to which group each rat belonged.

## Correlational Designs Examine How Variables Are Related

A **correlational study** examines how variables are naturally related in the real world, without any attempt by the researcher to alter them (**FIGURE 2.7**). For example, to study whether women who work longer than others want to have more fun after work, a researcher might sample a group of working women and compare the number of hours each woman worked to the way each woman rated her desire to have fun using the 1 to 10 scale suggested above. In this scenario, the goal would be to use the number of hours the women worked as a variable that the researcher did not control. This study would not tell the researcher, however, if the number of work hours directly *caused* the desire to have fun. Why not? A few potential problems prevent researchers from drawing causal conclusions from correlational studies.

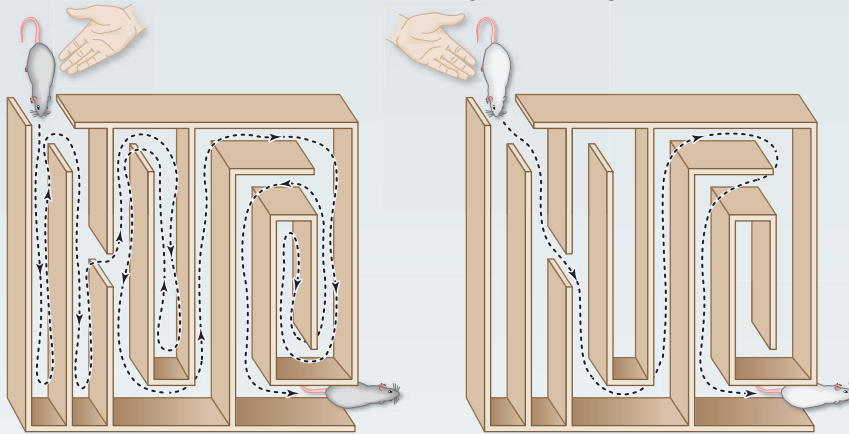
As discussed extensively in this chapter, different types of research methods play important roles in the stories of psychological science. In each chapter of the book, **Scientific Method** features will lead you through the steps of some of the most interesting experiments and studies discussed in the text.

**FIGURE 2.6 Scientific Method: Rosenthal's Study of Observer Bias**

**Hypothesis:** Research participants' behaviour will be affected by experimenters' biases.

**Research Method:**

- 1 One group of university students was given a group of rats and told to train them to run a maze.
- 2 A second group of university students was given a group of rats to train that were genetically the same as the first group of rats, except the students were told that the rats were bred to be very good at running mazes.



**Results:** The rats trained by the students who believed their rats were bred to be fast maze learners did learn the task more quickly.

**Conclusion:** The results for the two groups of rats differed because the students' biases caused them to give off subtle cues that changed the rats' behaviour.

Correlational studies are popular research designs because they rely on naturally occurring relationships. Some research questions require correlational research designs for ethical reasons. For example, suppose you want to know if soldiers who experience the horrors of war have more difficulty learning new tasks after they return home than soldiers who did not experience traumatic combat. Even if you have a theory that traumatic combat experiences *cause* later problems with learning, it would be unethical to induce trauma in some soldiers so that you could compare those soldiers with others who were not traumatized. For this research question, you would need to study the soldiers' ability to learn a new task (e.g., computer programming) and see if those who experienced traumatic combat performed less well when learning this task (on average) than soldiers who did not experience traumatic combat. This sort of study can be used to determine that two variables are associated with each other (e.g., the horrors of war are associated with learning difficulties later in life), a connection that enables the researchers to make predictions. In this example, if you found the association you expected between combat experience and learning difficulties, you could predict that soldiers who go into combat will (again, on average) have more difficulty learning new tasks when they return than soldiers who do not experience combat. Because your study drew on but did not control the soldiers' wartime experiences, however, you have not established a causal connection.

**Correlational studies** examine how variables are related, with no intervention by the observer.

**Advantages** Rely on naturally occurring relationships. May take place in a real-world setting.

**Disadvantages** Cannot be used to support causal relationships (that one thing happened because of the other). Cannot show the direction of the cause/effect relationship between variables (directionality problem). An unidentified variable may be involved (third variable problem).



**FIGURE 2.7 Correlational Studies** There may be a correlation between the extent to which parents are overweight and the extent to which their children are overweight. A correlational study cannot demonstrate the cause of this relationship, such as including biological propensities to gain weight, lack of exercise, and high-fat diets.

**directionality problem** When researchers find a relationship between two variables in a correlational study, they cannot determine which variable may have caused changes in the other variable.

**third variable problem** When the experimenter cannot directly manipulate the independent variable and therefore cannot be confident that another, unmeasured variable is not the actual cause of differences in the dependent variable.

Another problem with correlational studies is in knowing the direction of the cause/effect relation between variables. This sort of ambiguity is known as the **directionality problem**. Suppose some researchers surveyed a large group of people and found that those who reported sleeping a great deal also reported having a lower level of stress. Does reduced stress lead to longer and better sleep, or does sleep reduce stress levels? Both scenarios seem plausible:

#### The Directionality Problem

Sleep (A) and stress (B) are correlated.

- Does less sleep cause more stress? ( $A \rightarrow B$ )

or

- Does high stress cause less sleep? ( $B \rightarrow A$ )

Another drawback with all correlational studies is the **third variable problem**. Instead of variable A causing variable B, as a researcher might have assumed, it is possible that a third variable, C, caused A and B. How might this concept apply to the issue of working women wanting to have fun? Women with a lot of energy might be likely to work long hours and to want to have fun after work, but the women's high energy level causes both the long hours and the desire for fun. This third variable, energy level (here, variable C), caused variations in the number of hours worked (variable A) and how much the women wanted to have fun (variable B):

#### The Third Variable Problem

Working long hours (A) is correlated with wanting to have fun after work (B).

- Having high energy (C) causes working long hours. ( $C \rightarrow A$ )

and

- Having high energy (C) causes wanting to have fun after work. ( $C \rightarrow B$ )

Sometimes the third variable is obvious. For instance, if you were told that the more churches there are in a town, the greater the rate of crime, you would not conclude that churches cause crime, because obviously the population size of a city affects the number of churches and the frequency of crime. But sometimes third variables are not so obvious and may not even be identifiable. For instance, we have all heard that smoking causes cancer. Suppose some genetic defect makes people more likely to smoke and also more likely to get cancer. Indeed, recent evidence indicates that a particular gene predisposes some smokers to develop lung cancer (Paz-Elizur et al., 2003). Recent research supports the idea that, for at least some smokers, a genetic predisposition combines with environmental factors to increase the probability that someone will smoke and develop lung cancer (Thorgeirsson et al., 2008). This connection would exemplify a principle introduced in the first chapter, namely that nature and nurture work together in ways that are often inseparable. In this case, the combination of a genetic vulnerability and an action (smoking) may increase the likelihood of cancer.

In many other instances, people might erroneously believe there is a causal relationship between two variables when there is a correlation. Suppose the newspaper reports that children who attend preschool are better readers in grade one than those who do not. It is tempting to conclude that children are better readers in grade one *because* they learned prereading skills in preschool. This explanation of the data might be true, but so might another one: that children who attend preschool have parents who are concerned with their academic success, and that such parents probably read to their children and monitor their school work more

than parents who are less concerned with academic success (or less able to afford preschool). How would you design a study to determine if attending preschool, and not some other variable, caused higher reading scores?

The only way to know if attending preschool in itself makes children better readers in grade one would be to find a representative sample of preschool-age children and assign the children at random to either attend or not attend preschool. The researcher would then assess the reading skills of children from both groups at the end of first grade to see if the expected relationship was supported. This example shows how difficult it often can be to randomly assign participants to groups. Most parents want to decide if their children will attend preschool, and many parents would not participate in an experiment that might keep their children out of preschool. Furthermore, good data show that preschool is an important experience for young children, so it would be unethical to keep some children out of preschool. If we were unsure about the benefits of preschool, researchers could conduct a random assignment study (discussed below) to assess those benefits. Once the researchers had a good indication that preschool is beneficial, the experiment would need to end so that all the participating children could attend preschool.

Despite such potentially serious problems as these, correlational studies are widely used in psychological science because they provide important information about the natural relationships among variables, allowing researchers to make predictions. For example, correlational research has identified a strong relationship between depression and suicide, and therefore clinical psychologists often assess symptoms of depression to determine suicide risk. Most research on psychopathology uses the correlational method because it is unethical to induce mental disorders in people to study the effects. Typically, researchers who use the correlational method use other statistical procedures to rule out potential third variables and problems with the direction of the effect. By showing that a relationship between two variables holds even when potential third variables are taken into account, researchers can be more confident that the relationship is meaningful.

## An Experiment Involves Manipulating Conditions

In experimental research, the investigator has maximal control over the situation. An **experiment** is a study in which the researcher manipulates one variable to examine that variable's effect on a second variable. In studying how the number of hours worked affects how much women want to have fun, you could manipulate whether participants work few or many hours, a variable that would require the co-operation of their employer (who might also want to know the answer to this research question); you would then ask all participants to rate how much they wanted to have fun after work. A **control** (or **comparison**) **group**, consisting of women who do not work at all, would allow you to compare two **experimental** (or **treatment**) **groups** (women who worked few hours, say 5 hours a day, and women who worked many hours, say 10 hours a day) to the control condition. Two experimental groups and one control group is just one possible research design for this question. The variable that is manipulated (the number of hours worked) is the **independent variable**, and the variable that is measured (how much women want to have fun after work) is the **dependent variable**.

The benefit of an experiment is that the researcher can study the *causal relationship* between the two variables. If the independent variable influences the dependent variable consistently (for example, higher ratings for the desire to have fun in the 10-hour group than in the 5-hour group, and higher ratings in the 5-hour group than in the control group), then the independent variable is assumed to cause the change in the dependent variable.

**experiment** A study that tests causal hypotheses by measuring and manipulating variables.

**control (or comparison) group** The participants in a study that receive no intervention or an intervention different from the one being studied.

**experimental (or treatment) group** The participants in a study that receive the intervention.

**independent variable** In an experiment, the condition that is manipulated by the experimenter to examine its impact on the dependent variable.

**dependent variable** In an experiment, the measure that is affected by manipulation of the independent variable.

Although experiments allow us to infer cause, they are often criticized for being artificial. In real life, for example, some people decide for themselves how many hours they will work each day. Depending on the type of workplace you study, assigning different numbers of working hours may be so artificial that you end up studying something you had not intended, such as how women react when they are told how many hours they must work. Alternatively, you could compare a group of women who work part-time to a group of women who work full-time, with the prediction that the women in the full-time group want to have fun more than those in the part-time group. But unless you have assigned participants randomly to the various conditions, the possibility always exists that any difference you find derived from pre-existing differences among the groups. Research design often involves a series of choices: It means balancing the problems of taking people as they come with the problems of creating an artificial environment for the experiment.

## Real World PSYCHOLOGY

### CRITICAL THINKING SKILL

## Understanding the Limitations of Correlational Research and the Effects of Confounds

Understanding the limitations of correlational research and how confounds might affect the outcomes of studies is important when dealing with the increasing amount of scientific information about ourselves and our world. Knowing how to evaluate such information is an indispensable critical thinking skill. What should we believe? What should we ignore? These questions are crucial because we often make important decisions for ourselves and for society in direct response to conclusions we draw from science-based research. The practical benefit of thinking critically about the methods of psychological science is that doing so provides an invaluable basis for you to be an informed consumer of scientific information.

While medical use of marijuana continues to be debated in the United States, in Canada the Marihuana Medical Access Regulations, implemented in 2001, permit access to marijuana for clearly defined conditions, such as severe complications of cancer, epilepsy, and multiple sclerosis. But people's options about such use of the drug, which affect public policy debates, depend largely on interpreting available scientific information about marijuana—both its positive and negative aspects. For example, studies in Canada continue to explore marijuana use and its psychological effects, such as whether it can trigger schizophrenia during adolescence and young adulthood (Hall & Degenhardt, 2006). In another case, on March 3, 2000, the *New York Times* published an article that began: “In what is believed to be the first documented link between smoking marijuana and heart attacks, a study has found that a middle-aged person's risk of heart attack rises nearly fivefold in the first hour after smoking marijuana” (Noble, 2000). The conclusion is clear: Middle-aged people are at increased risk for a heart attack if they smoke marijuana. But is the conclusion valid?

According to the article, the researchers who conducted the study took brief case histories from 3,882 middle-aged heart attack patients. Of these, 124 were found to have been regular users of marijuana. Of these 124, 37 had smoked within the 24 hours preceding their attack, and 9 had smoked within the actual hour. On the basis of this evidence, the researcher

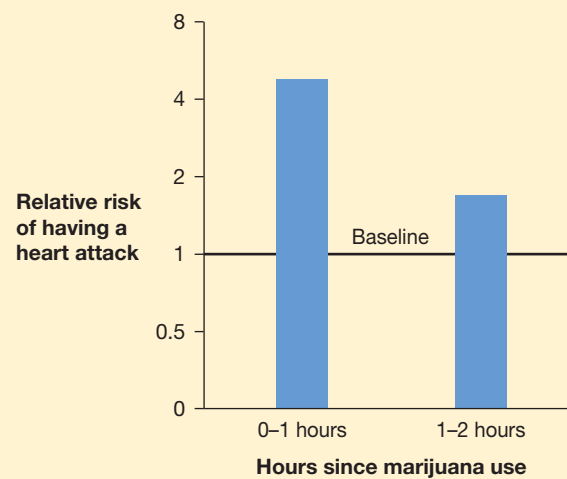


suggested that there is a significantly increased risk of heart attack within the first several hours after smoking marijuana. Let's consider several important issues regarding these data—and the conclusions that we can draw.

First, the study looked only at people who had had heart attacks, which is a non-randomized sampling technique. As a result, the findings don't pertain to *all* middle-aged people. Rather, the results generalize only to middle-aged people who have had heart attacks *and* who smoke marijuana. To assess the risk of marijuana-induced heart attacks in all middle-aged people, we would need to compare the rates of heart attacks in the middle-aged population that smokes marijuana and in the middle-aged population that doesn't. If the smoking population shows a greater rate of heart attacks, *then* we should advise middle-aged people to think twice before lighting up. But even then, this would be a correlational rather than a true experimental design, and causality could not be established.

Second, we need to consider whether factors other than marijuana may have influenced the rate of heart attacks for marijuana smokers. Did these patients do anything else near the time of the heart attack that may have contributed to—or fully caused—the cardiac event? One possibility might be that the heart attack victims had gotten high prior to engaging in sex or exercise, two activities that can contribute to the occurrence of attacks. These possible confounds are examples of third variable problems that again prevent any conclusions about causality. However, the *Times* article does not make it clear whether or how the researchers treated this concern. As a result, we again lack necessary information, and an informed reader will have serious doubts about the link between marijuana and heart attacks.

Critical thinkers might consult the original article, since media can distort the results of studies. The study appeared in the scientific literature following its report in the *New York Times*, and it indicates that the researchers did their best to account for other behaviours in the sample, such as using other drugs or having sex (Mittleman, Lewis, Maclure, Sherwood, & Muller, 2001). They conclude that the effects are real, even controlling for other potential cause (FIGURE 2.8). However, significant problems with sampling remain. The marijuana smokers were much younger (44 vs. 62), more likely to be male, more out of shape, and more likely to smoke cigarettes. Could other lifestyle factors in addition to drug use—such as diet, exercise, socioeconomic status, and regular physician checkups—be associated with heart disease? What does this finding tell us about the cardiac risks of smoking marijuana for adults in general?

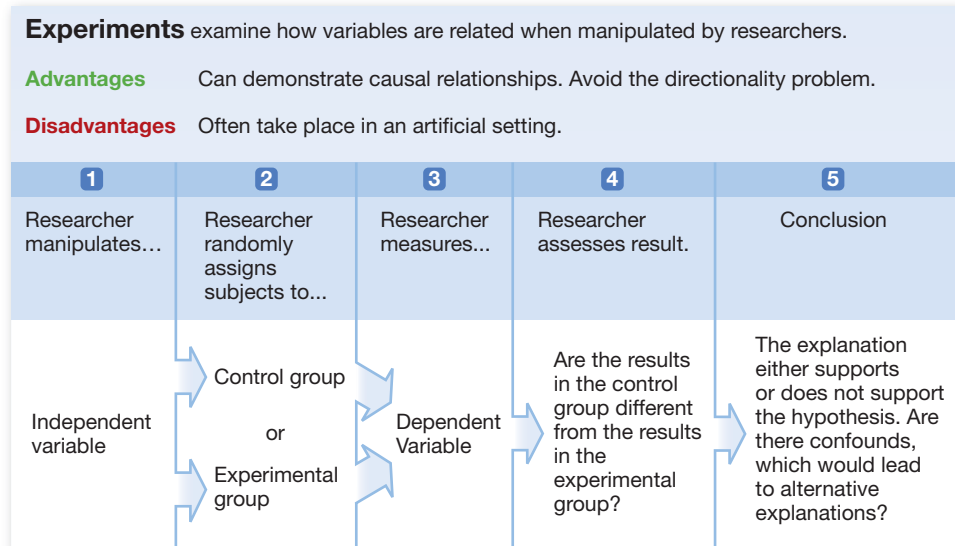


**FIGURE 2.8 Think Critically: The Relation between Heart Attack Risk and Marijuana Use** This graph simply shows the relative risk of a heart attack depending on hours since marijuana was smoked in this study. (The baseline indicates the standard risk during periods with no exposure to marijuana.) But does this graph actually show that smoking marijuana causes heart attacks?

**ESTABLISHING CAUSALITY** A properly performed experiment depends on rigorous control, the steps taken to minimize the possibility that anything other than the independent variable may affect the experiment's outcome. A **confound** is anything that affects a dependent variable and may unintentionally vary between the study's different experimental conditions. When conducting an experiment, a researcher needs to ensure that the only thing that varies is the independent variable. Control thus represents the foundation of the experimental approach, in that it allows the researcher to rule out *alternative explanations* for the observed data (FIGURE 2.9). For example, in an experiment about working women who want to have fun, if the participants who work 10 hours a day have more money than those who work 5 hours a day or those

**confound** Anything that affects a dependent variable and may unintentionally vary between the experimental conditions of a study.

FIGURE 2.9 Experiments



in the control group (who do not work at all), the differences among these groups in their ratings of how much they want to have fun might depend on the amount of money available for fun activities and not the hours worked. In this example, the number of hours worked might be *confounded with* how much money the women in each group have to spend on fun activities, making it impossible to tell whether the number of hours worked or the amount of money is responsible for the ratings.

The more confounds and thus alternative explanations that can be eliminated, the more confident a researcher can be that the independent variable produced the change (or effect) in the dependent variable. For this reason, researchers have to watch vigilantly for potential confounds, and as consumers of research, we all need to think about confounds that could be causing particular results.

### Random Assignment Is Used to Establish Equivalent Groups

An important issue to be considered for any research method is how to select people for inclusion in the study. Psychological scientists typically want to know that their findings *generalize*, or apply, to people beyond the individuals in the study. In studying working women’s desire for fun, for example, researchers would not be interested in the behaviour of the specific women participating in the study; they would want to discover general laws about human behaviour so they could predict what women, in general, want to do after work. Such results would generalize to all women who work. Other results, depending on the nature of the study, might generalize to all university students, to students who belong to sororities and fraternities, to everyone in the world, and so on. The group you want to know about is the **population**; the subset of people who are studied is the **sample**. *Sampling* is the process by which people from the population are selected for the sample. The sample should represent the population, and the best method for making this happen is *random sampling*, in which each member of the population has an equal chance of being chosen to participate. Most of the time, a researcher will use a *convenience sample*, which, as the term implies, is a sample of people who are conveniently available for the study. Even if you wanted your results to generalize to all students in your country or in the world, you would, realistically, probably use a sample from your own university and hope that this sample represented all students in your country and beyond. It

**population** Everyone in the group the experimenter is interested in.

**sample** A subset of a population.

is important for researchers to assess how well their results generalize to other samples (Henrich, Heine, & Norenzayan, 2010). For many topics studied in psychology (e.g., the structure of personality [discussed in Chapter 13] and sex differences in some mating preferences [Chapter 9]), the findings appear highly similar regardless of the sample used. For many other topics studied (e.g., the Mueller-Lyer illusion [Chapter 5] and the self-concept [Chapter 13]), the results obtained from samples of North American university students do not replicate to other populations. Indeed, they often look quite different from those obtained with other populations.

Even with random sampling, one likely confound is pre-existing differences between groups that are assigned to different conditions. An example of this situation was presented above, with the possibility of studying women who work part-time and women who work full-time; such an experiment would be more realistic than one in which women were assigned at random to groups that worked different numbers of hours, but it would have the problem of pre-existing group differences. When the groups are not equivalent because participants differ between conditions in unexpected ways, the condition is known as **selection bias**. For instance, in the study of working women wanting to have fun, suppose you have two experimental conditions described above—a group assigned to work 10 hours a day and a group assigned to work 5 hours a day. What happens if the women assigned the 10-hour workday are older than those assigned the 5-hour workday? Will age differences likely affect what people want to do after work? How would you know if the people in the different conditions of the study are equivalent? You could match each group for age, assigning an equal number of women in their 20s, 30s, 40s, and 50s to each group, but you can never be sure that you have assessed all possible factors that may differ between the groups.

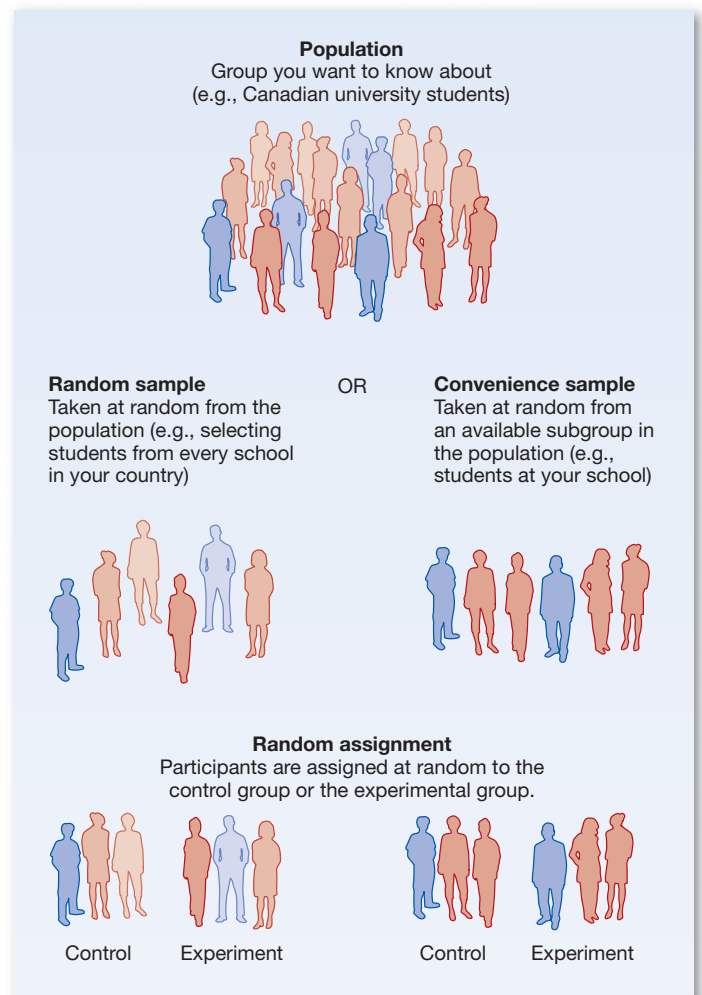
The only way to make the groups' equivalency more likely is to use **random assignment**, in which each potential research participant has an equal chance of being assigned to any level of the independent variable. (The groups are sometimes called *levels*; in this case, the three levels would be not working, working 5 hours, and working 10 hours.) Perhaps you would have participants draw numbers from a hat to determine who was assigned to the control group (no-work group) and to each experimental group (5-hour workday group and 10-hour workday group). Of course, individual differences are bound to exist among participants. For example, any of your groups might include some women who have children and some women who do not—a variable likely to influence what women want to do after work—as well as women whose incomes and education vary. But these differences will tend to average out when participants are assigned to either the control or experimental groups randomly, so that the groups are equivalent *on average*. Random assignment balances out known and unknown factors (FIGURE 2.10).

**Meta-analysis** is a type of study that, as its name implies, is an analysis of multiple analyses, or studies that have already been conducted. (The plural of *meta-analysis* is *meta-analyses*.) With meta-analysis, many studies that addressed the same issue are combined and summarized in one “study of studies.” Suppose, for example, that 10 studies had been conducted on men’s and women’s effectiveness as leaders. Among these 10 studies,

**selection bias** When participants in different groups in an experiment differ systematically.

**random assignment** The procedure for placing research participants into the conditions of an experiment in which each participant has an equal chance of being assigned to any level of the independent variable.

**meta-analysis** A “study of studies” that combines the findings of multiple studies to arrive at a conclusion.



**FIGURE 2.10 Sampling** For the results of an experiment to be considered useful, the participants should be representative of the population. The best method for making this happen is random sampling, but most of the time researchers are forced to use a convenience sample. Random assignment is used when the experimenter wants to test a *causal* hypothesis.

5 found no differences, 2 favoured women, and 3 favoured men. Researchers who conducted a meta-analysis would not just count up the numbers of different findings from the research literature. Rather, they would weight more heavily those studies that had larger samples, because large samples are more likely to provide more accurate reflections of what is true in populations. The researchers would also look at the size of each effect, that is, whether each study found a large difference, a small difference, or no difference between the groups being compared, in this case, women and men. (The researchers who conducted such a meta-analysis on men's and women's effectiveness found no overall differences; Eagly, Karau, & Makhijani, 1995.) Because meta-analysis combines the results of separate studies, many researchers believe that meta-analysis provides stronger evidence than the results of any single study. As discussed earlier in this chapter, we can be more confident about results when the research findings are replicated. Meta-analysis has the concept of replication built into it.

#### CRITICAL THINKING SKILL

### Recognizing That Large Samples Generate More Reliable Results Than Small Samples

*Given a thimbleful of facts, we rush to make generalizations as large as a tub.*

—Gordon Allport (1954, p. 8)

A general critical thinking skill related to sampling from populations is considering the size of the sample, or the number of participants in the study. (FIGURE 2.11). As consumers of research, we need to understand which studies provide strong evidence and which are junk science, and the number of participants in a sample is one critical difference between the two types of study. The importance of sample size can be difficult to understand when you think about it one way but easy to understand when you think about it a different way. First, read the following information and answer the questions:

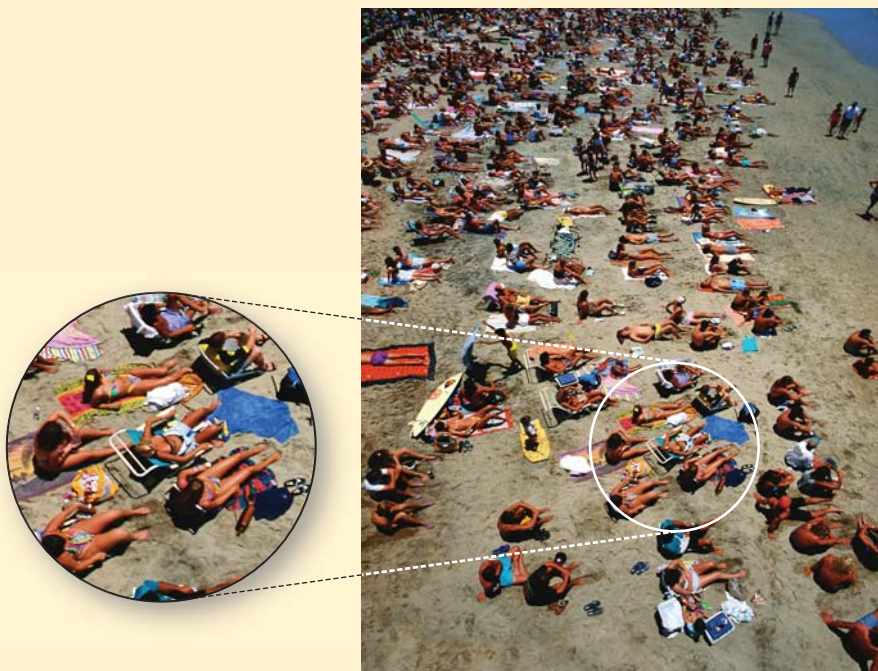
A certain town is served by two hospitals. In the larger hospital, about 45 babies are born each day, and in the smaller hospital, about 15 babies are born each day. As you know, about 50% of all babies are boys. The exact percentage of baby boys, however, varies from day to day. Sometimes it may be higher than 50% and sometimes lower.

1. For a period of 1 year, each hospital recorded the days on which more than 60% of the babies born were boys. Which hospital do you think recorded more such days?
  - a. the larger hospital
  - b. the smaller hospital
  - c. they would each record approximately the same number of days on which more than 60% of the babies born were boys.
2. Which hospital do you think is more likely to find on any one day that more than 60% of babies born were boys?
  - a. the larger hospital
  - b. the smaller hospital
  - c. the probability of having more than 60% of babies born being boys on any day is the same for both hospitals

(Sedlmeier & Gigerenzer, 1997, p. 34; original problem posed by Kahneman & Tversky, 1972)

Look carefully at both questions and the way you answered them. The first question is about the number of days you would expect 60 percent or more of the births to be boys, and the second is about what you would expect on one specific day. If you answered like most people, you selected option C for the first question and B for the second question. Both questions are about sample sizes, however, and the answer to both questions is B. The smaller hospital has fewer births and therefore a smaller sample size, and small samples are more variable, as you will see below. It may help to think about a similar situation that you are more familiar with: tossing a coin. Suppose you want to know if a coin is fair—that is, heads will appear as often on the “up” side as tails when it is flipped. To demonstrate that the coin is fair, you would toss it a few times to show that heads and tails each come up about half the time. Suppose you flip it 4 times. Might you get 3 heads and 1 tail in 4 flips of a fair coin, when there is an equal chance of getting a head or tail on each flip? It is not hard to see how heads and tails might not appear equally if you flip a coin a few times. Now suppose you flip the same coin 100 times. You probably would not get exactly 50 heads and 50 tails, but just by chance you would get close to 50 for each. With only 4 flips, it is quite possible that 75 percent of the flips could be all heads or all tails just by chance. With 100 flips, that same 75 percent is very unlikely.

Can you see how this is the same problem as in the hospital scenario? The smaller hospital is more likely to have some days when the percentage of boys (or girls) is higher than 60 percent, even when the true number of girl and boy babies in the population is approximately equal. It is easier to understand this principle when thinking about any single day (question 2) than about the



**FIGURE 2.11 Think Critically: Large Samples Are More Accurate Than Small Samples** If you wanted to compare how many women like going to the beach and how many men do, but you only considered this small inset sample of seven people, you might think that only women go to the beach! But looking at the big picture, you can see that is clearly not the case.

number of days (question 1), although the reasoning is the same. Variability is discussed in more detail later in this chapter, but for now, you need to understand that small samples are more variable than large samples.

The *law of large numbers* states that you get more accurate estimates of a population from a large sample than from a small one. To apply this law in an everyday context, suppose you are deciding which of two universities to attend. To help make this decision, you spend one day at each university and attend one class at each. You like the professor you meet at one of the universities much better than the professor you meet at the other. Should this small sample of classes and professors influence your decision about which university to attend? Can you see how results from such a small sample could be very misleading? In planning a research project, as in deciding how you feel about a place, you must consider the size of the sample you are generalizing from.

## SUMMING UP

### What Are the Types of Studies in Psychological Research?

There are three main types of studies in psychological research: descriptive, correlational, and experimental. In descriptive and correlational designs, researchers examine behaviour as it naturally occurs. These types of studies are useful for describing and predicting behaviour, but they do not allow researchers to assess causality. Correlational designs have limitations, including directionality problems (knowing whether variable A caused variable B or the reverse) and the third variable problem (the possibility that a third variable is responsible for variables A and B). In an experiment, a researcher manipulates the independent variable to study how it affects the dependent variable. An experiment allows a researcher to establish a causal relationship between the independent and dependent variables and to avoid the directionality problem when trying to understand how one variable might affect another. An experiment gives the researcher the greatest control, so that the only thing that changes is the independent variable. If the goal is to conclude that changes in one variable caused changes in another variable, the researcher must assign participants at random to different groups to make the groups as equal as possible (on average) on all variables except the one being studied. The researcher wants to know about a population, but because it is usually impossible for everyone in the population to be a research participant, the researcher uses a representative sample of the population and then generalizes the findings to the population. Random sampling, in which everyone in the population has an equal chance of being a research participant, is the best way to sample, but since this is usually not possible, most researchers use a convenience sample. Among the most important factors in whether the results from a particular sample can be generalized back to the population is sample size. In general, large samples provide more accurate results than small ones.

## MEASURING UP

1. The main reason researchers randomly assign participants to different groups in an experiment is that \_\_\_\_\_.
  - a. it is easier to assign participants to different conditions than it is to find people who naturally fit into different conditions
  - b. random assignment controls for any intuitions the participants may have at the start of the experiment

- c. random assignment is used when there are ethical reasons for not using observational or correlational research designs
  - d. random assignment is the only way to ensure that the participants are (on average) equal and that any difference in the dependent variables must have been caused by the participants' being in different groups
2. Match each of the main methods of conducting research with the advantages and disadvantages listed below. Write in "descriptive," "correlational," "experimental," "longitudinal," or "cross-sectional" next to its advantage or disadvantage.
- \_\_\_ a. Allows the researcher to conclude that one variable caused a change in another variable.
  - \_\_\_ b. Allows for a detailed description in a real-world setting.
  - \_\_\_ c. Allows the researcher to understand if two or more variables are related, without demonstrating a causal relationship.
  - \_\_\_ d. Measures people of different ages to learn about developmental changes.
  - \_\_\_ e. Data are most likely to be biased (reflect the thoughts and beliefs of the person collecting the data).
  - \_\_\_ f. The same people are repeatedly measured over time to understand developmental changes.
  - \_\_\_ g. The research conditions are most likely to be artificial (because this method is often used in a laboratory).
  - \_\_\_ h. It is always possible that a third variable not considered by the researcher caused the results.

## What Are the Data Collection Methods of Psychological Science?

Once the researcher has established the best design for a particular study, the next task is to choose a method for collecting the data. A fundamental principle of psychological research is that the question the researcher wants to answer dictates the appropriate method for collecting data. In short, as previously discussed, you start with an appropriate, theory-based question, and then ask yourself, "What sort of data will best answer my question?" Recall from Chapter 1 the four major research categories that span the levels of analysis: biological, individual, social, and cultural. The first step in selecting a data collection method is determining the level of analysis a particular question is addressing. The data collection method used in the study must be appropriate for questions at that level of analysis.

When the research question is aimed at the biological level, researchers measure such things as brain processes and differences in hormone levels. For instance, they might use brain imaging to examine how the brain responds when people look at pictures of scary faces, or they might measure whether men secrete more testosterone when their favorite team wins than when it loses. At the individual level, researchers are looking for individual differences among participants' responses. Researchers will therefore question participants or use indirect assessments, such as observing how quickly participants respond to a particular question or whether they accurately discriminate between stimuli. At the social level, researchers often collect data by observing people within a single culture and seeing how they interact. Most work at the cultural level compares groups of people



### LEARNING OBJECTIVES

Provide examples of data collection methods that are appropriate for different research questions.

Identify ethical issues and explain their importance.



**FIGURE 2.12 Schadenfreude** Conrad Black attempted to restore his Canadian citizenship to avoid going to prison for his role in the diversion of funds from Hollinger International for his personal gain.

**culturally sensitive research** Studies that take into account the ways culture affects thoughts, feelings, and actions.

from different cultures as a way of studying the effect of culture on some variable. For example, cross-cultural studies might examine beliefs about appropriate roles for women and men or attitudes toward pornography. The various methods for studying this latter topic might include attitudinal measures, such as noting cultural differences in defining pornography; behavioural measures, such as observing who buys pornographic materials in different countries; brain imaging, to see if arousal centres in the brain react differently when people in different countries view pornography; and even legislation summaries, collecting differences in the laws regarding pornography.

One difficulty in comparing people from different cultures is that some ideas and practices do not translate easily across cultures, just as some words do not translate easily into other languages. For example, in Turkey, there apparently is no word corresponding to *jeerk*; and the title of the Disney movie *Lady and the Tramp* was translated into the equivalent of *Lady and the Street Dog*, because Turkish has no word with the same positive and negative connotations as *tramp*. Another such “untranslatable” word is *Schadenfreude*, German for taking pleasure in another person’s misfortune. The experience of *schadenfreude* occurs around the world (as in the delight many Canadians experienced in 2006 when Conrad Black, the wealthy newspaper magnate who renounced his Canadian citizenship in order to become a British Lord [FIGURE 2.12] tried—and failed—to get his citizenship back to avoid going to a U.S. prison for fraud), but some languages do not have a word for it. Thus a researcher studying the phenomenon of *schadenfreude* might have to explain the concept to participants whose language lacked a single word to describe it. Apparent differences among cultures may reflect such differences in language, or they may reflect participants’ relative willingness to report negative things about themselves publicly (such as that they take pleasure in other people’s misfortunes). A central challenge for cross-cultural researchers is to refine their measurements to rule out these kinds of alternative explanations (FIGURE 2.13).

**Culturally sensitive research** practices take into account the significant role that culture plays in how we think, feel, and act (Adair & Kagitcibasi, 1995; Zebian, Alamuddin, Mallouf, & Chatila, 2007). The underlying idea of different cultural practices is that a culture has a “shared system of meaning” transmitted from one generation to the next (Betancourt & Lopez, 1993, p. 630). The world-views that cultures share are adaptive; that is, they help ensure the survival of our species. Adaptation is usually associated with the evolution of biological traits that are passed down through biological linkages, but here it refers to cultural traits, which include, in part, thoughts and behaviours. Some psychological traits are the same across all cultures (e.g., care for the young); others differ widely across cultures (e.g., behaviours expected of adolescents). In cities with diverse populations, such as Toronto, London, and Los Angeles, cultural differences exist among different groups of people living in the same neighbourhoods and having close daily contact. Researchers therefore need to be sensitive to cultural differences even when they are studying people in the same neighbourhood or the same school. Researchers must also guard against applying a psychological concept from one culture to another without considering whether the concept is the same in both cultures. For example, Japanese children’s attachment to their parents looks quite different from the attachment styles common among North American children (Miyake, 1993).



## Observing Is an Unobtrusive Strategy

**Observational techniques** (see Figure 2.3) involve the systematic assessment and coding of overt behaviour, as in watching and noting people's gestures during social interaction or coding the eating or sexual behaviour of animals that have been injected with drugs that affect brain function. Using observational techniques to collect data requires researchers to make at least three decisions. First, should the study be conducted in the laboratory or in a natural environment? At issue are the extent to which the researchers are interested in behaviour as it occurs in the real world and the possibility that the laboratory setting will lead to artificial behaviour.

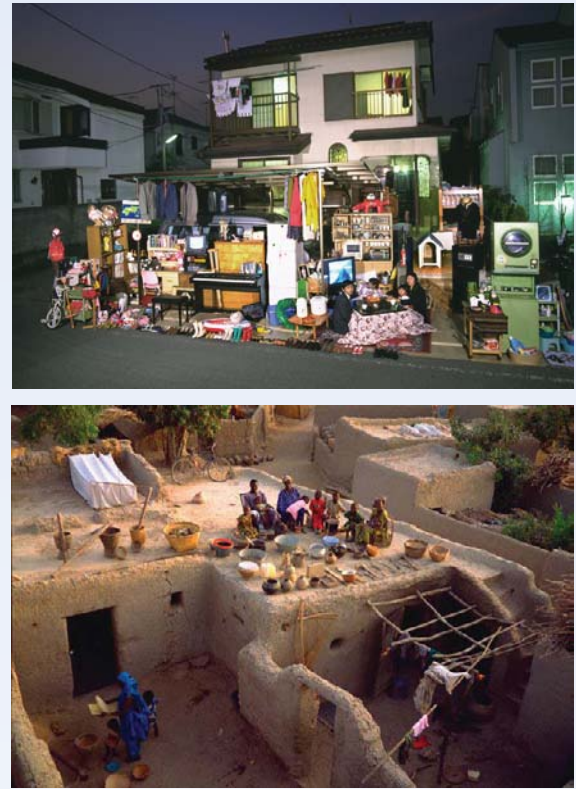
Second, how should the data be collected—as a written description of what was seen, or as a running tally of prespecified categories of behaviour? For example, suppose you hypothesize that people greet friends and family more effusively at airports than at train stations (perhaps because people think of air travel as more dangerous than rail travel, or perhaps because travellers tend to make longer trips by air and so are likely to have been apart longer from the people greeting them). To begin your study, you would need to operationally define different categories of effusive greetings, rating hugging and kissing, for example, as more effusive than hand shaking or head nodding. While observing each episode of greeting at the airport gate or train platform, you could check off the appropriate category on a tally sheet. Researchers generally prefer pre-established categories as being more objective. However, badly chosen categories can lead observers to miss important behaviour. For example, how would you classify the two-cheek air kiss, a more popular greeting in some countries than in others? The extent to which such a greeting is “effusive” depends on the cultural context. Likewise, a kiss on the mouth is a standard greeting between men in some parts of the world, but it suggests a romantic relationship in other parts of the world. Any greeting would need to be rated and interpreted in its cultural context.

Third, should the observer be visible? The concern here is that observation might alter the behaviour being observed, an effect known as **reactivity**. People may feel compelled to make a positive impression on an observer, so they may act differently when they believe they are being observed. An example of this happened in a series of studies of the effects of workplace conditions, such as different levels of lighting, different pay incentives, and different break schedules, on productivity at the Hawthorne Works manufacturing plant of Western Electric in Cicero, Illinois, USA, between 1924 and 1933 (Olson, Hogan, & Santos, 2006). This series of studies has become a classic in the psychological literature because the researchers were among the first to apply the principles of the scientific method to real-world questions in a workplace setting. The workers knew they were being observed, so they responded to changes in their working conditions by increasing productivity, regardless of the nature of the manipulation—including the lengthening or shortening of breaks and various changes to the pay system. The workers did not speed up continuously throughout the various studies—the main dependent variable was how long it took them to complete certain tasks—but they worked faster at the start of a new type of manipulation. The *Hawthorne effect* refers to changes in behaviour that occur when people know that others are observing them (FIGURE 2.14).

**Cross-cultural studies** compare groups of people from different cultures.

**Advantages** Examine the effect of culture on some variable of interest, thereby making psychology more applicable around the world.

**Disadvantages** Some situations and some specific words do not convey the same meaning when translated across cultures and can leave room for alternative explanations (other than culture per se), such as misunderstanding during the research process.



**FIGURE 2.13 Cross-Cultural Studies** (top) The living space and treasured possessions of a family in Japan, for example, differ from (bottom) those of a family in Mali. Cross-cultural researchers might study how either family would react to crowding or to the loss of its possessions.

**observational technique** A research method of careful and systematic assessment and coding of overt behaviour.

**reactivity** When the knowledge that one is being observed alters the behaviour being observed.

**Real World  
PSYCHOLOGY**

FIGURE 2.14 Scientific Method: The Hawthorne Effect

**Hypothesis:** Being observed can lead participants to change their behaviour.

**Research Method:**

**1** During studies of the effects of workplace conditions, the researchers manipulated several **independent variables**, such as the levels of lighting, pay incentives, and break schedules.

**2** The researchers measured the **dependent variable**, the speed at which workers did their jobs.



**Results:** The workers' productivity increased when they knew they were being observed, regardless of the change to the independent variable.

**Conclusion:** Being observed can lead participants to change their behaviour because people often act in particular ways to make positive impressions.

Can you think of ways the Hawthorne effect might operate in other studies? Consider, for example, a study of the effectiveness of a new reading program in elementary schools. Say that the teachers know they have been selected to try out a new program. They also know that their students' reading progress will be monitored closely and reported to the schools' superintendent. It is easy to see how these teachers might teach more enthusiastically or pay more attention to each child's reading progress than would teachers using the old program. One likely outcome is that the students receiving the new program of instruction would show reading gains caused by the teachers' increased attention and not by the new program. In general, observation should be as unobtrusive as possible.

## Case Studies Examine Individual Lives and Organizations

A **case study** involves the intensive examination of one person or a few individuals or one or a few organizations, typically people or organizations that are somehow unusual (FIGURE 2.15). For this reason, case studies are often considered a special type of observation or descriptive study, with a sample size equal to 1. An organization might be selected for intensive study because it is doing something very well (such as making a lot of money) or very poorly (such as losing a lot of money). The goal of an organizational case study is to determine which practices led to success or failure. Did the employees have flexible work schedules, or was an exercise program offered at work? Many psychologists work in organizations, studying the wide range of variables that influence human behaviour at work. In psychology, case studies are frequently conducted with people who have brain injuries or psychological disorders. Case studies of people with brain injuries have provided a

wealth of evidence about which parts of the brain are involved in various psychological processes. In one case, a man who was accidentally stabbed through the middle part of the brain with a fencing foil lost the ability to store new memories, and case histories of individuals with damage to the front portions of their brains reveal consistent difficulties with inhibiting impulsive behaviours (Squire & Moore, 1979; Chamberlain & Sahakian, 2007).

The major problem with clinical case studies, the ones used most frequently in psychology, is that it is difficult to know whether the researcher's theory about the cause of the psychological disorder is correct. The researcher has no control over the person's life and is forced to make assumptions about the effects of various life events. The same problem applies for organizational case studies. We cannot know why a certain life history may lead to a particular disorder for one individual and not for others or why different work practices can have different outcomes for different organizations. Thus the interpretation of case studies is often very subjective.

On September 13, 2006, Kimveer Gill, a 25-year-old native of Fabreville, Quebec, entered the Dawson College campus, in Montreal, and soon began shooting students randomly. At the end of his shooting spree, 19 people were injured, one was dead, and Gill turned his gun on himself. The horror of this event led many people to ask what was known about Gill's mental health beforehand. Gill's portrait is one of contradictions: according to several people who knew him, he was a quiet and unassuming individual who did well in school and had a number of friends. However, according to his online profile on [vampirefreaks.com](http://vampirefreaks.com), Gill was a very depressed and bitterly angry man who hated almost everyone, was obsessed with violent video games and horror movies, and had disturbing fantasies of "crushing my enemies' skulls."

This tragic case provides a glimpse into the mind of a severely disturbed individual. Psychologists and law enforcement officials cannot use the data from this unique case to identify other people who might erupt in similar ways because Gill is not representative of disturbed individuals in general. Professional writers, such as horror novelists and Hollywood scriptwriters, often detail anger and violence, and in that context, Gill's online profile would not have been that unusual. In hindsight, it is easy to see that Gill should have been put in a locked facility where he could not harm others and could get treatment. But before his rampage, there was not enough evidence to allow his involuntary commitment to an institution. Fortunately, murderous outbursts like this one are extremely rare, but that also means that they are almost impossible to predict. Some lonely people have violent fantasies, but very few of those people commit violent crimes. A case study can reveal a lot about the person being examined, but it does not allow generalization to all similar people (e.g., all lonely people, all violent people), and thus its use as a research tool is limited.

**Case studies** are a special type of observational/descriptive study that involves intensive examination of one person or a few individuals (clinical case studies) or one or a few organizations (organizational case studies).

**Advantages** Can provide extensive data about one or a few individuals or organizations.

**Disadvantages** Can be very subjective: If a researcher has a causal theory (for example, people who are loners are dangerous), this theory can bias what is observed and recorded. It is not possible to generalize the results from an individual to the population.



**FIGURE 2.15 Case Studies** The tragic story of Kimveer Gill provides a case study of a severely disturbed individual. Before launching a deadly campus shooting spree at Dawson College, in Montreal, on September 13, 2006, he posted photos on his blog of himself posing with guns.

**Interactive methods** involve asking questions of participants, who then respond in any way they feel is appropriate (open-ended questions) or select from among a fixed number of options (closed-ended questions).

**Advantages** Self-report methods such as questionnaires can be used to gather data from a large number of people. They are easy to administer, cost-efficient, and a relatively fast way to collect data. Interviewing people face-to-face gives the researcher the opportunity to explore new lines of questioning. Experience sampling allows researchers to determine how responses vary over time.

**Disadvantages**

People can introduce biases into their answers (self-report bias) or may not recall information accurately.



Surveys and questionnaires



Interviews



Experience sampling

**FIGURE 2.16** Interactive Methods

## Asking Takes a More Active Approach

If observation is an unobtrusive approach for studying behaviour, asking people about themselves—what they think, why they act the way they do, and how they feel—is a much more interactive way of collecting data. Methods of asking participants questions include surveys, interviews, questionnaires, and other self-reports. The type of information sought ranges from demographic facts (e.g., ethnicity, age, religious affiliation) to past behaviours, personal attitudes, beliefs, and so on. “Have you ever used an illegal drug?” “Should people who drink and drive be jailed for a first offense?” “Are you comfortable sending food back to the kitchen in a restaurant when there is a problem?” Questions such as these require people to recall certain events from their lives or reflect on their mental or emotional states to decide how they would react in different settings. A critical issue in question-based research is how to frame the questions. *Open-ended questions* allow respondents to provide any answer they think of and to answer in as much detail as they feel is appropriate. In contrast, *closed-ended questions* require respondents to select among a fixed number of options, as in a multiple-choice exam. Ultimately, the researcher decides what style of question will provide the most appropriate information for the hypothesis being investigated.

Like all methods of data collection, methods that require participants to answer questions have strengths and weaknesses. Consider, for example, the differences between asking respondents to fill out a survey and actually interviewing each person with open-ended questions. **Self-report methods** such as questionnaires can be used to gather data from a large number of people (FIGURE 2.16). They can be mailed out to a sample drawn from the population of interest or handed out in appropriate locations. They are easy to administer and cost-efficient. Researchers who use questionnaires can collect a great deal of data in a relatively short time. Interviews by contrast can be used very successfully with groups that cannot be studied through surveys, such as young children. Furthermore, interviewing people gives the researcher the opportunity to explore new lines of questioning, if respondents’ answers inspire avenues of inquiry that were not originally planned. Some large government-run programs and agencies, such as Statistics Canada, employ questionnaires and interviews to collect statistical information regarding industrial, social, economic, and general activities of Canadians.

When researchers want to understand how thoughts, feelings, and behaviours vary throughout the day, week, or longer, they turn to a relatively new method of data collection, *experience sampling*. As the name implies, researchers take several samples of the participants’ experiences over time. By repeatedly getting answers to set questions, researchers can determine how the responses vary over time. So, for example, if researchers wanted to know what a typical day is like for a high school student, they might give each student-participant a notebook with labelled categories in which to fill in what is happening and how the participant feels about it. Or each student-participant might be given a PDA (personal digital assistant) to carry at all times. At random or predetermined times, the PDA would signal the participants to record what they are doing, thinking, or feeling at that moment. Studies with experience sampling have shown, by the way, that students are frequently bored in class; while teachers may believe that students are engaged in a learning activity, students are more likely not paying attention and are thinking about lunch, friends, or other topics unrelated to the course content (Schneider & Csikszentmihalyi, 2000).

**SELF-REPORT BIAS** A problem common to all asking-based methods of data collection is that people often introduce biases into their answers, making it difficult to discern an honest or true response. In particular, people may not reveal personal information that casts them in a negative light. Consider the question “How many times have you lied to get something you wanted?” Although most people have lied at some points in their lives to obtain desired outcomes or objects, few of us want to admit this, especially to strangers. At issue is the extent to which questions produce *socially desirable responding*, or *faking good*, in which the person responds in a way that is most socially acceptable. Imagine having an interviewer around your parents’ age, or, if you are an older student, perhaps a twenty-something interviewer, ask you to describe intimate aspects of your sex life. Would you be embarrassed and therefore not very forthcoming? Might you even lie to the interviewer?

Even when respondents do not purposefully answer incorrectly, their answers may reflect less-than-accurate self-perceptions. Research has shown that, at least in some cultures, people tend to describe themselves in especially positive ways, often because people believe things about themselves that are not necessarily true. This is called the *better-than-average effect*. For instance, most people believe they are better-than-average drivers. The tendency to express positive things about oneself is especially common in Western cultures, such as those of North America and Europe, but is less pronounced in Eastern cultures, such as those in Korea and Japan (as you will learn in Chapter 13, “Personality”). A recent meta-analysis found that although East Asians tend to rate themselves as better than average on a wide range of variables, they do so less consistently than people from Canada and the United States (Heine & Hamamura, 2007).

One reason that researchers vary their data collection methods among different studies is that they can have more confidence in research findings when studies with different types of measures support the same conclusion. Recall the Implicit Association Test, described in the first chapter. In that test, participants respond as rapidly as possible to pictures and words, and researchers infer these people’s thoughts and feelings based on the time it takes them to make different judgments. One cross-cultural study of self-esteem compared participants’ reaction times to pleasant words (e.g., “good,” “nice,” “kind”) with their reaction times when those words were applied to themselves. Researchers found no differences in the reaction times among people in Japan, China, and the United States and concluded that high self-esteem is culturally universal, though East Asians are less likely to express their self-esteem publicly (Yamaguchi et al., 2007). Studies like this one show why particular results can depend on the data collection method. Researchers would have come to a different conclusion about self-esteem across cultures if they had relied on self-report methods. These results also show why research methods are central to our understanding of psychological principles—because we can get different results when we use different methods.

## Response Performance Measures Information Processing

As noted in Chapter 1, Wilhelm Wundt established the first psychology laboratory in 1879. Wundt and his students pioneered many of the methods for studying how the mind works, by examining, for example, how people responded to psychological tasks such as deciding whether two stimuli were the same or whether words flashed on a screen were the names of animals. **Response performance** can take three basic forms. First, the researcher can measure *reaction time*, the speed of a

**self-report method** A method of data collection in which people are asked to provide information about themselves, such as in questionnaires or surveys.

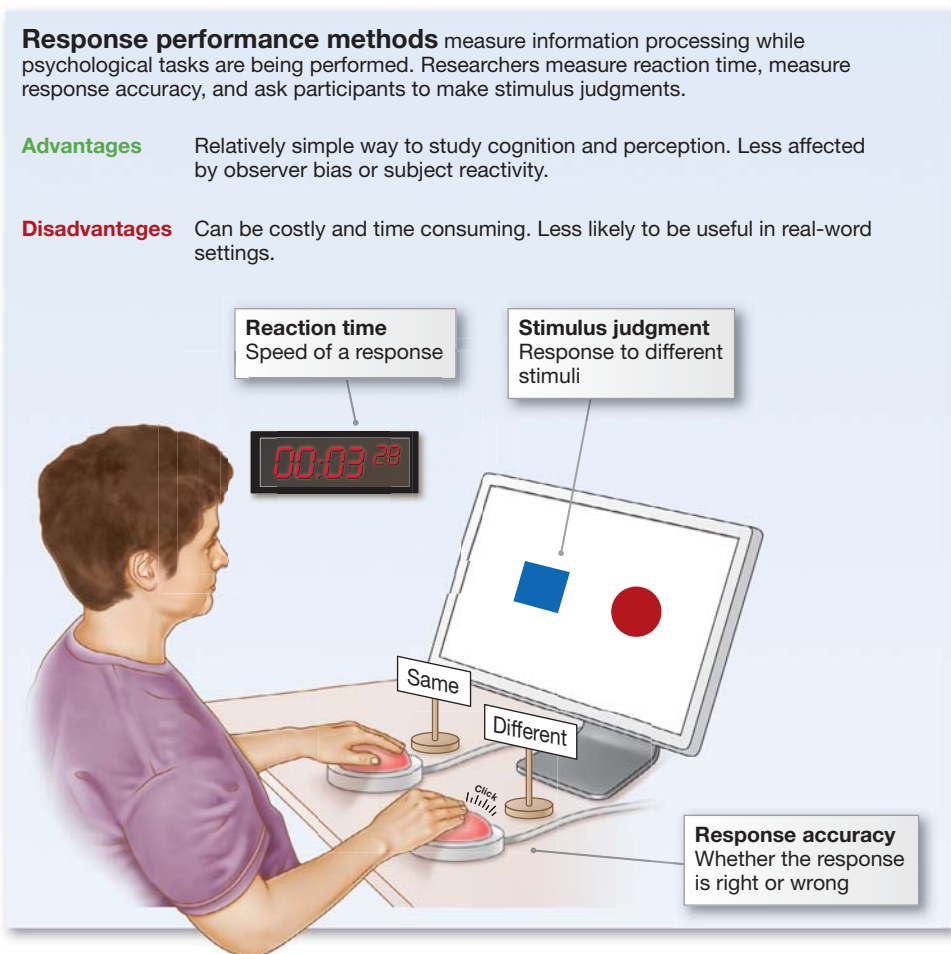
**response performance** A research method in which researchers quantify perceptual or cognitive processes in response to a specific stimulus.

response. The interpretation of reaction times—the workhorse method of cognitive psychology—is based on the idea that the brain takes time to process information; the more processing a stimulus requires, the longer the reaction time to that stimulus. So research participants will make an easy decision, such as whether a figure flashed on a screen is red or blue, faster than a more difficult decision, such as whether that figure is red or blue *and* round or square. By manipulating what a subject must do with a stimulus and measuring reaction times, researchers can gain much information regarding the different operations involved in information processing.

A researcher can also measure *response accuracy*. For example, does paying attention to a stimulus improve a person’s perception of that stimulus? One way to study this in the visual domain would be to ask participants to pay attention to one side of a computer screen while keeping their eyes focused on the centre of the screen. The researcher would then present a stimulus requiring a discrimination response, such as by briefly flashing a shape on either side of the screen and then asking whether the shape was a hexagon or an octagon. If participants answered more accurately when the stimulus appeared on the side of the screen they were attending to than when it appeared on the side they were ignoring, the results would indicate that attention improves perception of the stimulus.

Finally, a researcher can measure response performance by asking people to make *stimulus judgments* regarding the different stimuli with which they are

**FIGURE 2.17** Response Performance Methods



presented. Typical examples would be asking subjects whether they noticed a faint stimulus such as a very soft sound or light touch or asking them to compare two objects and judge whether they are the same in some way, such as colour, size, or shape (FIGURE 2.17).

Reaction times for responding to simple stimuli, such as the time it takes to press one key on a computer keyboard if a red shape appears and a different key if a blue shape appears, are often measured in hundredths or thousandths of a second. One reason psychological scientists use reaction times as dependent measures is that reaction times cannot be faked. If a participant tries to respond more slowly, for example, the reaction time will be much longer than what is expected (maybe two or three seconds instead of a fraction of a second), and the experimenter will know immediately that the response was not a measure of actual processing time.

Because people have very limited control over their reaction times, these measures again illustrate the idea that some psychological processes happen unconsciously. We have no conscious knowledge about what is happening in our brains as we use information, but measures of reaction time indirectly reflect brain processing (FIGURE 2.18).

## Body/Brain Activity Can Be Measured Directly

Researchers operate at the biological level of analysis when they collect data about the ways people's bodies and brains respond to particular tasks or events. Body/brain activity can be measured directly in different ways. For instance, certain emotional states influence the body in predictable ways. When people are frightened, their muscles become tense and their hearts beat faster. Other bodily systems influenced by mental states include blood pressure, blood temperature, perspiration rate, breathing rate, pupil size, and so on. Measurements of these systems are examples of *psychophysiological assessment*, in which researchers examine how bodily functions (physiology) change in association with behaviours or mental states (psychology). For example, police investigators often use *polygraphs*, popularly known as "lie detectors," to assess some of these bodily states, under the assumption that people who are lying experience more arousal and therefore more likely show physical signs of stress. Correspondence between mental state and bodily response is not perfect, however, and people who lie easily can show little or no emotional response when they lie during a polygraph recording, so lie detectors do not accurately measure whether someone is lying. (Brain activity methods—polygraphs and the techniques discussed below—are illustrated in FIGURE 2.19.)

**ELECTROPHYSIOLOGY** *Electrophysiology* is a data collection method that measures electrical activity in the brain. A researcher fits electrodes onto the participant's scalp. The electrodes act like small microphones that pick up the brain's electrical activity instead of sounds. The device that measures brain activity is an **electroencephalograph (EEG)**. This measurement is useful because different behavioural states produce different and predictable EEG patterns. As Chapter 4 discusses further, the EEG shows specific and consistent patterns as people fall asleep, and it reveals that the brain is very active even when the body is at rest, especially during dreams.

**FIGURE 2.18 Try for Yourself: The Stroop Effect**

As quickly as you can, name the colour of the ink each word is printed in. Do not read the words.

red blue green red blue yellow red blue  
 blue red green yellow red blue green red  
 yellow blue green red blue yellow red green  
 green yellow red yellow blue red green blue

If you are like most people, your reaction time for naming the ink colours in the bottom two rows was slower than your reaction time for naming the top two rows.

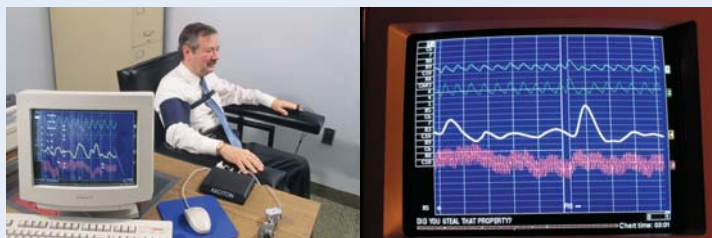
**Explanation:** The Stroop effect, named after the psychologist John Ridley Stroop, accounts for this phenomenon, in which it takes longer to name the colours of words for colours when they are printed in conflicting colours. The tendency to automatically read the words interferes with the process of naming the ink colours.

**electroencephalograph (EEG)** A device that measures electrical activity in the brain.

**Brain activity methods** measure body/brain responses to tasks or events.

**Advantages** Map the brain in various ways to show brain regions involved in different tasks.

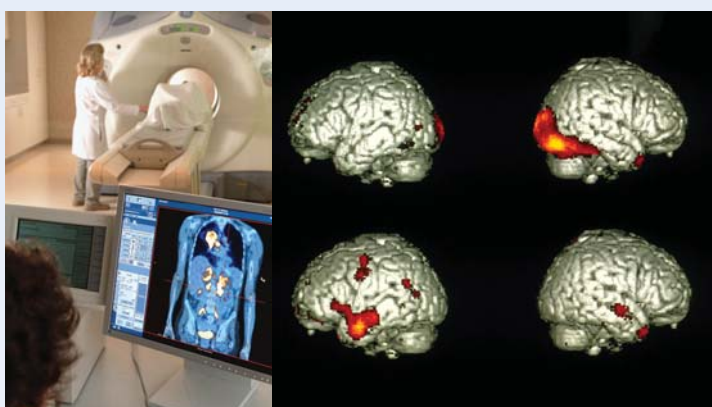
**Disadvantages** Show only the brain regions active while tasks are performed or events occur—we do not know whether, for example, a particular brain region is necessary for a particular task because these data are correlational and thus have the disadvantage of the third variable problem; directionality problem.



Polygraph (lie detector) measures changes in bodily functions related to behaviours or mental states. These are *not* reliable measures of lying.



Electroencephalograph (EEG) measures the brain's electrical activity.



Positron emission tomography (PET) scans the brain's metabolic activity.



Magnetic resonance imaging (MRI) produces a high-resolution image of the brain.



Functional magnetic resonance imaging (fMRI) maps mental activity by assessing the blood's oxygen level in the brain.



Transcranial magnetic stimulation (TMS) momentarily disrupts brain activity in a specific brain region.

**FIGURE 2.19** Brain Activity Methods

As a measure of specific cognitive states, however, the EEG is limited because the recordings reflect all brain activity and therefore are too “noisy” or imprecise to isolate specific responses to particular stimuli. A more powerful method of examining how brain activity changes in response to a specific stimulus involves conducting many trials and averaging across the trials. Researchers are thus able to observe patterns associated with specific events; hence the name *event-related potential*, or *ERP*.



**BRAIN IMAGING** The brain's electrical activity is associated with changes in the flow of blood carrying oxygen and nutrients to the active brain regions. **Brain imaging** methods measure changes in the rate, or speed, of blood flow, and by keeping track of these changes, researchers can monitor which brain areas are active when people perform particular tasks or experience particular events. Imaging is a powerful tool for uncovering where different systems reside in the brain and the manner in which different brain areas interact to process information. For example, research has shown that certain brain regions become active when people look at pictures of faces, whereas other brain regions become active when people try to understand what other people are thinking. The major imaging technologies are *positron emission tomography* and *magnetic resonance imaging*.

**Positron emission tomography (PET)**, is the computer-aided reconstruction of the brain's metabolic activity. When cells in the body, including brain cells, are active, they break down, or metabolize, glucose. After the injection of a relatively harmless radioactive substance into the bloodstream, a PET scan enables researchers to find the brain areas that are using glucose. The research participant lies in a special scanner that, by detecting the injected radiation, produces a three-dimensional map of the density of radioactivity inside the participant's brain. This map is useful because as the brain performs a mental task, blood flow increases to the most active regions, leading these regions to emit more radiation. By scanning participants as they perform some psychological task (for example, looking at pictures of faces expressing fear), and then by collating those scans, researchers obtain a map of the brain's metabolic activity during the task. However, since the entire brain is extremely metabolically active all the time, scans must also be made while the participants perform another, closely related task (for example, looking at pictures of faces with neutral expressions). In this way, brain regions can be correlated with specific mental activities.

**Magnetic resonance imaging (MRI)** is the most powerful imaging technique. In MRI, a research participant lies in a scanner that produces a powerful magnetic field, as strong as that used to pick up scrap metal at junkyards. The researchers momentarily disrupt the magnetic forces, and during this process, energy is released from brain tissue in a form that can be measured by detectors surrounding the head. Because different types of brain tissue release energy differently, researchers can produce a high-resolution image of the brain. (The amount of energy released is very small, so having an MRI is not dangerous.)

MRI is extremely valuable for determining the location of, for example, brain damage, but it can also be used to create images of the working brain. Like a PET scan, **functional magnetic resonance imaging (fMRI)** makes use of the brain's blood flow to map mental activity, scanning the brains of participants as they perform tasks (e.g., deciding whether a face they are viewing is happy or sad). Whereas PET measures blood flow directly by tracking a harmless radioactive substance, fMRI measures blood flow indirectly by assessing changes in the blood's oxygen level. In all brain imaging methods, including fMRI, participants are asked to perform tasks that differ in only one way, which reflects the particular mental function of interest. The researchers then compare images to examine differences in blood flow and therefore brain activity.

**TRANSCRANIAL MAGNETIC STIMULATION** One limitation of brain imaging is that the findings are necessarily correlational. We know that certain brain regions are active while a task is performed; we do not know whether each brain region is necessary for the task. As a correlational method, brain imaging has the conceptual problems, such as the third variable and directionality problems,

**brain imaging** A range of experimental techniques that make brain structures and brain activity visible.

**positron emission tomography (PET)**

A method of brain imaging that assesses metabolic activity by using a radioactive substance injected into the bloodstream.

**magnetic resonance imaging (MRI)** A method of brain imaging that produces high-quality images of the brain.

**functional magnetic resonance imaging (fMRI)**

An imaging technique used to examine changes in the activity of the working human brain.

### transcranial magnetic stimulation (TMS)

The use of strong magnets to briefly interrupt normal brain activity as a way to study brain regions.

discussed above. (If you are unsure what these terms mean, reread the section on correlational research designs; these important concepts will reappear throughout the book.) To see whether a brain region is important for a task, we ideally want to compare performance when that area is working effectively and when it is not. **Transcranial magnetic stimulation (TMS)** uses a very fast but powerful magnetic field to disrupt brain activity momentarily in a specific brain region. For example, placing the TMS coil over areas of the brain involved in language will disrupt a person's ability to speak. This technique has its limitations, particularly that it can be used only for short durations to examine brain areas close to the scalp, but when used along with imaging it is a powerful method for examining which brain regions are necessary for specific psychological functions.

## Research with Animals Provides Important Data

Throughout the history of psychological science, many of the most important research findings have been obtained by studying nonhuman animals' behaviour. For instance, watching animals—usually rats—run through mazes or press levers to earn rewards led to the development of many principles about learning. Indeed, Ivan Pavlov's observation of a salivating dog inspired John B. Watson to launch the behaviourist movement (see Chapter 6, "Learning"). One central assumption underlying Watson's behaviourism was that humans are subject to the same laws of nature as other animals. Although humans' behaviours might seem more complex than those of rats or dogs, the forces that control the behaviours of rats, dogs, and humans—indeed, of human and nonhuman animals—are in many ways the same.

As our knowledge of the human genome increases rapidly, interest increases in the way genes affect behaviours, mental and physical illnesses, and well-being. Psychological scientists working at the biological level of analysis manipulate genes directly to examine their effects on behaviour. Of course, for ethical reasons, much of the genetic research cannot be conducted with humans, so researchers use other animals for this important work. (Government regulations require a careful monitoring of animals used in research. The Canadian Council on Animal Care and the Canadian Psychological Association both mandate the humane treatment of research animals, requiring researchers to properly house and care for animals, and to use alternative procedures, whenever possible, that will minimize the harm done to animals). As Chapter 3 discusses in greater detail, specific genes can be targeted for manipulation. Researchers can delete genes to eliminate their effects or move genes to other locations to enhance their effects. For research purposes, *transgenic mice* are produced by manipulating the genes in developing mouse embryos—for example, by inserting strands of foreign DNA. The new genes are integrated into every cell of each mouse's body. This sort of research is providing new hope for curing and preventing many diseases (FIGURE 2.20).

## There Are Ethical Issues to Consider

When scientists select a research method, they must make decisions with full knowledge of the ethical issues involved and strict adherence to the relevant ethical guidelines. Are scientists asking the participants to do something unreasonable? Are the participants risking physical or emotional harm from the study? Some ethical





**FIGURE 2.20 Animal Research**

Researchers observe the behaviours of transgenic mice to understand how certain genes affect behaviour.

concerns are specific to the kind of method used, while others apply across all methods. Therefore, to ensure the participants' well-being, all universities, universities, and research institutes have strict guidelines in place regarding human- and animal-based research. **Research ethics boards (REBs)** consisting of administrators, legal advisers, and trained scholars review all proposed research to ensure that it meets scientific standards and allays ethical concerns for the safety and well-being of participants. These REBs operate according to the regulations set out by the Canadian Psychological Association (1992).

One of the more prominent ethical concerns about research is participants' reasonable expectation of *privacy*. If behaviours are going to be observed, is it okay to observe people without their knowledge? This question obviously depends on what sorts of behaviours researchers might be observing. If the behaviours tend to occur in public rather than in private, researchers might be less concerned about observing people without their knowledge. For example, even without their knowledge it would be okay to observe couples saying goodbye in a public place such as an airport, but without their knowledge it would be inappropriate to observe those couples' private sexual behaviours. The concern over privacy is compounded by the ever-increasing technology for monitoring people remotely. Although it might be useful to compare men's and women's behaviours in public bathrooms, would it be acceptable to install discreet video cameras to monitor people in restrooms? No!

When people are asked for information, should some topics not be raised because they may be too personal or otherwise inappropriate? Say, for example, that researchers would like to understand how a physically and emotionally traumatic event affects people in the months and years after it occurs. Although such issues must be explored to develop strategies for overcoming physical and emotional anguish, researchers must consider how their line of questioning is affecting the individuals they are studying.

No matter what method is employed, researchers must also consider who will have access to the data they collect. Participant *confidentiality* should always be guarded carefully so that personal information is not linked publicly to the study's

**research ethics boards (REBs)** Groups of people responsible for reviewing proposed research to ensure that it meets the accepted standards of science and provides for the physical and emotional well-being of research participants.

findings. When a study's participants are told that their information will remain confidential, the implicit promise is that their information will be kept secret or made available to only the few people who need to know it. Often the quality and accuracy of data depend on the participants' certainty that their responses will be kept confidential, especially when emotionally or legally sensitive topics are involved.

For studies concerning extremely sensitive topics, the participants' responses should remain anonymous. *Anonymity* is not the same as confidentiality, although these terms are often confused. Anonymity means that no personal information is collected, so responses can never be traced to any individual. For example, if you wanted to know how many university students in your sample had ever cheated on an exam, the students would have to be assured of anonymity so that they would be comfortable about responding honestly. An anonymous study might be conducted in the form of a written questionnaire that asked about cheating but did not ask for any identifying information; participants would return the completed questionnaires to a large box so that no questionnaire could be linked to any individual.

Sometimes psychologists will study an organization instead of individuals or animals. The organization could be a university department, a small business, a global corporation, a government, and so on. As with all research, the issue being investigated will determine the method or methods used. The methods for organizational research are most often questionnaires and interviews, but other methods, including experiments, such as those used in the studies at the Hawthorne Works plant described above, are also used. Privacy, confidentiality, and anonymity remain as important in organizational research as in research with individuals. Indeed, ethics is central to every aspect of psychological science.

**INFORMED CONSENT** Research involving human participants is a partnership based on mutual respect and trust. People who volunteer for psychological research have the right to know what will happen to them during the course of the study. Compensating people for their participation in research does not alter this fundamental right. Ethical standards require providing people with all relevant information that might affect their willingness to become participants. *Informed consent* means that participants make a knowledgeable decision to participate. Typically, informed consent is obtained in writing; in the case of observational studies of public behaviour, to protect privacy, individuals are treated anonymously. Minors, the intellectually incapacitated, and the mentally ill cannot legally provide informed consent, and therefore the permission of a legal guardian is necessary.

It is not always possible to inform participants fully about a study's details. If knowing the study's specific goals may alter the participants' behaviour, thereby rendering the results meaningless, researchers may need to use *deception*, which involves either misleading participants about the study's goals or not fully revealing what will take place. Researchers use deception only when other methods are not appropriate and when the deception does not involve situations that would strongly affect people's willingness to participate. If deception is used, a careful *debriefing*, or explanation of the study after its completion, must take place to inform participants of the study's goals and the need for deception and to eliminate or counteract any negative effects produced by the deception.

**RELATIVE RISKS OF PARTICIPATION** Another ethical issue is the relative risk to participants' mental or physical health. Researchers must always remain conscious of

Research ethics boards (REBs) were an outgrowth of the Nuremberg doctors' trial, during which 20 Nazi physicians were tried and convicted for contributing to the horrendous human experiments at the Auschwitz concentration camp (FIGURE 2.21). Among these men's moral justifications for their actions were that a few prisoners' deaths could save many German lives, to resist would be treasonous, and that medical ethics could be set aside by law or war.

In August 1947, the United States Counsel for War Crimes, concerned about the ethical issues raised by the Nazis' experiments, included in its verdict a section called "Permissible Medical Experiments," which later became known as the Nuremberg Code. It contained 10 directives. The first, the cornerstone of the code, was informed consent. In 1964, the World Medical Association drew up the Declaration of Helsinki, a set of ethical principles for the medical community regarding human experimentation and clinical research. The Declaration of Helsinki relaxed the conditions of consent. If a subject is unable to give consent, a proxy consent may be obtained from a legal guardian. The Nuremberg Code and the Declaration of Helsinki have not been incorporated directly into Canadian law, but they are the foundation for the Tri-Council Working Group's Code of Ethical Conduct for Research Involving Humans in Canada.

Particularly important to research in psychology, which differs from research in other fields, is the issue of deceit and informed consent. On the one hand, deceiving research participants is seen as inappropriate by many people, inside and especially outside the field of psychology, and it goes against the first tenet of the Nuremberg Code. On the other hand, individuals aware that they are being studied can modify many psychological processes. For instance, participants told that their responses will be used to determine how fast people read newspapers may try to read faster than their normal speeds to impress the researchers, whereas participants told that the point is to rate their interest in newspaper topics would most likely read at their normal speeds. Many of the processes now known to be taking place in the brain would not be understood if deceit had been eliminated from all psychological testing. The ethical guidelines of the Canadian Psychological Association allow deception under certain circumstances. Determining what circumstances make it permissible is the ethical problem.

In the early 1960s, American Stanley Milgram, who wanted to understand how ordinary German citizens could willingly obey orders to kill innocent citizens, used deceit to conduct one of the most controversial experiments on record. Milgram's results were unexpected and changed how people viewed the power of authority.



FIGURE 2.21 Informed Consent: The Nuremberg Trials

(They are discussed in Chapter 12, "Social Psychology.") Ironically, in performing the experiment that obtained these important results, Milgram violated the Nuremberg Code and deceived a group of individuals for the possible benefit to many, the same justification used by the Nuremberg defendants, although at a different level. But was the use of deceit inappropriate, as critics of his experiment charge? Today, this question would be addressed by an REB; indeed, concern over the ethics of Milgram's research caused the rapid increase in REBs. Along with ensuring research participants' rights and safety, REBs have the tricky duties of assessing a study's scientific merit, evaluating the methods to be used, and balancing the benefits to society against the risks to the participants. However, because Milgram's results were so unexpected, an REB reviewing a request for his experiment might not have foreseen the benefits to be gained from the work.

Without deception, many topics in psychology could not be studied, because participants' knowledge that they are being studied will often change how they behave. In thinking about this dilemma in psychological research, consider the risk/benefit ratio for any research. Is deception allowable when the research might yield a very important gain, such as a cure for a particular mental illness or a way to reduce prejudice? Can any form of deception be thought of as mild—for example, telling participants you are studying reading comprehension when you are really studying reading speed—or is any deception, no matter how seemingly harmless, unacceptable? Are there circumstances in which deception should be allowed? If so, what are they?

what they are asking of participants. They cannot ask people to endure unreasonable amounts of pain or of discomfort, either from stimuli or from the manner in which data measurements are taken. Fortunately, in the vast majority of research being conducted, these types of concerns are not an issue. However, although risk is low, researchers have to think carefully about the potential for risk to specific participants. Again, any research conducted at a university or research institute must be approved by an REB familiar with the rules and regulations that protect participants from harm. Most REBs look at the relative trade-off between risk and benefit. Potential gains from the scientific enterprise sometimes require asking participants to expose themselves to some risk to obtain important findings. The *risk/benefit ratio* is an analysis of whether the research is important enough to warrant placing participants at risk.

### **SUMMING UP**

#### **What Are the Data Collection Methods of Psychological Science?**

In psychological science, there are five basic data collection methods, which operate at different levels of analysis; the choice of which to use is generally dictated by the research question. First, researchers can observe behaviours as they take place and either write down general descriptions of the behaviours or check off a tally sheet of prespecified behaviour categories. Second, researchers can ask people for information about their thoughts, feelings, and preferences by using surveys, questionnaires, interviews, and other self-reports. Third, researchers can measure how quickly and accurately people respond to a stimulus. Fourth, researchers can directly measure the brain's electrical activity and blood flow, and they can disrupt ongoing brain processes; these techniques are increasingly being combined with the other three methods. Finally, researchers can use animal models in which genes, chemicals involved in the way neurons function, or brain structures are altered to study the effects on behaviour. Regardless of the method chosen, researchers must consider the ethical consequences of their data collection; they must weigh the study's relative risks against its potential benefits.

### **MEASURING UP**

For each example below, indicate which data collection method would work best. Fill in the blank with one of the following: description/observation, case study, survey, interview, experience sampling, response performance (which includes accuracy and reaction time), meta-analysis, EEG, brain imaging, or transcranial magnetic stimulation.

1. A researcher is investigating Adolf Hitler's childhood and teenage years to see if there are ways of recognizing the experiences that made Hitler evil as an adult. What data collection method is he using? \_\_\_\_\_
2. As discussed in Chapter 9, "Motivation and Emotion," Alfred Kinsey studied the sexual behaviours of large numbers of people from every walk of life. What data collection method or methods would you have suggested he use? \_\_\_\_\_
3. Fascinating new data reveal that the great apes' social lives are surprisingly similar to human social systems. What method was probably used to obtain these data? \_\_\_\_\_

4. In a study of families, the researchers want to know when children and their parents feel stressed, happy, relaxed, and bored throughout the day. What data collection method should the researchers use? \_\_\_\_\_
5. Many studies have addressed the question of whether self-esteem is related to school achievement. What method would you use to summarize these studies' results? \_\_\_\_\_
6. If you wanted to study which parts of their brains long-time soccer players use when they perform spatial tasks, what method would you use? \_\_\_\_\_
7. Researchers are often interested in the similarities and differences between men's and women's brain processes. If you believed that women use both sides of their brains more equally when using language than men do, you could interrupt the brain processes and see what happens. What research method would be best for this proposed study? \_\_\_\_\_

## How Are Data Analyzed and Evaluated?

So far, this chapter has presented the essential elements of scientific inquiry in psychology: how to frame an empirical question using theories, hypotheses, and research; how to decide what type of study to run; and how to collect data. This section focuses on the data. Specifically, it examines the characteristics that make for good data and the statistical procedures that are used to analyze data.

### Good Research Requires Valid, Reliable, and Accurate Data

If you collect data to answer a research question, the data must address that question. **Validity** refers to whether the data you collect address your question; valid data provide clear information researchers can use to evaluate the theory or hypothesis. Suppose your theory predicts that children who are physically abused by their parents are more likely than nonabused children to use drugs in high school. One way to test this hypothesis is to identify two samples: children who have been abused by their parents and children who have not. Court and medical records could be used to identify the abused children. Researchers could follow the children longitudinally until they are teens to determine if the children in the abused group are more likely to use drugs than those who were not abused as children. Regardless of the outcome of this research—whether or not the hypothesis is supported—the data from court and medical records would be a valid way to identify abused children.

The key here is that the data's validity depends on the question being studied. Data that are invalid for one question may be perfectly valid for a different question. Validity is essentially the extent to which the data really are measuring what you want to measure. If you wanted to assess an advertisement's effectiveness, for example, a valid measure would be whether people are more likely to purchase the advertised product after viewing the ad. Simply asking viewers how much they liked the advertisement would not validly measure the ad's effectiveness in persuading viewers to buy the product.

Another important aspect of data is **reliability**, or the stability and consistency of a measure over time. If the measurement is reliable, the data collected will not vary because of changes over time in the way they are measured. Suppose



#### LEARNING OBJECTIVES

Describe measures of central tendency and variability.

Discuss the rationale for inferential statistics.

**validity** The extent to which the data collected address the research hypothesis in the way intended.

**reliability** The extent to which a measure is stable and consistent over time in similar conditions.

you hypothesize that people in their 20s are more likely to channel surf (rapidly switch among television channels) than are people in their 50s. To test your hypothesis, you would need to study television watching behaviour and, in particular, the average length of time people stay tuned to each station they watch. One option for measuring the duration of each channel stay would be to have an observer use a stopwatch. However, there will likely be some variability in when the observer starts and stops the watch relative to when the surfer actually changes channels. As a consequence, the data in this scenario would be less reliable than data collected by a computer linked to each viewer's television remote.

**accuracy** The extent to which an experimental measure is free from error.

The third and final characteristic of good data is **accuracy**, or the extent to which the measure is error free. A measure may be valid and reliable but still not *accurate*. Psychological scientists think about this problem by turning it on its head and asking, "How do errors creep into a measure?" There are two basic types of error, random and systematic (**FIGURE 2.22**). Take the channel surfing study. The problem with using a stopwatch to measure the duration of each channel stay is that each measurement will tend to overestimate or underestimate the duration (because of human error or variability in recording times). This is known as a *random error*, because although an error is introduced into each measurement, the value of the error differs each time. But suppose the stopwatch has a glitch, such that it always overstates the time measured by two seconds. This is known as a *systematic error*, because the amount of error introduced into each measure is constant. Generally, systematic error is more problematic than random error because the latter tends to average out over time and therefore is less likely to produce inaccurate results.

**descriptive statistics** Overall summary of data.

**central tendency** A measure that represents the typical behaviour of the group as a whole.

**mean** A measure of central tendency that is the arithmetic average of a set of numbers.

**median** A measure of central tendency that is the value in a set of numbers that falls exactly halfway between the lowest and highest values.

## Descriptive Statistics Provide a Summary of the Data

The first step in evaluating data is to inspect the *raw values*, data as close as possible to the form in which they were collected. In examining raw data, researchers look for errors in data recording. For instance, they assess whether any of the responses seem especially unlikely (e.g., blood alcohol content of 50 percent or a 113-year-old participant). Once the researchers are satisfied that the data make sense, they summarize the basic patterns using **descriptive statistics**, which provide an overall summary of the study's results, such as how people, on average, performed in one condition compared with another. The simplest descriptive statistics are measures of **central tendency**, a single value that describes a typical response or the behaviour of the group as a whole. The most intuitive measure of central tendency is the **mean**, the arithmetic average of a set of numbers. The class average on an exam is an example of a mean score. Consider the study of working women wanting to have fun. A basic way to summarize the data would be to calculate the mean ratings, on the scale of how much the women want to have fun, for each of the three groups—the experimental group that worked 10 hours, the experimental group that worked 5 hours, and the control group that did not work at all. If number of hours worked affects how women rate the degree to which they want to have fun after work, the mean ratings would be higher for the 10-hour group than for the 5-hour group and higher for the 5-hour group than for the control group.

A second measure of central tendency is the **median**, the value in a set of numbers that falls exactly halfway between the lowest and highest values. For instance, if you received the median score on a test, half the people who took the test scored lower than you and half the people scored higher. Sometimes researchers



## Hypothesis:

People in their 20s are more likely to channel surf than people in their 50s.

### 1. Validity: Do the data you collect address your question?

**YES**  
You calculate the number of minutes spent per channel by age.



**NO**  
You calculate the number of minutes the television was on by age.



### 2. Reliability: Are the data consistent over time?

**YES**  
You time the subjects from week to week and find minimal variation.



**NO**  
You time the subjects from week to week and find dramatic variation.



### 3. Accuracy: How do errors creep into a measure?

**RANDOM ERROR**  
You time the same subject several times, and the value of the error is different each time.



**SYSTEMATIC ERROR**  
You time the same subject several times, and the value of the error is constant.



**FIGURE 2.22 Validity, Reliability, and Accuracy** Good data should be valid (addressing the research question), reliable (consistent over time, no matter when or how the data are collected), and accurate (free from error). Random error occurs when the degree of error varies each time; systematic error occurs when the measurement has the same degree of error each time.

will summarize data using a median instead of a mean because if one or two numbers in the set are dramatically larger or smaller than all the others, the mean will give either an inflated or a deflated summary of the average. This effect occurs in studies of average incomes. Perhaps approximately 50 percent of Canadians make more than \$45,000 per year, but a small percentage of people make so much more (multiple millions or billions for the richest) that the mean income is much higher than the median and is not an accurate measure of what most people earn. The median provides a better estimate of how much money the average person makes.

**mode** A measure of central tendency that is the most frequent score or value in a set of numbers.

**variability** In a set of numbers, how widely dispersed the values are from each other and from the mean.

**standard deviation** A statistical measure of how far away each value is, on average, from the mean.

A third measure of central tendency is the **mode**, the most frequent score or value in a set of numbers. For instance, the modal number of children in a Canadian family is two, which means that more Canadian families have two children than any other number of children. (For examples of all three central tendency measures, see **FIGURE 2.23.**)

In addition to measures of central tendency, another important characteristic of data is the **variability** in a set of numbers, or how widely dispersed the values are about the mean. The most common measure of variability—how spread out the scores are—is the **standard deviation**, which relates to how far away each value is, on average, from the mean. For instance, if the mean of an exam is 75 percent and the standard deviation is 5, most people scored between 70 and 80 percent. If the mean remains the same but the standard deviation becomes 15, most people scored between 60 and 90—a much larger spread. Another measure of how spread out scores are is the *range*, the distance between

**FIGURE 2.23 Descriptive Statistics**

Descriptive statistics are used to summarize a data set and to measure the central tendency and variability in a set of numbers.

**You count the number of hours 11 women worked:**

- One woman did not work
- Three women worked 1 hour
- Two women worked 2 hours
- One woman worked 3 hours
- Two women worked 4 hours
- One woman worked 6 hours
- One woman worked 9 hours

Written in ascending order, the number of hours per woman looks like this:

0 1 1 1 2 2 3 4 4 6 9

**Mean**

The arithmetic average of a set of numbers

$$\frac{\text{total \# of hours}}{\text{total \# of women}} = \frac{0+1+1+1+2+2+3+4+4+6+9}{11} = \frac{33}{11} = 3$$

**Median**

The value that falls exactly halfway between the lowest and highest values

0 1 1 1 2 2 3 4 4 6 9 = 2

**Mode**

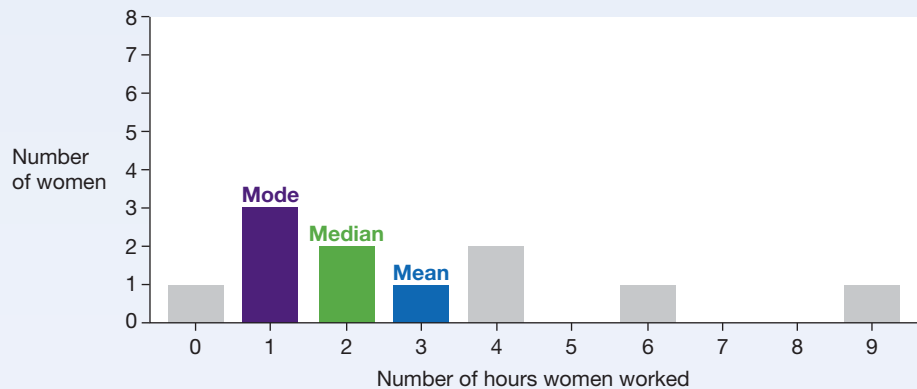
The most frequent score or value in a set of numbers

0 1 1 1 2 2 3 4 4 6 9 = 1

**Range**

The distance between the largest and smallest values

$$0 \ 1 \ 1 \ 1 \ 2 \ 2 \ 3 \ 4 \ 4 \ 6 \ 9 = 9 - 0 = 9$$



**Which measure of central tendency—mode, median, or mean—provides the best summary for these data?**

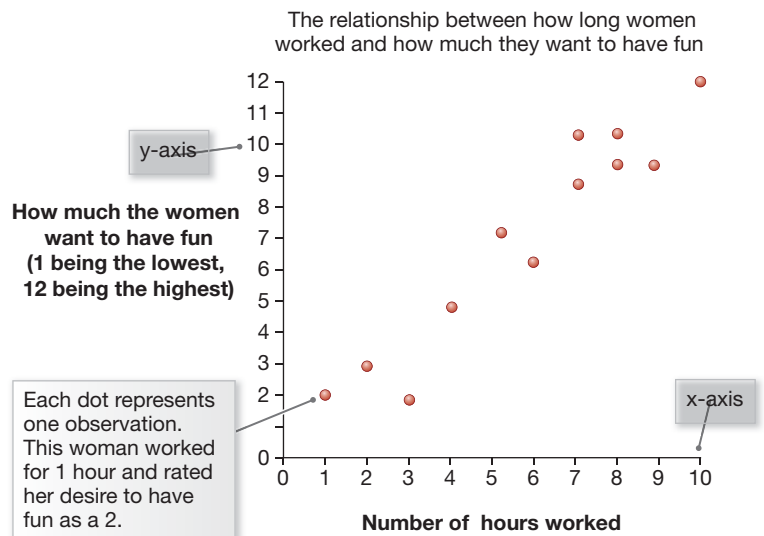
the largest value and the smallest one; the range often is not of much use because it is based on only two scores.

## Correlations Describe the Relationships between Variables

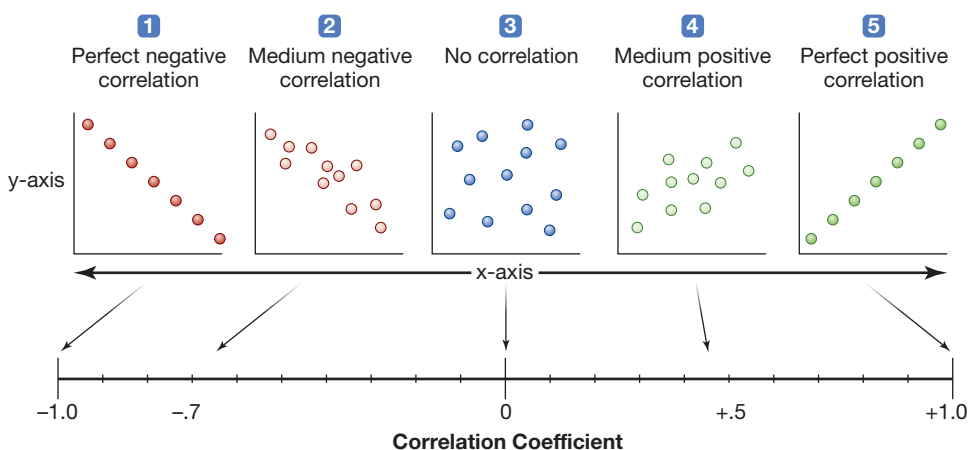
The descriptive statistics discussed so far are used for summarizing the central tendency and variability in a set of numbers. Descriptive statistics can also be used to summarize how two variables relate to each other. The first step in examining the relationship between two variables is to create a graph known as a **scatterplot**, which provides a convenient picture of the data (FIGURE 2.24).

In analyzing the relationship between two variables, researchers can compute a *correlation coefficient*, a descriptive statistic that provides a numerical value (between  $-1.0$  and  $+1.0$ ) indicating the strength of the relationship between the two variables. If the two variables have a strong relationship (we are considering only one type of relationship here—linear relationships, in which increases or decreases in one variable are associated with increases or decreases in the other variable), knowing how people measure on one variable enables you to predict how they will measure on the other variable. What signifies a strong relationship? Consider the different scatterplots in FIGURE 2.25. Two variables can have a *positive correlation*, in which the variables increase or decrease together. For example, taller people often weigh more than shorter people. A perfect positive correlation is indicated by a value of  $+1.0$ . Two variables can also have a *negative correlation*: As one increases in value, the other decreases in value. For example, if women who worked more hours rated their desire to have fun after work lower than did women who worked fewer hours, this finding would constitute a negative correlation. A perfect negative correlation is indicated by a value of  $-1.0$ . If two variables show no apparent relationship, the value of the correlation will be a number close to zero (assuming a linear relationship for the purposes of this discussion).

Have you ever wondered if height is correlated with success? There is a common belief that taller people, or at least taller men, are more successful than shorter ones because height is a desirable physical characteristic. The question about the relationship between height and success necessarily requires a correlational study



**FIGURE 2.24 Scatterplots** Scatterplots are graphs that illustrate the relationship between two variables. In general, according to this scatter plot, the more women worked, the more they wanted to have fun.



**FIGURE 2.25 Correlations** Correlations can have different values between  $-1.0$  and  $+1.0$ , which reveal different kinds of relationships between two variables. The greater the scatter of values, the lower the correlation. A perfect correlation occurs when all the values fall on a straight line.

because we cannot assign people at random to different heights and then see if height causes differences in their success. To answer the question about height and success, researchers reviewed all the studies published on this topic and conducted a meta-analysis that related height to self-esteem, salary, and job performance (Judge & Cable, 2004). They hypothesized that they would find a positive correlation between height and self-esteem: Taller people would feel better about themselves than shorter people would because being tall is considered a desirable trait. (The researchers really had a causal hypothesis, but they assessed it through correlational designs—a problematic approach because of the third variable problem.) The researchers also expected a positive relationship between height and salary because salaries are determined, in part, by subjective impressions, and taller people would be perceived more positively than shorter people who performed their jobs equally well. Finally, the researchers did not expect to find a correlation between height and job performance ratings because height was hypothesized to be unrelated to how well a person performs a job, a measure that is more objective (e.g., a good salesperson makes more sales, a skilled lawyer wins more legal cases) than self-esteem and how high a salary a person should be paid.

As hypothesized, the researchers found that height and self-esteem were positively correlated, as were height and salary, but contrary to expectations, height was also positively correlated with job performance. These three correlations were positive for men and women, but the relationship was not as strong for women as it was for men. Because the authors used a meta-analysis, a summary of the findings from many studies, we can have more confidence in these conclusions than in the results from any single study. Of course, the data are quite variable, and these are average effects. Some tall people are unsuccessful, and some short people are very successful!

This meta-analysis of height and success is a good example of a correlational study because it is not possible to use random assignment when studying the effects of height on some other variable. There is also no problem of understanding the direction of the effect because we have no reason to believe that high self-esteem or higher salaries cause people to grow taller. In theorizing about the way height might affect salary and job performance, the researchers suggested that taller people perform better (or at least have higher job performance ratings) because of expectancies created by their colleagues. (Remember the study, discussed above, in which some students were told they were training rats who would do well at maze learning; those students' rats performed better than the rats given to students who were not told anything special about their rats.) We may not be aware of our biases, but they affect our thinking and behaviour—a theme emphasized throughout this book.

## Inferential Statistics Permit Generalizations

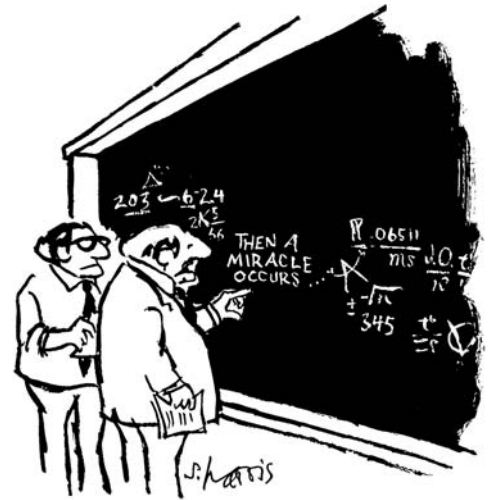
While researchers use descriptive statistics to summarize data sets, they use **inferential statistics** to determine whether differences actually exist in the populations from which samples were drawn. For instance, suppose you find that the mean ratings of how much women want to have fun after work varied with the number of hours the women worked. How different do these means need to be between each experimental group and the control group for you to conclude that they reflect real differences in the larger population of women, all of whom work different numbers of hours? Recall that we use samples from a population when we conduct research; then, depending on what we find in our study, we generalize our findings back to the population from which we sampled. Researchers use inferential statistics to decide

**inferential statistics** A set of procedures used to make judgments about whether differences actually exist between sets of numbers.

if the differences in sample means reflect differences in the populations from which they were drawn. How does this work? Assume for a moment that the number of hours women work does not influence their ratings of how much they want to have fun. Even so, if you measure the ratings made by women who work different numbers of hours, just by chance there will be some variability in the mean ratings made by the women in the different groups. We use statistical techniques to determine if the differences among the sample means are (probably) chance variations or whether they reflect differences in the populations.

The principle is the same as for how many heads appear when you flip a coin ten times: On average, the number will be five or close to it, but every now and then, just by chance, you will get no heads or ten heads. Therefore, when you are comparing two means, inferential statistics tell you how probable the outcome would be if there were no differences between the ratings made by participants in the two groups. This is the general logic researchers use to determine whether the differences between the groups represent real differences in the populations from which the groups were drawn.

When the results obtained from a study would be very unlikely to occur if there really were no differences among the groups of subjects, the researchers conclude that the results are *statistically significant*. How unusual do the results have to be for researchers to conclude that they are statistically significant? The coin-flipping example should help explain this concept. Suppose you and a friend stop for coffee every day, and your friend suggests that he will flip a coin each day to decide who pays. Heads means you pay; tails means he pays. The first day, he flips heads; the second day, he flips heads again. How many coin flips would it take before you asked him if he was using a fair coin? Few people would be willing to accuse a friend of cheating after three heads in a row. But what about five or six heads in a row? Generally accepted standards determine how unusual a result must be before we say it is statistically significant: It would have to occur less than 5 percent of the time if no other factors affect the results. In this case, if the coin is fair, there is a greater than 5 percent chance of flipping three heads in a row (12.5 percent) but a less than 5 percent chance of flipping five heads in a row (3.125 percent). Similarly, in the example above, if the women in the no-work group rated their desire to have fun as a 2 (mean rating for the group) and those in the 10-hour work group rated their desire to have fun as a 9, we would use statistical methods to determine if this outcome would occur less than 5 percent of the time if the groups really were the same in all other respects. If the data meet this statistical test, we would say the results are statistically significant.



**"I think you should be more explicit here in step two."**

## SUMMING UP

### How Are Data Analyzed and Evaluated?

Data analysis begins with descriptive statistics, which summarize the data. Measures of central tendency indicate statistical averages across sets of numbers, whereas the standard deviation indicates how widely numbers are distributed about an average. Correlations describe the relationship between two variables: positive, negative, or none. Inferential statistics show whether the results of a study were due to the effect of one variable on another or whether the results were more likely due to chance.

## MEASURING UP

1. When researchers want to summarize in a single number all the data they collect, they compute a measure of central tendency. Here are hypothetical data for a study in which 10 women in a sample indicated how many

hours they worked that day and then used a rating scale to indicate how much they wanted to have fun. The rating scale ranged from 1 (“not at all”) to 10 (“I want to have fun more than anything else in the world”). For each set of data, compute the mean, median, and mode.

Number of hours worked	Rating of how much they want to have fun
5	5
5	6
8	7
6	6
4	10
6	5
2	4
10	7
8	9
3	5
Mean =	Mean =
Median =	Median =
Mode =	Mode =

Now, using a grid like the one in Figure 2.24, draw a scatterplot of the data in question 1. When you are finished, look at the plot and decide if it represents a positive, a negative, or no (linear) correlation between these two variables. Explain what the scatterplot is showing, in your own words.

2. Which is an accurate description of the rationale for inferential statistics?
  - a. When the means of two sample groups are significantly different, we still need to compute a mean value for each population before we can conclude that the groups really are different.
  - b. When the means of two sample groups are significantly different, we can be fairly certain that we did not make any mistakes in our research.
  - c. When the means of two sample groups are significantly different, we can be certain that the data are not correlated.
  - d. When the means of two sample groups are significantly different, we can infer that the populations the groups were selected from are different.

## Real World PSYCHOLOGY

### CONCLUSION

This chapter has presented the major issues involved in designing and conducting research in psychological science. However, the ideas discussed here are most important when research is evaluated. The quality of research matters whether or not you have conducted the experiments yourself. Every day, the media report some new major finding, such as the link between height and self-esteem and salary discussed above. Should you believe a report and perhaps change your daily life as a result? Should you ignore new and potentially important data, because they came from a flawed study? To make educated decisions in this domain, as well as in your everyday experiences, requires understanding the way good psychological science is conducted, an understanding that in turn requires good critical thinking skills.

So what determines good science? Quality research stems from sound methodology *and* good questions. A number of factors need to be considered. Is a good theory guiding the design of the research? Were the method and level of analysis appropriate for the question of interest? Does the study have adequate operational definitions for the variables involved? Have the researchers presented their results as though the results show a causal relationship between two variables, even though an experiment was not performed? If an experiment was performed, was it carefully designed and well controlled, or might potential confounds have been overlooked? Did the researchers randomly assign participants to different experimental groups? How large was the sample, and were the participants representative of the population of interest? Was the research culturally sensitive, or did the researchers make the mistake of assuming that people in all cultures would respond the same way? These fundamental questions underscore the necessity of being a critical, well-informed research evaluator. If you cannot answer these questions when reading about a study, you cannot properly evaluate whether you should believe the results or the way those results have been interpreted.

## CHAPTER SUMMARY

### What Is Scientific Inquiry?

- **The Scientific Method Depends on Theories, Hypotheses, and Research:** Scientific inquiry relies on objective methods and empirical evidence to answer testable questions. Interconnected ideas or models of behaviour (theories) yield testable predictions (hypotheses), which are tested in a systematic way (research) by collecting and evaluating evidence (data).
- **Unexpected Findings Can Be Valuable:** Unexpected (serendipitous) discoveries sometimes occur, but only researchers who are prepared to recognize their importance will benefit from them.

### What Are the Types of Studies in Psychological Research?

- **Descriptive Studies Involve Observing and Classifying Behaviour:** Researchers observe and describe naturally occurring behaviours to provide a systematic and objective analysis.
- **Correlational Designs Examine How Variables Are Related:** Correlational studies are used to examine how variables are naturally related in the real world, but cannot be used to establish causality or the direction of a relationship (which variable caused changes in another variable). Correlational reasoning occurs in many contexts, so readers need to be able to recognize correlational designs in everyday contexts, not just when reading research reports.
- **An Experiment Involves Manipulating Conditions:** In an experiment, researchers control the variations in the conditions that the participant experiences (independent variables) and measure the outcomes (dependent variables) to gain an understanding of causality. Researchers need a control group to know if the experiment had an effect.
- **Random Assignment Is Used to Establish Equivalent Groups:** Researchers sample participants from the population they want to study (e.g., all women who work). They use random sampling when everyone in the population is equally likely to participate in the study, a condition that rarely occurs. To establish causality between an intervention and an outcome, all participants must be equally likely to be in the experimental group or the control group, to control for pre-existing group differences.

### What Are the Data Collection Methods of Psychological Science?

- **Observing Is an Unobtrusive Strategy:** Data collected by observation must be defined clearly and collected systematically. Bias may occur in the data because the participants are aware they are being observed or because of the observer's expectations.
- **Case Studies Examine Individual Lives and Organizations:** A case study, one kind of descriptive study, examines an individual or an organization. An intensive study of an individual or organization can

be useful for examining an unusual participant or unusual research question. Interpretation of a case study, however, can be subjective.

- **Asking Takes a More Active Approach:** Surveys, questionnaires, and interviews can be used to directly ask people about their thoughts and behaviours. Self-report data may be biased by the respondents' desire to present themselves in a particular way (e.g., smart, honest). Culturally sensitive research recognizes the differences among people from different cultural groups and from different language backgrounds.
- **Response Performance Measures Information Processing:** Measuring reaction times and reaction accuracy and asking people to make stimulus judgments are methods used to examine how people respond to psychological tasks.
- **Body/Brain Activity Can Be Measured Directly:** Electrophysiology (often using an electroencephalograph, or EEG) measures the brain's electrical activity. Brain imaging is done using positron emission tomography (PET), magnetic resonance imaging (MRI), and functional magnetic resonance imaging (fMRI). Transcranial magnetic stimulation (TMS) disrupts normal brain activity, allowing researchers to infer the brain processing involved in particular thoughts, feelings, and behaviours.
- **Research with Animals Provides Important Data:** Research involving nonhuman animals provides useful, although simpler, models of behaviour and of genetics. The purpose of such research may be to learn about animals' behaviour or to make inferences about human behaviour.
- **There Are Ethical Issues to Consider:** Ethical research is governed by a variety of principles that ensure fair and informed treatment of participants.

### How Are Data Analyzed and Evaluated?

- **Good Research Requires Valid, Reliable, and Accurate Data:** Data must be meaningful (valid) and their measurement reliable (i.e., consistent and stable) and accurate.
- **Descriptive Statistics Provide a Summary of the Data:** Measures of central tendency and variability are used to describe data.
- **Correlations Describe the Relationships between Variables:** A correlation is a descriptive statistic that describes the strength and direction of the relationship between two variables. Correlations close to zero signify weak relationships; correlations near +1.0 or -1.0 signify strong relationships.
- **Inferential Statistics Permit Generalizations:** Inferential statistics allow us to decide whether differences between two or more groups are probably just chance variations (suggesting that the populations the groups were drawn from are the same) or whether they reflect true differences in the populations being compared.

## KEY TERMS

accuracy, p. 70	cross-sectional studies, p. 41	directionality problem, p. 44	experimenter expectancy effect, p. 42	inferential statistics, p. 74
brain imaging, p. 63	culturally sensitive research, p. 54	electroencephalograph (EEG), p. 61	functional magnetic resonance imaging (fMRI), p. 63	longitudinal studies, p. 41
case study, p. 56	data, p. 37	experiment, p. 45	hypothesis, p. 37	magnetic resonance imaging (MRI), p. 63
central tendency, p. 70	dependent variable, p. 45	experimental (or treatment) group, p. 45	independent variable, p. 45	mean, p. 70
confound, p. 47	descriptive statistics, p. 70			median, p. 70
control (or comparison) group, p. 45	descriptive studies, p. 40			meta-analysis, p. 49
correlational study, p. 42				



mode, p. 72	population, p. 48	replication, p. 37	scientific method, p. 36	third variable problem, p. 44
naturalistic observation, p. 40	positron emission tomography (PET), p. 63	research, p. 37	selection bias, p. 49	transcranial magnetic stimulation (TMS), p. 64
observational technique, p. 55	random assignment, p. 49	research ethics boards (REBs), p. 65	self-report method, p. 58	validity, p. 69
observer bias, p. 42	reactivity, p. 55	response performance, p. 59	standard deviation, p. 72	variability, p. 72
participant observation, p. 40	reliability, p. 69	sample, p. 48	theory, p. 36	variable, p. 39
		scatterplot, p. 73		

## ■ PRACTICE TEST

- Which of the following is a technique that increases scientists' confidence in the findings from a given research study?
    - amiable skepticism
    - operationalization of variables
    - replication
    - serendipity
- For the following five questions, imagine you are designing a study to investigate whether deep breathing causes students to feel less stressed. Because you are investigating a causal question, you will need to employ experimental research. For each step in the design process, indicate the most scientifically sound decision.*
- Which hypothesis is stronger? Why?
    - Stress levels will differ between students who engage in deep breathing and those who do not.
    - Students who engage in deep breathing will report less stress than those who do not engage in deep breathing.
  - Which sampling method is strongest? Why?
    - Obtain an alphabetical list of all students enrolled at the university. Invite every fifth person on the list to participate in the study.
    - Post a note to your Facebook and MySpace accounts letting friends know you would like their help with the study. Ask your friends to let their friends know about the study, too.
    - Post fliers around local gyms and yoga studios inviting people to participate in your study.
  - Which set of conditions should be included in the study? Why?
    - All participants should be given written directions for a deep breathing exercise.
    - Some participants should be given written directions for a deep breathing exercise; some participants should be given a DVD with demonstrations of deep breathing exercises.
    - Some participants should be given written directions for a deep breathing exercise; some participants should be given no instructions regarding their breathing.
  - How should participants be chosen for each condition? Why?
    - Once people agree to participate in the study, flip a coin to decide if each will be in the experimental or control condition.
    - Let participants select which condition they would like to be in.
  - Which operational definition of the dependent variable, stress, is stronger? Why?
    - Stress is a pattern of behavioural and physiological responses that match or exceed a person's abilities to respond in a healthy way.
    - Stress will be measured using five questions asking the participant to rate his or her stress level on a scale from 1 to 10, where 1 equals "not at all stressed" and 10 equals "as stressed as I've ever been."
- For the following three questions, imagine you want to know whether students at your university talk about politics in their day-to-day lives. To investigate this issue, you would like to conduct an observational study and need to make three design decisions. For each decision, recommend the most appropriate choice.*
- Should you conduct the study in a lab or in a natural setting (e.g., in the campus dining hall)? Why?
  - Should you use written descriptions of what is heard or a running tally of prespecified categories of behaviour? Why?
  - Should participants know you are observing them? Why?
- Indicate which quality of good data is violated by each description. Response options are "accuracy," "reliability," "validity."
    - A booth at the local carnival announces the discovery of a new way to assess intelligence. The assessment method involves interpreting the pattern of creases on one's left palm.
    - At the end of a long night of grading, a professor reads what he believes to be the last essay in the pile. He assigns it a grade of 80%. When he goes to write the grade on the back of the paper, he realizes he has already graded this paper earlier in the evening—and only gave it a 70% the first time around.
    - A five-year-old counts the jelly beans in a jar, often skipping over numbers ending in 8 (e.g., 8, 18, 28).

## ■ PSYCHOLOGY AND SOCIETY

- Identify a song lyric that makes a claim about human behaviour. Elaborate and/or refine this claim, focusing the question in a way that addresses a goal of empirical inquiry: description, prediction, identifying causes, or making explanations. Clearly label the goal most relevant to your question.
- Locate a claim about human behaviour in a newspaper or magazine or on the Internet. Evaluate the claim using at least three ideas from this chapter. Some ideas from the chapter that lend themselves to this sort of analysis are validity, reliability, accuracy, central tendency, variability, descriptive studies, correlational studies, experiments, random assignment, control group, ethics.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.





# Biological Foundations

WILLIAM (NOT HIS REAL NAME) HATES DRIVING because the sight of road signs tastes like a mixture of pistachio ice cream and ear wax (McNeil, 2006). This sort of cross-sensory experience—in which, for example, a visual image has a taste—is called **synesthesia**. There are many kinds of synesthesia. For another patient, M.M., any personal name has a specific taste; for example, the name *John* tastes like cornbread (Simner et al., 2006). For yet another *synesthete* (a person who experiences synesthesia), each day of the week is coloured (Monday is red, Tuesday is indigo), as is each month of the year (December is yellow, January is red; Ramachandran, 2003). For others, colours evoke smells, sights evoke sounds, and numbers come in colours (e.g., 5 is always red, 2 is always green; FIGURE 3.1). Such experiences

## What Is the Genetic Basis of Psychological Science?

- Heredity Involves Passing Along Genes through Reproduction
- Genotypic Variation Is Created by Sexual Reproduction
- Genes Affect Behaviour
- Social and Environmental Contexts Influence Genetic Expression
- Genetic Expression Can Be Modified
- Critical Thinking Skill: Seeking Disconfirming Evidence

## How Does the Nervous System Operate?

- Neurons Are Specialized for Communication
- Action Potentials Cause Neural Communication

- Neurotransmitters Bind to Receptors across the Synapse
- Neurotransmitters Influence Mind and Behaviour

## What Are the Basic Brain Structures and Their Functions?

- The Brain Stem Houses the Basic Programs of Survival
- The Cerebellum Is Essential for Movement
- Subcortical Structures Control Emotions and Basic Drives
- The Cerebral Cortex Underlies Complex Mental Activity

## How Are Neural Messages Integrated into Communication Systems?

- The Peripheral Nervous System Includes the Somatic and Autonomic Systems
- The Endocrine System Communicates through Hormones
- Actions of the Nervous System and Endocrine System Are Coordinated

## How Does the Brain Change?

- The Interplay of Genes and Environment Wires the Brain
- Culture Affects the Brain
- The Brain Rewires Itself throughout Life
- Critical Thinking Skill: Recognizing Unstated Assumptions
- Females' and Males' Brains Are Similar and Different
- The Brain Can Recover from Injury



**FIGURE 3.1 Synesthesia** For synesthetes, sensory experiences are crossed. For example, colours may evoke smells, sights may evoke sounds, and numbers may come in colours.

are idiosyncratic—for one person, bread is always smooth in texture and silver in colour, but for another person it sounds like a foghorn. For each person, the associations do not vary—if road signs have a taste, for example, they always taste the same. How can we understand such bizarre sensations? Can we just write these people off as crazy? Reports of people with synesthesia date as far back as ancient Greece (Ferry, 2002). Estimates of the percentage of the population that report these cross-sensory experiences range from 1 in 2,000 to 1 in 200.

Recent research into heredity and brain organization provides fascinating clues for understanding synesthesia; because synesthesia tends to run in families, it may help us understand how heredity affects the way we experience the world. Even more provocatively, brain research suggests that cross-sensory experiences could be related to creativity. Could the mixture of colours, words, and images by artists be the result of “special brain wiring” that they inherited (Blakeslee, 2001)? Can synesthesia explain why we call some smells “sharp” and some colours “loud”? Questions like these, and scientific research into answering them, are radically changing how we think about all human experience and behaviour.

Over the past three decades, scientific understanding of the genetic and physiological foundations of psychological activity has increased dramatically. As technology has advanced, scientists have developed sophisticated tools to explore the biological bases of who we are. Researchers can now examine people’s genetic makeup, their DNA (discussed below), to predict who will develop specific disorders and to understand how certain diseases are passed from one generation to the next. Researchers have also identified the gene or genes that predispose people to be outgoing, for example, or to be intelligent. Most recently, researchers have developed techniques that allow them to turn specific genes on and off. Changing the expression of a single gene can profoundly affect even a complex behaviour such as social interaction (Insel & Young, 2001). Similarly, scientists have learned a great deal about brain activity’s biological basis, such as why particular drugs affect thoughts and emotions in specific ways. As noted in the previous chapter, advances in the ability to watch the brain in action using imaging have enabled psychological scientists to better understand the functions of different brain regions. This chapter discusses psychological activity at the genetic and neurochemical levels, as well as the functions of various brain regions at the brain systems level of analysis.

## What Is the Genetic Basis of Psychological Science?

### LEARNING OBJECTIVE

Explain how genes transmit information between generations in ways that can affect behaviours and emotions.

Until the last few years, genetic research focused almost entirely on whether people possessed certain types of genes, such as genes for psychological disorders or for intelligence. Although it is important for us to discover the effects of individual genes, this approach misses the critical role of environmental factors in shaping who we are. While the term *genetics* is typically used to describe how characteristics such as height, hair colour, and weight are passed along to offspring through inheritance, it also refers to the processes involved in turning genes “on” and “off.” This research reflects and reveals that environment affects our genes: how they are expressed and therefore how they influence our thoughts, feelings, and behaviour. Genetic predispositions are often important in determining the environments we select for ourselves, so biology and environment mutually influence each other. To understand fully what makes us who we are, we need to understand how basic physiological processes—beginning with genetics—affect thoughts,

feelings, and behaviour. We also need to understand how those physiological processes interact with the environment—how nurture influences nature and the reverse. Exciting new genetic research is reshaping the way psychologists think about these relationships.

One of the major developments in the new biological revolution occurred in February 2001, when two groups of scientists published separate articles detailing the results of the first phase of the *Human Genome Project*, an international research effort. This achievement represents the coordinated work of hundreds of scientists around the world to map the entire structure of human genetic material. In 1992, Canada became the seventh country to join the challenge. To understand the project's goals, you need a basic understanding of genetic processes.

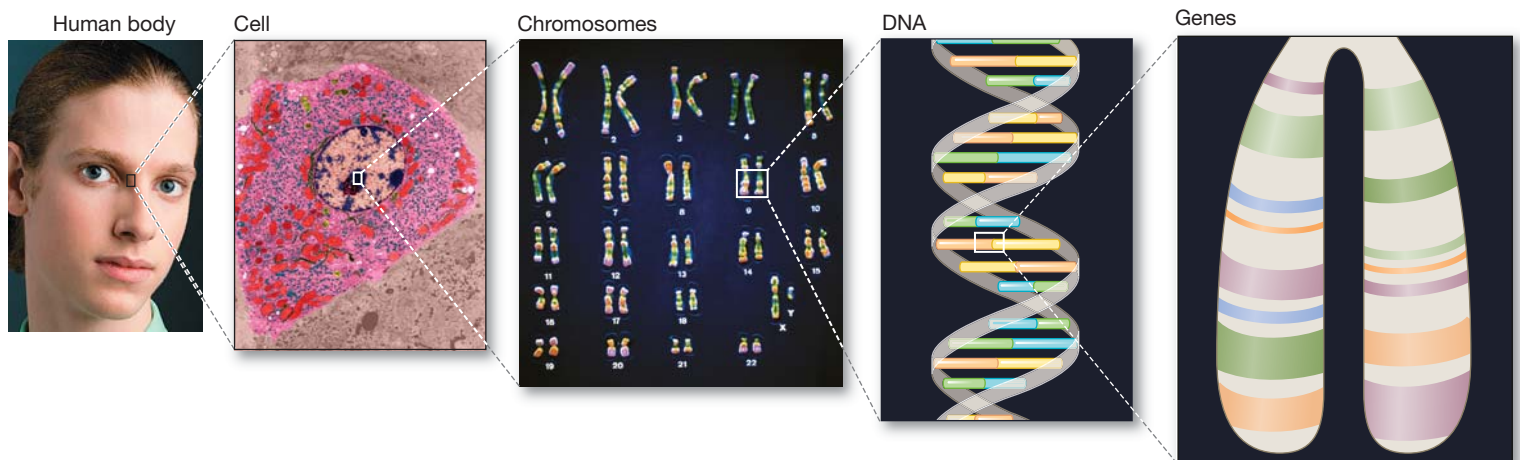
Within nearly every cell in the body is the genome for making the entire organism. The genome is the master blueprint that provides detailed instructions for everything from how to grow a gall bladder to where the nose gets placed on a face. Whether a cell becomes part of a gall bladder or a nose is determined by which genes are turned on or off within that cell, and these actions are in turn determined by cues from outside the cell. The genome provides the option, and the environment determines which option is taken.

Within each cell are **chromosomes**, structures made of genes. The typical human has 23 pairs of chromosomes, half of each pair coming from each parent. Genes are components of *DNA*, or deoxyribonucleic acid, a substance that consists of two intertwined strands of molecules (**FIGURE 3.2**). The sequence of these molecules along each DNA strand specifies an exact instruction to manufacture a distinct protein. Proteins, of which there are thousands of different types, are the basic chemicals that make up the structure of cells and direct their activities. A **gene**, then, is a segment of DNA, which is involved in producing a protein, which carries out a specific task. The environment determines which proteins are produced and when they are produced. For example, a certain species of butterfly becomes colourful or drab depending on the season in which it is born. The environment during its development probably causes a gene sensitive to temperature to be expressed (Marcus, 2004). Similarly, although each cell in the human body contains the same DNA, cells become specialized depending on which of their genes are expressed. Gene expression not only determines the body's basic physical makeup but also determines specific developments throughout life and is involved in all psychological activity. Gene expression allows us to sense, to learn, to fall in love, and so on.

**chromosomes** Structures within the cell body that are made up of genes.

**gene** The unit of heredity that determines a particular characteristic in an organism.

**FIGURE 3.2 The Human Body Down to Its Genes** Each cell in the human body includes pairs of chromosomes, which consist of DNA strands. DNA has a double helix shape and is composed of genes. The 23rd chromosome pair determines sex: A female has two X chromosomes in that pair, whereas a male has one X and one Y.



The first step of the Human Genome Project was to map out the entire structure of DNA—in other words, to identify the precise order of molecules that make up each of the thousands of genes on each of the 23 pairs of human chromosomes. One of the most striking findings from the Human Genome Project is that we have fewer than 30,000 genes, only about twice as many as a fly (13,000) or a worm (18,000) does, and not much more than the number of genes found in some plants (26,000) and fewer than the number of genes estimated to be in an ear of corn (50,000). Indeed, more-recent estimates indicate that the human genome may consist of just over 20,000 genes (Pennisi, 2007). Thus humans' complexity may be due not simply to our possessing a large number of genes but to subtleties in how those genes are expressed and regulated (Baltimore, 2001). Now that the initial map of the human genome is complete, geneticists are mapping different individuals' genomes to see how they vary. That is, by comparing one person's genome to another, researchers hope to learn how variations in particular genes determine whether someone is likely to develop a specific disease or have some special ability. The project's eventual goal is to understand how genes and their variations interact to affect health as well as illness. To this end, Genome Canada was established in 2000 and given a mandate from the federal government to support genetics research for the benefit of all Canadians (FIGURE 3.3). Understanding how genes work should enable medical researchers, down the line, to cure various ailments by altering gene functions. Meanwhile, genetic research is giving psychological scientists a new understanding of the biological basis of psychological activity.

### Heredity Involves Passing Along Genes through Reproduction

The first clues to the mechanisms responsible for heredity were discovered by the monk Gregor Mendel around 1866. At the Austrian monastery (located in Brno, in what is now the Czech Republic) where Mendel lived, there was a long history of studying plants. For studying genetics, Mendel developed an experimental

#### FIGURE 3.3 Human Genome Research

Stephen Scherer, senior scientist at the Hospital for Sick Children, has received funding from Genome Canada to study the human genome in search of autism susceptibility genes and the mechanisms governing their action. Scherer and his colleagues will screen genetic material from over 6,000 members of 1,600 families to find where the genes that are related to autism reside along the chromosomes. This research has the potential to produce more-accurate diagnostic tests for autism.

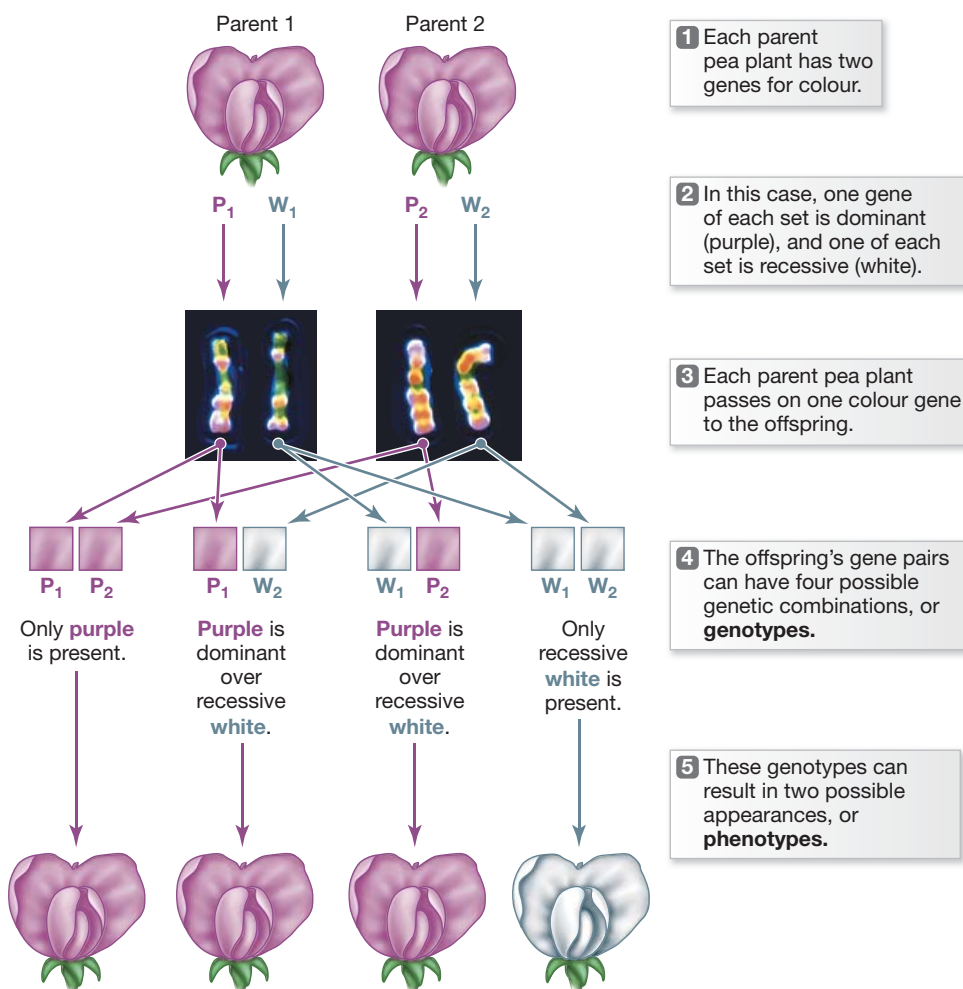


technique, *selective breeding*, that strictly controlled which plants bred with which other plants.

In one simple study, Mendel selected pea plants that had either only purple flowers or only white flowers. He then cross-pollinated the two types to see which colour flowers the plants would produce. Mendel found that the first generation of pea offspring tended to be completely white or completely purple. If he had stopped there, he would never have discovered the basis of heredity; however, he then allowed each plant to self-pollinate into a second generation. This second generation revealed a different pattern: Of the hundreds of pea plants, about 75 percent had purple flowers and 25 percent had white flowers. This three-to-one ratio repeated itself in additional studies, and it held true for other characteristics, such as pod shape. From this pattern, Mendel deduced that the plants contained separate units, now referred to as genes, that existed in different versions (e.g., white and purple). In determining offspring's features, some of these versions would be dominant and others would be recessive. We now know that a **dominant gene** from either parent is expressed (becomes apparent or physically visible) whenever it is present, whereas a **recessive gene** is expressed only when it is matched with a similar gene from the other parent. Thus because in pea plants white flowers were recessive, they occurred only when the gene for purple flowers was not present. All white genes and no purple ones were one of the four possible combinations of white and purple genes in Mendel's experiments (FIGURE 3.4).

**dominant gene** A gene that is expressed in the offspring whenever it is present.

**recessive gene** A gene that is expressed only when it is matched with a similar gene from the other parent.



**FIGURE 3.4 Genotypes and Phenotypes** Mendel's experiments with cross-breeding pea blossoms resulted in purple flowers 75 percent of the time and white flowers 25 percent of the time.

**genotype** The genetic constitution determined at the moment of conception.

**phenotype** Observable physical characteristics that result from both genetic and environmental influences.

## Real World PSYCHOLOGY

**GENOTYPE AND PHENOTYPE** The existence of dominant and recessive genes means that not all genes are expressed. The **genotype** is an organism's genetic constitution, the genetic makeup determined at the moment of conception. The **phenotype** is that organism's observable physical characteristics, which result from genetic and environmental influences. So, for instance, in Mendel's experiments two purple flowers had the same phenotype but might have differed in genotype, in that either one might have had two (dominant) genes for purple and either one might have had one (dominant) purple gene and one (recessive) white gene. Environment can also affect the phenotype. For instance, humans inherit their height and skin colour, but good nutrition leads to increased size and sunlight changes skin colour. Another example of environmental influence on the phenotype is *phenylketonuria (PKU)*, a disorder in which infants are unable to break down an enzyme, phenylalanine, contained in dairy and other products, such as aspartame, a sweetener in diet soft drinks. This rare genetic disorder can lead to severe brain damage. Fortunately, providing such children with a low-phenylalanine diet until they pass the critical stages of neural development greatly helps reduce brain damage. The phenotype, then, is modified by diet.

**POLYGENIC EFFECTS** Mendel's flower experiments dealt with single-gene characteristics, traits that appear to be determined by one gene each. But when a population displays a range of variability for a certain characteristic, such as height or intelligence, the characteristic is *polygenic*, influenced by many genes (as well as by environment). Think about human skin colour, for example; there are not three or four separate skin colours but a spectrum. In the 2006 Canadian Census, more than 200 different ethnic origins were identified (Statistics Canada, 2008). Moreover, 41.4 percent of the population had more than one ethnic origin and more than five million Canadians (16.2 percent of the total population) were members of a visible minority group. The 2006 Census also showed a 25 percent increase in mixed unions involving visible minorities. The huge range of skin tones among Canadians illustrates that human skin colour is not inherited in the same ways as flower colour was in Mendel's research. The rich variety of skin colours (phenotype) is not the end product of a single dominant/recessive gene pairing (genotype) but rather shows the effects of multiple genes.

### Genotypic Variation Is Created by Sexual Reproduction

Although they have the same parents, siblings may differ from each other in many ways, such as eye colour, height, and personality. This occurs because each person has a specific combination of genes, determined in part by random cell division before reproduction. Most cells in the human body contain 23 pairs of chromosomes, among them the sex chromosomes, which are denoted X and Y due to their shapes (see Figure 3.2). Females have two X chromosomes, whereas males have one X chromosome and one Y. In each parent, reproductive cells divide to produce *gametes*, the egg and sperm cells, each of which contains half of every chromosome pair. After one sperm and one egg combine during fertilization, the resulting fertilized cell, known as a *zygote*, contains 23 pairs of chromosomes, half of each pair from the mother and the other half from the father. From any two parents, eight million different combinations of the 23 chromosomes are possible. The net outcome is that a unique genotype is created at conception, and this accounts for the genetic variation of the human species (FIGURE 3.5).

The zygote grows through *cell division*: The chromosomes duplicate, and then the cell divides into two new cells with an identical chromosome structure. Cell



### FIGURE 3.5 Try for Yourself: Genetic Matching

Shown in the top row are two couples. Below are four children. Try to match which child comes from which parents.



**Answer:** The boy and the girl at the ends of the bottom row are children of the parents at the top right. The two girls in the middle of the bottom row are children of the parents at the top left.

division is the basis of the life cycle and is responsible for growth and development. Errors sometimes occur during cell division and lead to *mutations*, most of which are benign and have little influence on the organism. Occasionally, a genetic mutation produces a selective advantage or disadvantage in terms of survival or reproduction—in other words, mutations can be adaptive or maladaptive. The evolutionary significance of such a change in adaptiveness is complex, but a mutation that produces an ability or behaviour may spread through the gene pool if the ability or behaviour proves advantageous to the organism, because those who carry the gene are more likely to survive and reproduce. For instance, consider *industrial melanism*, a phenomenon in which areas of the world with heavy soot or smog tend to have moths, and butterflies, that are darker in colour. Before industrialization, landscapes (trees, buildings, etc.) were lighter in colour. Predators were more likely to spot darker insects against pale backgrounds, so any mutation that led to darker colouring in insects was eliminated quickly through natural selection. But with industrialization, pollution darkened the landscapes, and therefore darker insects became more adaptive because they were harder to see against the darker backgrounds.

Genetic mutations sometimes lead to disease, making them disadvantageous adaptively, and yet they remain in the gene pool. For instance, *sickle-cell disease* is a genetic disorder that alters the bloodstream's processing of oxygen; it can lead to pain, organ and bone damage, and anemia. The disease occurs mainly in people of African descent, approximately 9 percent of whom are estimated to have the (recessive) gene for it (L. Liberman et al. 2009). Because the sickle-cell gene is recessive, only those who receive it from both parents will develop the disease. Those who receive a recessive gene from only one parent will have healthy phenotypes in spite of genotypes that include the disease (FIGURE 3.6).

(a) Moths displaying industrial melanism



(b) Red blood cells displaying sickle-cell disease



**FIGURE 3.6 Mutations** (a) Industrial melanism is caused by the fact that it is easier for predators to spot light-coloured insects against dark backgrounds, so only darker moths and darker butterflies survive in more-polluted areas, where there are darker trees. (b) Sickle-cell disease occurs when people receive recessive genes for it from both parents, and it is most common among those of African descent. It causes red blood cells to assume the distinctive "sickle" shape seen here in the left cell.

With our rapidly increasing knowledge about the human genome, we are being presented with new questions: Is it ethical to use (or not to use) genetic information, and to what extent should it be used? Today, if you know that you are a carrier of certain genetic diseases, you no longer need to risk passing your bad genes to your children. Current reproductive technology allows you to use in vitro fertilization (IVF), where several eggs are fertilized by sperm in a petri dish—that is, outside the body. After three days, when the resulting embryos are at the eight-cell stage, a single cell is removed, and the DNA is extracted. With an advanced procedure known as preimplantation genetic haplotyping (PGH), the DNA can be tested for thousands of genetic defects, and the healthiest embryos can be selected for implantation in the mother's uterus.

As in a great deal of biomedical research, the methods used to treat disease are being co-opted by the healthy population for other uses, and perhaps nowhere else are the ethical questions so rife as in the field of human reproduction. Using reproductive technologies to identify devastating genetic disease seems ethical and even laudable to many people, but the idea of using it to cater to personal preference is more debatable. One question is whether it is ethical to allow prospective parents to choose their offspring's sex. This practice has been going on since the 1970s, when *amniocentesis* (the analysis of amniotic fluid from the mother's uterus) made it possible to determine the sex of a fetus at 16–18 weeks of gestation. Amniocentesis originally was done for couples who were carriers of sex-linked genetic diseases, but both it and the less invasive *ultrasound* (creation of a two-dimensional image from vibrations in the uterus), developed in the 1980s, increasingly have been used for sex selection. Beginning in the 1990s, the sex of embryos used for IVF has been determined through genetic diagnosis, and many prospective parents choose the sex of the implanted embryos, a practice now banned in the United Kingdom. More recently, Microsort, a private company, has developed a sperm-sorting sex determination technology that boasts a 73 percent success rate for males and a 90 percent success rate for females.

Advocates of sex determination argue that choosing the sex of one's child is a private decision that does not harm anyone. The most common objection to sex determination, however, is its discriminatory effect on women. In the few years that sex selection methods have been available, the male-to-female ratios in many countries have climbed dramatically. (In Canada, there are about 105 baby boys born for every 100 baby girls, and any sex ratio over 106 is assumed to be evidence of sex



FIGURE 3.7 China's "One Child Per Family" Policy

control.) One report (President's Council on Bioethics, 2003) found skewed sex ratios in regions around the world, including Venezuela (107.5); Yugoslavia (108.6); Egypt (108.7); Hong Kong (109.7); South Korea (110); Pakistan (110.9); Delhi, India (117); China (117); and Cuba (118). In Azerbaijan, Armenia, and Georgia, the sex ratio was as high as 120. In societies with such skewed male populations, each heterosexual male is less likely to find a mate, and the fear is that the society in general is likely to be more aggressive and suffer higher crime and greater social unrest. Certain cultures' strong preference for males has led to personal choices that have not just personal consequences but a societywide effect (FIGURE 3.7).

Controlling the sex of one's offspring is merely the beginning of what we may be able to control. Genes for traits such as eye colour, skin colour, height, temperament, personality, athleticism, and intelligence will be identified. When *germline therapy* becomes available (that is, changing the early embryonic genes, which are incorporated into all cells of the body and are passed on to future generations), scientists will be able to screen for particular genes and eventually to tinker with them. Eliminating genetic diseases is one thing, but in the future, children could be the specific results of their parents' desires: We may soon be able to order up our children just as we do burgers at fast-food restaurants. *Eugenics* (the science of attempting to improve a group's gene pool), whether it is in the hands of government or of individuals, raises a central question: By what standard are choices being made? In the case of sex determination, personal decisions appear to be based on cultural desires, religious beliefs, and so on. The consequences of such decisions are yet to be determined.

Recessive genes do not interfere with most people's health, so the recessive genes for diseases like sickle-cell can survive in the gene pool. This particular gene also has some benefit, in that it increases resistance to malaria, a parasitic disease prevalent in certain parts of Africa. People with only one sickle-cell gene enjoy this resistance without suffering from sickle-cell disease. In contrast to recessive gene disorders like this one, most dominant gene disorders are lethal for most of their carriers and therefore do not last in the gene pool.

## Genes Affect Behaviour

What determines the kind of person you are? What factors make you more or less bold, intelligent, or able to read a map? Your abilities and your psychological traits are influenced by the interaction of your genes and the environment in which you were raised or to which you are now exposed. The study of how genes and environment interact to influence psychological activity is known as *behavioural genetics*. Behavioural genetics has made important contributions to the biological revolution, providing information about the extent to which biology influences mind, brain, and behaviour.

Any research suggesting that abilities to perform certain behaviours are biologically based is controversial. Most people do not want to be told that what they can achieve is limited by something beyond their control, such as their genes. It is easy to accept that genes control physical characteristics such as sex, race, eye colour, and predisposition to diseases such as cancer and alcoholism. But can genes determine whether people will get divorced, how smart they are, or what careers they choose? Increasingly, science indicates that genes lay the groundwork for many human traits. From this perspective, people are born essentially like undeveloped photographs: The image is already captured, but the way it eventually appears can vary based on the development process. Psychological scientists study the ways in which characteristics are influenced by nature, nurture, and their combination—in other words, by the ways genes are expressed in environment.

**BEHAVIOURAL GENETICS METHODS** Most of us, at one time or another, have marvelled at how different siblings can be, even those raised around the same time and in the same household. The differences are to be expected, because most siblings share neither identical genes nor identical life experiences. Within and outside the household, environments differ subtly and not so subtly. Siblings have different birth orders, their mother may have consumed different foods and other substances during pregnancies, they may have different friends and teachers, and their parents may treat them differently. It is difficult to know what causes the similarities and differences between siblings, who always share some genes and often share much of their environments. Therefore, behavioural geneticists use two methods to assess the degree to which traits are inherited: twin studies and adoption studies.

*Twin studies* compare similarities between different types of twins to determine the genetic basis of specific traits. **Monozygotic twins**, or *identical twins*, result from one zygote (fertilized egg) dividing in two; each new zygote, and therefore each twin, has the same chromosomes and the same genes on each chromosome. Interesting research indicates, however, that monozygotic twins' DNA might not be as identical as long thought, due to subtle differences in how the mother's and father's genes are combined (Bruder et al., 2008). **Dizygotic twins**, sometimes called *fraternal* or *nonidentical twins*, result from two separately fertilized eggs developing in the mother's womb simultaneously; the resulting twins are no more

**monozygotic twins** Twin siblings who result from one zygote splitting in two and therefore share the same genes (i.e., identical twins).

**dizygotic twins** Twin siblings who result from two separately fertilized eggs (i.e., fraternal twins).

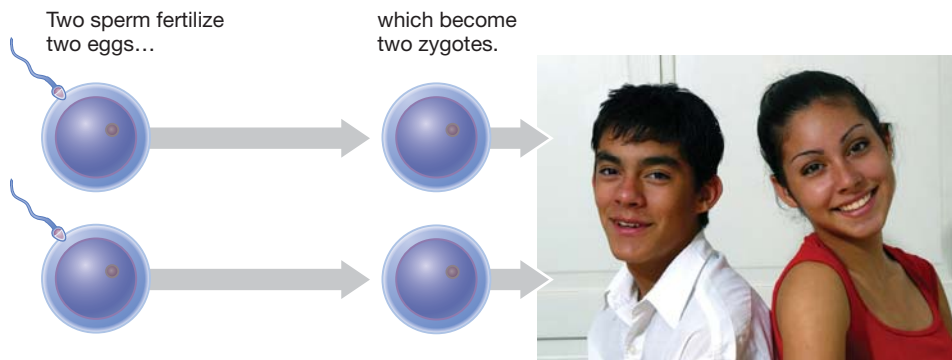
similar genetically than any other pair of siblings. To the extent that monozygotic twins are more similar than dizygotic twins, the increased similarity is considered most likely due to genetic influence. Even identical twins do not have the exact same environment (and in rare circumstances might even have some different genes due to random mutations), and therefore they have different phenotypes, but they are typically much more similar than dizygotic twins, who differ in genotype and phenotype.

*Adoption studies* compare the similarities between biological relatives and adoptive relatives. Nonbiological adopted siblings may share similar home environments but will have different genes. Therefore, the assumption is that similarities among nonbiological adopted siblings have more to do with environment than with genes. Growing up in the same home turns out to have relatively little influence on many traits, such as personality. Indeed, after genetic similarity is controlled for, even biological siblings raised in the same home are no more similar than two strangers plucked at random off the street. (This point is examined in greater detail in Chapter 11, “Human Development,” and Chapter 13, “Personality.”)

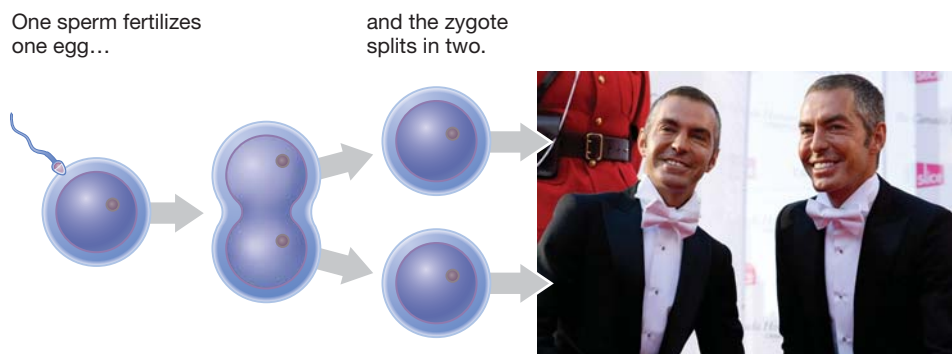
One way to conduct a behavioural genetic study is to compare monozygotic twins who have been *raised together* with ones who were *raised apart* (FIGURE 3.8). Thomas Bouchard and his colleagues at the University of Minnesota identified more than 100 pairs of identical and nonidentical twins, some raised together and some raised apart (1990). The researchers examined a variety of these twins’ characteristics, including intelligence, personality, well-being, achievement, alienation, and aggression. The general finding from the Minnesota Twin Project was that identical twins, raised together or not, were likely to be similar. The “Jim twins”

**FIGURE 3.8 Twins** (a) Fraternal twins, such as this pair pictured during their 13th birthday party, result when two separate eggs are fertilized at the same time. (b) Identical twins result when one fertilized egg splits in two. Identical twins Dean and Dan Caten are fashion designers who host Bravo television’s *Launch My Line*.

**(a) Dizygotic (fraternal) twins**



**(b) Monozygotic (identical) twins**



were among the most famous case studies to emerge from this project. These twin brothers were separated at birth and raised by different families. It is easy to guess about how each one was given the same name, but how is it possible that each James went on to marry a woman named Linda, divorce Linda and marry a woman named Betty, name a son James Alan (or James Allen), and name a dog Toy? In addition, both were part-time law-enforcement officers who drove Chevrolets and vacationed in Florida. Just to complete the circle, they were the same height and weight, chain-smoked the same brand of cigarettes, and drank the same brand of beer. Although no one would seriously suggest there are genes for naming dogs Toy or for marrying and divorcing women named Linda, the many similarities in the Jim twins' lives point to the strong genetic influences in shaping personality and behaviour.

Some critics have argued that most of the adopted twins in the Minnesota study were raised in relatively similar environments, in part because adoption agencies try to match the child to the adoptive home. However, this argument does not explain the identical twins Oskar Stohr and Jack Yufe, who were born in Trinidad in 1933 (T. J. Bouchard et al., 1990). Oskar was raised a Catholic in Germany and eventually joined the Nazi Party. Jack was raised a Jew in Trinidad and lived for a while in Israel. Few twins have more different backgrounds. Yet when they met, at an interview for the study, they were wearing similar clothes, exhibited similar mannerisms, and shared odd habits such as flushing the toilet before using it, dipping toast in coffee, storing rubber bands on their wrists, and enjoying startling people by sneezing loudly in elevators. Some critics feel that nothing more than coincidence is at work in these case studies and that if a researcher randomly selected any two people of the same age, many surprising similarities would exist in those people and their lives, just by coincidence, even if the people and their lives differed in most other ways. But twins and other relatives share similarities beyond coincidental attributes and behaviour quirks. For instance, intelligence and personality traits such as shyness tend to run in families due to strong genetic components.

Moreover, some evidence suggests that twins raised apart may be more similar than twins raised together. This phenomenon might occur if parents encouraged individuality in twins raised together by emphasizing different strengths and interests as a way of helping each twin develop as an individual. In effect, the parents would actively create a different environment for each twin.

**UNDERSTANDING HERITABILITY** *Heredity* is the transmission of characteristics from parents to offspring by means of genes. A term that is often confused with *heredity* but means something else altogether is **heritability**, which is a statistical estimate of the genetic portion of the variation in some specific trait. The heritability for a trait depends on the *variation*, the measure of the overall difference among a group of people for that particular trait. That is, within a group of people (e.g., Canadian women), how much do members vary in some trait (e.g., height)? Once we know the typical amount of variation within the population, we can see whether people who are related show less variation. For instance, do sisters tend to be more similar in height than unrelated women chosen at random?

Heritability refers to populations, not to individuals. If within a certain population a trait such as height has a heritability of .60, that means 60 percent of height variation among individuals within that population is genetic, not that anyone necessarily gets 60 percent of his or her height from genetics and 40 percent from environment. For instance, almost everyone has two legs, and more people lose legs through accidents than are born without them. Thus the heritability value for

**heritability** A statistical estimate of the variation, caused by differences in heredity, in a trait within a population.

having two legs is nearly zero, despite the obvious fact that the human genome includes instructions for growing two legs. Herein lies a key lesson: Estimates of heritability are concerned only with the extent that people differ in terms of their genetic makeup within the group.

## Social and Environmental Contexts Influence Genetic Expression

In a longitudinal study of criminality, Avshalom Caspi and his colleagues (2002) followed a group of more than 1,000 New Zealanders from their births in 1972–73

until adulthood, collecting enormous amounts of information about the participants and their lives each few years. When the participants were 26 years old, the investigators were able to examine which factors predicted who became a violent criminal. Prior research had demonstrated that children who are mistreated by their parents are more likely to become violent offenders. But not all mistreated children become violent, and these researchers wanted to know why not. They hypothesized that the enzyme monoamine oxidase (MAO) is important in determining susceptibility to the effects of maltreatment, because low levels of MAO have been implicated in aggressive behaviours (see Chapter 14, “Psychological Disorders”). The gene that controls MAO comes in two forms, one of which leads to higher levels of MAO and one of which leads to lower levels. Caspi and colleagues found that boys with the low-MAO gene appeared to be especially susceptible to early childhood maltreatment and were much more likely to be convicted of a violent crime than those with the high-MAO gene. Indeed, although only 1 in 8 boys *both* was mistreated *and* had the low-MAO gene, these boys were responsible for nearly half of all violent crimes committed by the group (FIGURE 3.9). The New Zealander study is a good example of how nature and nurture together affect behaviour—in this case, unfortunately, violent behaviour. Nature and nurture are inextricably entwined.

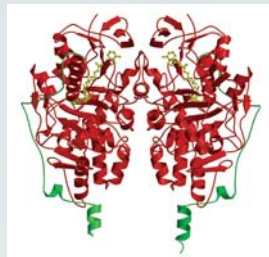
Many other studies have provided evidence that genes and social contexts

**FIGURE 3.9 Scientific Method: Caspi’s Study of the Influence of Environment and Genes**

**Hypothesis:** The enzyme monoamine oxidase (MAO) may be important in determining susceptibility to the effects of maltreatment, because low levels of MAO have been implicated in aggressive behaviours.

**Research Method:**

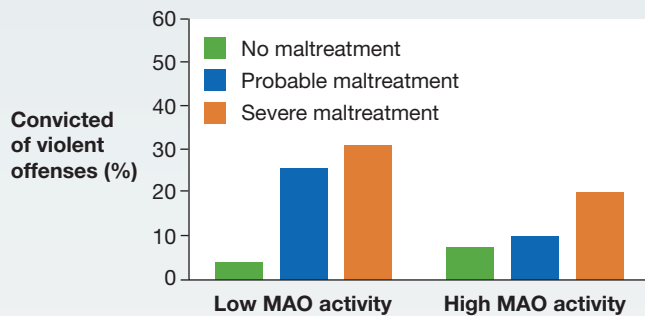
- 1 A group of more than 1,000 New Zealanders were followed from birth to adulthood.
- 2 Researchers measured which children were mistreated by their parents (**nurture**).
- 3 Researchers measured the presence of the MAO gene, which comes in two forms, one that leads to higher levels of MAO and one that leads to lower levels (**nature**).



- 4 Researchers measured the tendency toward criminal behaviour.



**Results:** Those who had the gene for low MAO activity were much more likely than others to have been convicted of violent crimes if they had been maltreated as children. The effects of maltreatment had less influence on those with the high-MAO gene.



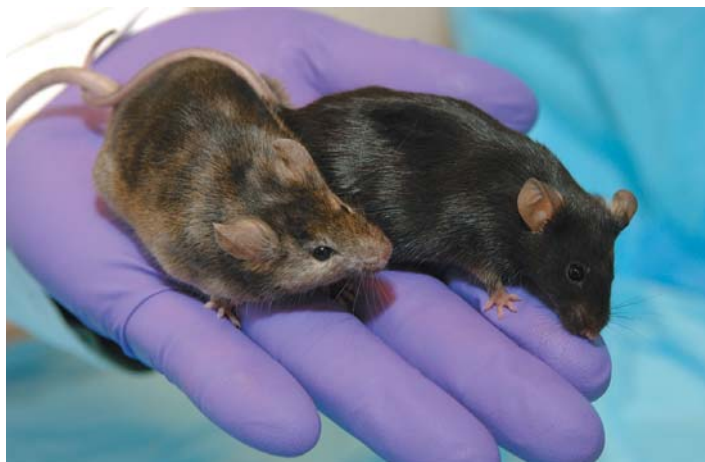
**Conclusion:** Nature and nurture can work together to affect human behaviour.

interact to affect the phenotype. Sandra Scarr and her colleagues have proposed a theory of development that stresses the interactive nature of genes and environment (Scarr & McCarthy, 1983). According to Scarr, early environments influence young children, but children's genes also influence the experiences they receive. For instance, children exposed to the same environment interpret and react to it in different ways. When teased, some children withdraw, others shrug it off without concern, and still others fight back. Because of differences in how they react to events, different children evoke different responses from others. A well-mannered, cuddly child cues more nurturing from parents and others than an irritable, fussy child does. Similarly, a child who seems to enjoy reading is likely to get more books and be read to more often than one who does not. And as children become older, they can choose their social situations. Some children prefer vigorous outdoor activities, others prefer quieter indoor activities, and so on. Thus genes predispose people to certain behaviours, those behaviours elicit particular responses, and those subsequent interactions then shape the phenotype. Because genes and social contexts interact, separating their independent effects can be very difficult. Some would argue that it is impossible.

### Genetic Expression Can Be Modified

Researchers can employ various gene manipulation techniques to enhance or reduce particular genes' expression or even to insert genes from one animal species into embryos of another. The researchers can then compare the genetically modified animals with unmodified ones to test theories about the affected genes' functions. Such techniques have dramatically increased our understanding of how gene expression influences thought, feeling, and behaviour. For instance, among the transgenic mice discussed in Chapter 2 are *knockouts*, research mice from which genes have been "knocked out," or rendered inactive by being removed from or disrupted within the genome (FIGURE 3.10); if a gene is important for a specific function, knocking out that gene should interfere with the function. This experimental technique has revolutionized genetics, and in recognition the 2007 Nobel Prize in Medicine was awarded to the three scientists who developed it: Italian-born Mario Capecchi, British-born Oliver Smithies, and Sir Martin Evans of Cardiff University, UK.

One remarkable finding from genetic manipulation is that changing even a single gene can dramatically change behaviour. Through various gene manipulations, researchers have created anxious mice, hyperactive mice, mice that cannot learn or



**FIGURE 3.10 Genetic Modifications** These mice look different because the gene affecting hair growth was "knocked out" of the mouse on the left but not the mouse on the right.

remember, mice that groom themselves to the point of baldness, mice that fail to take care of their offspring, and even mice that progressively increase alcohol intake when stressed (Marcus, 2004; Ridley, 2003). In one study, a gene from the highly social prairie vole was inserted into the developing embryos of normally anti-social mice. The resulting transgenic mice exhibited social behaviour more typical of prairie voles than of mice (Insel & Young, 2001). Another study found that knocking out specific genes led mice to forget mice they had previously encountered. These knockouts also failed to investigate new mice placed in their cages, though normal mice would do so readily. In essence, knocking out one gene led to multiple impairments in social recognition (Choleris et al., 2003). This finding indicates not that mice have a specific gene for being social, but that changing one gene's expression leads to the expression of a series of other genes, an effect that ultimately influences even complex behaviours. As noted by the Canadian psychologist David Suzuki and colleagues (1989), genes seldom work in isolation to influence mind and behaviour; rather, complex interaction among thousands of genes gives rise to the complexity of human experience.

### CRITICAL THINKING SKILL

## Seeking Disconfirming Evidence

Most of us tend to focus on information that confirms what we already believe. Suppose you believe that genetics plays only a small role in the way people think, feel, and act. How would you test this belief? If you are like most people, you would look for studies that show a small genetic effect and criticize studies that show a large one. But a better way to gather and study information would be to draw a  $2 \times 2$  chart and fill in every cell (FIGURE 3.11).

On the left, you would list each position: your thesis (A) and its opposite, or antithesis (B). In the middle, you would supply at least one or two reasons supporting each position, provide evidence for each reason, and evaluate the strength of each piece of evidence.

List your thesis (A) and its opposite, or antithesis (B).	Supply at least one or two reasons <b>supporting</b> each position, provide evidence for each reason, and evaluate the strength of each piece of evidence.	Supply at least one or two reasons <b>contradicting</b> each position, provide evidence for each reason, and evaluate the strength of each piece of evidence.
	<b>Supporting</b> Reasons and Evidence	<b>Contradicting</b> Reasons and Evidence
<b>A. Genetic influences on mind and behaviour are <b>small</b>.</b>	1. <i>Strength</i> 2. <i>Strength</i>	1. <i>Strength</i> 2. <i>Strength</i>
<b>B. Genetic influences on mind and behaviour are <b>large</b>.</b>	1. <i>Strength</i> 2. <i>Strength</i>	1. <i>Strength</i> 2. <i>Strength</i>

FIGURE 3.11 Think Critically: Supporting and Contradictory Evidence



evaluate the relative strength of each piece of evidence. (For example, how reliable is your source for this information? If a study was conducted, did it use appropriate control groups?) On the right, you would supply at least one or two reasons contradicting each position, provide evidence for each of these reasons, and, as with the supporting evidence, evaluate the relative strength of each piece of evidence. Thus the table would force you to consider not only information that supports your beliefs but also information that fails to support them.

Suppose you believe that vitamin C reduces your likelihood of getting a cold. If you acted on the natural tendency to consider only confirming information, you would look for studies in which people who took vitamin C had fewer colds. If you employed this table, you would also need to consider other possibilities, such as studies in which people took vitamin C and did not have fewer colds, or did not take vitamin C and had fewer colds, or did not take vitamin C and had more colds. To consider the subject thoroughly, you would include all four kinds of studies in your thinking. In many contexts, this critical thinking skill (or strategy) will not only guide you away from ignoring disconfirming evidence. It will also increase your ability to gather disconfirming evidence, evaluate it, and thereby strengthen your arguments—for and against.

## SUMMING UP

### What Is the Genetic Basis of Psychological Science?

Human behaviour is influenced by genetic processes. People inherit both physical characteristics and personality traits from their parents. Only recently have scientists developed the tools to measure genetic processes and the roles that various genes play in psychological activity. The Human Genome Project has mapped DNA's basic sequence, information that eventually will be translated into medical treatments and a greater understanding of individual differences among people. Researchers increasingly are studying how and when genes are expressed, in addition to particular traits' heritability. Among the genetic research tools are methods that enhance or interrupt gene expression by selectively knocking out specific genes to reveal which behaviours are affected.

## MEASURING UP

1. The difference between genotype and phenotype is that \_\_\_\_\_.
  - a. genotype refers to an organism's genetic makeup; phenotype refers to observable characteristics that result from genetic and environmental influences
  - b. genotype refers to monozygotic twins' (nearly) identical genetic makeup; phenotype refers to dizygotic twins' genetic makeup
  - c. genotypes can be modified by experiences; phenotypes can be modified only if the underlying genes are knocked out
  - d. genotypes direct the experiences organisms seek for themselves; phenotypes cannot affect environmental events
2. What is the principle behind knockout gene research?
  - a. Aggressive behaviour is inherited through so-called knockout genes.

- b. By rendering a single gene inactive, we can study that gene's effects on behaviour.
- c. Knockout genes reveal the relative contributions of prenatal and postnatal experiences on offspring.
- d. Knockout genes reduce the need for using MRIs to study brain development.

### LEARNING OBJECTIVES

Describe the electrical and chemical bases for communication among neurons.

List the major neurotransmitters and what they do.

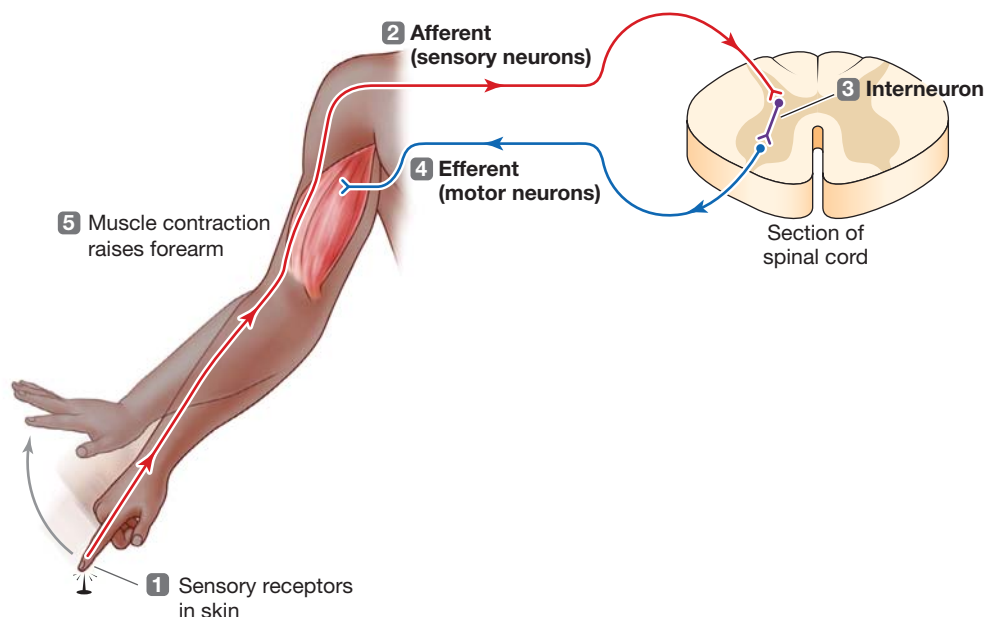
**neuron** The basic unit of the nervous system; it operates through electrical impulses, which communicate with other neurons through chemical signals. Neurons receive, integrate, and transmit information in the nervous system.

**sensory neurons** One of the three types of neurons, these afferent neurons detect information from the physical world and pass that information along to the brain.

**motor neurons** One of the three types of neurons, these efferent neurons direct muscles to contract or relax, thereby producing movement.

**interneurons** One of the three types of neurons, these neurons communicate only with other neurons, typically within a specific brain region.

**FIGURE 3.12 The Three Types of Neurons** Receptors send afferent signals to the brain for processing. An efferent signal is then sent from the brain to the body via the spinal cord to produce a response.



## How Does the Nervous System Operate?

### Neurons Are Specialized for Communication

**Neurons**, the basic units of the nervous system, are cells that specialize in communication. Neurons differ from most other cells because they are excitable: They operate through electrical impulses and communicate with other neurons through chemical signals. They have three functions: taking in information from neighbouring neurons (reception), integrating those signals (conduction), and passing signals to other neurons (transmission).

**TYPES OF NEURONS** The three basic types of neurons are *sensory neurons*, *motor neurons*, and *interneurons*. **Sensory neurons** detect information from the physical world and pass that information along to the brain, usually via the spinal cord. You know from hitting your funny bone that sensory neurons can transmit fast-acting signals that trigger a nearly instantaneous bodily response and sensory experience. Sensory neurons are often called *afferent* neurons, meaning they carry information to the brain. The sensory nerves that provide information from muscles are referred to as *somatosensory*, which is the general term for sensations experienced from within the body.

**Motor neurons** direct muscles to contract or relax, thereby producing movement. Motor neurons are therefore *efferent* neurons, neurons that transmit signals from the brain to the muscles throughout the body. **Interneurons** communicate within local or short-distance circuits. That is, interneurons integrate neural activity within a single area rather than transmitting information to other brain structures or to the body organs.

Together, sensory and motor neurons control movement (**FIGURE 3.12**). For instance, if you are using a pen to take notes as you read these words, you are

contracting and relaxing your hand muscles and finger muscles to adjust your fingers' pressure on the pen. When you want to use the pen, your brain sends a message via motor neurons to your finger muscles so they move in specific ways. Receptors in both your skin and your muscles send back messages through sensory neurons to help determine how much pressure is needed to hold the pen. This symphony of neural communication for a task as simple as using a pen is remarkable, yet most of us employ motor control so easily that we rarely think about it.

Complex networks of thousands of neurons sending and receiving signals are the functional basis of all psychological activity. In fact, they are the basis of your every thought, your every emotion, your every action. Essentially, you *are* your nervous system. Although single neurons' actions are simple to describe, human complexity results from billions of neurons, each making contact with tens of thousands of other neurons. Neurons do not communicate randomly or arbitrarily; they selectively communicate with other neurons to form circuits, or *neural networks*. These networks develop through maturation and experience, forming permanent alliances among groups of neurons.

**NEURON STRUCTURE** Neurons have different functions and come in a wide assortment of shapes and sizes, but all types usually share four structural regions that participate in the neuron's communication functions: the dendrites, the cell body, the axon, and the terminal buttons (**FIGURE 3.13**). The **dendrites** are short, branchlike appendages that increase the neuron's receptive field and detect chemical signals from neighbouring neurons. In the **cell body**, the information received from thousands of other neurons is collected and integrated.

Once the incoming information from many other neurons has been integrated in the cell body, electrical impulses are transmitted along a long narrow outgrowth known as the **axon**. Axons vary tremendously in length, from a few millimetres to more than a metre. The longest axons stretch from the spinal cord to the big toe. You probably have heard the term *nerve*, as in a pinched nerve. Used in this context, a nerve refers to a bundle of axons that carry information between the brain and other places in the body.

**Terminal buttons**, small nodules at the axons' ends, receive the electrical impulses and release chemical signals from the neuron to an area called the **synapse**, or **synaptic cleft**, the site for chemical communication between neurons. Neurons do not touch each other; they communicate by sending chemicals into tiny gaps between the axon of the "sending" neuron and the dendrites of the "receiving" neuron. Chemicals leave one neuron, cross the synapse, and pass signals along to other neurons' dendrites.

The neuron's membrane serves as its boundary. The membrane also plays an important role in communication between neurons by regulating the concentration of electrically charged molecules that are the basis of the neuron's electrical activity (discussed further below). These electrical signals travel quickly down the

**dendrites** Branchlike extensions of the neuron that detect information from other neurons.

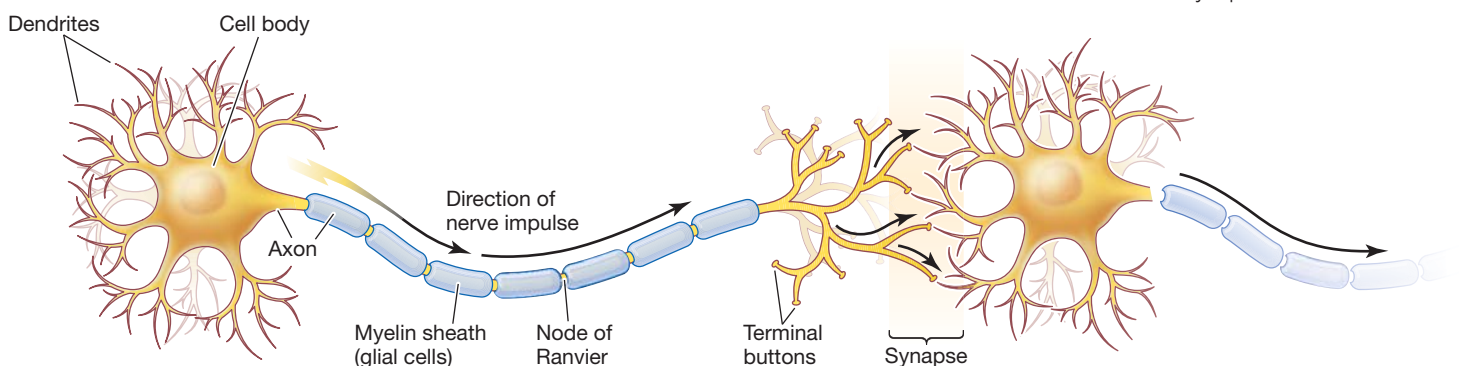
**cell body** In the neuron, where information from thousands of other neurons is collected and processed.

**axon** A long narrow outgrowth of a neuron by which information is transmitted to other neurons.

**terminal buttons** Small nodules, at the ends of axons, that release chemical signals from the neuron to the synapse.

**synapse, or synaptic cleft** The site for chemical communication between neurons, which contains extracellular fluid.

**FIGURE 3.13 Neuron Structure** Messages are received by the dendrites, processed in the cell body, transmitted along the axon, and sent to other neurons via chemical substances released from the terminal buttons across the synapse.



**myelin sheath** A fatty material, made up of glial cells, that insulates the axon and allows for the rapid movement of electrical impulses along the axon.

**nodes of Ranvier** Small gaps of exposed axon, between the segments of myelin sheath, where action potentials are transmitted.

**resting membrane potential** The electrical charge of a neuron when it is not active.

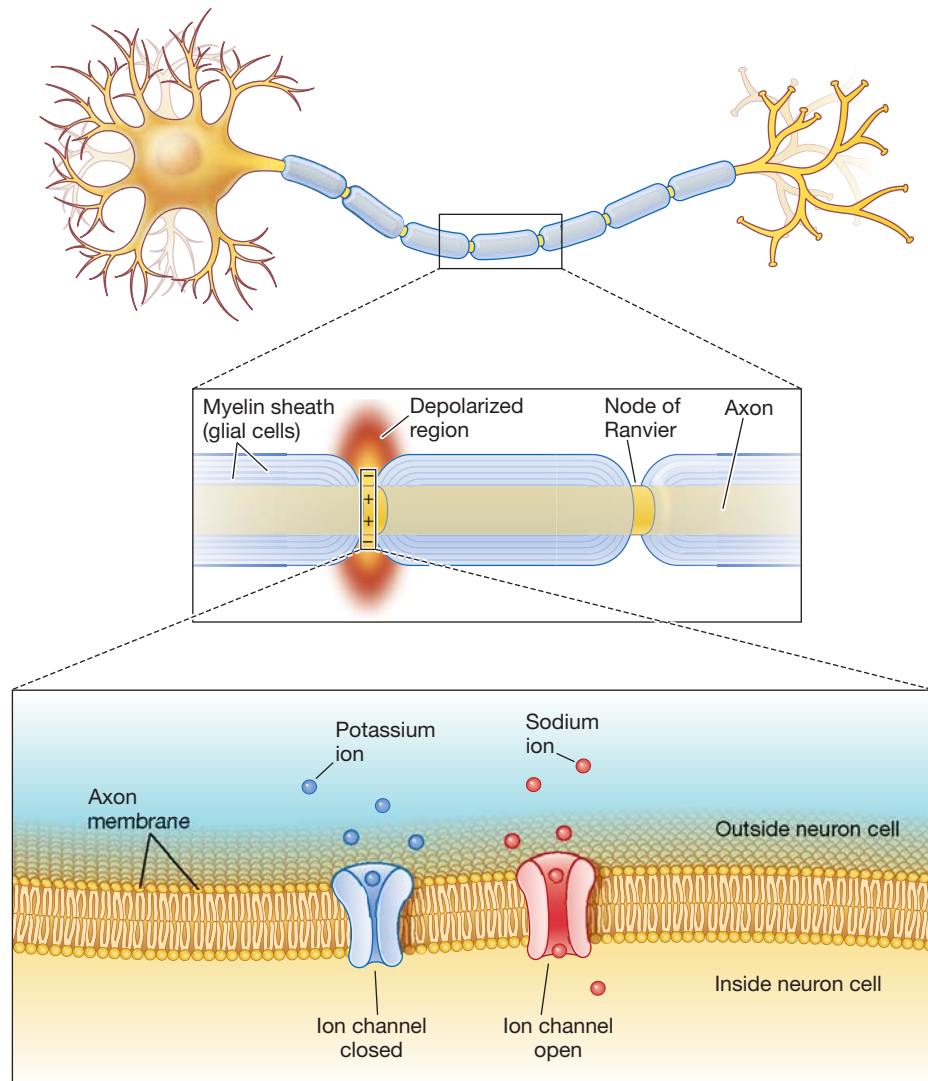
axon because of the fatty **myelin sheath** that encases and insulates it like the plastic tubing around wires in an electrical cord. Made up of *glial cells* (Greek, “glue”), the myelin sheath grows along an axon in short segments. Between these segments are small gaps of exposed axon called the **nodes of Ranvier** (after the French anatomist Louis A. Ranvier, the researcher who first described them). At these gaps are ion channels, which allow negatively and positively charged ions to pass in and out of the cell when the neuron transmits signals down the axon.

**THE RESTING MEMBRANE POTENTIAL IS NEGATIVELY CHARGED** When a neuron is resting (not active) the inside and outside differ electrically, a phenomenon referred to as the **resting membrane potential** (FIGURE 3.14). This difference occurs because the ratio of negative to positive ions is greater inside the neuron than outside it. Therefore, the electrical charge inside the neuron is slightly more negative than the one outside. Changing this differential electrical charge inside and outside the neuron, *polarization*, creates the electrical energy necessary to power the firing of the neuron.

**THE ROLES OF SODIUM AND POTASSIUM IONS** Two types of ions that contribute to a neuron’s resting membrane potential are *sodium ions* and *potassium ions*.

**FIGURE 3.14 Resting Membrane Potential**

**Potential** A neuron at rest is polarized—it has a different electrical charge inside and outside. The passage of negative and positive ions inside and outside the membrane is regulated by ion channels located at the nodes of Ranvier.



Although other ions are involved in neural activity, sodium and potassium are most important for this discussion. Ions pass through the cell membrane at *ion channels*, specialized pores located at the nodes of Ranvier. Each channel matches a specific type of ion (i.e., sodium channels allow sodium but not potassium and vice versa), and the flow of ions through each channel is controlled by a gating mechanism. When a gate is open, ions flow in and out of the cell membrane; a closed gate will prevent their passage. Ion flow also is affected by the cell membrane's selective permeability; the membrane allows some types of ions to cross more easily than others, much like a bouncer at an exclusive nightclub. Partially as a result of this selective permeability of the cell membrane, more potassium is inside the neuron than sodium, an imbalance that contributes to polarization. Another mechanism in the membrane that contributes to polarization is the sodium-potassium pump. This pump works to increase potassium and decrease sodium inside the neuron.

## Action Potentials Cause Neural Communication

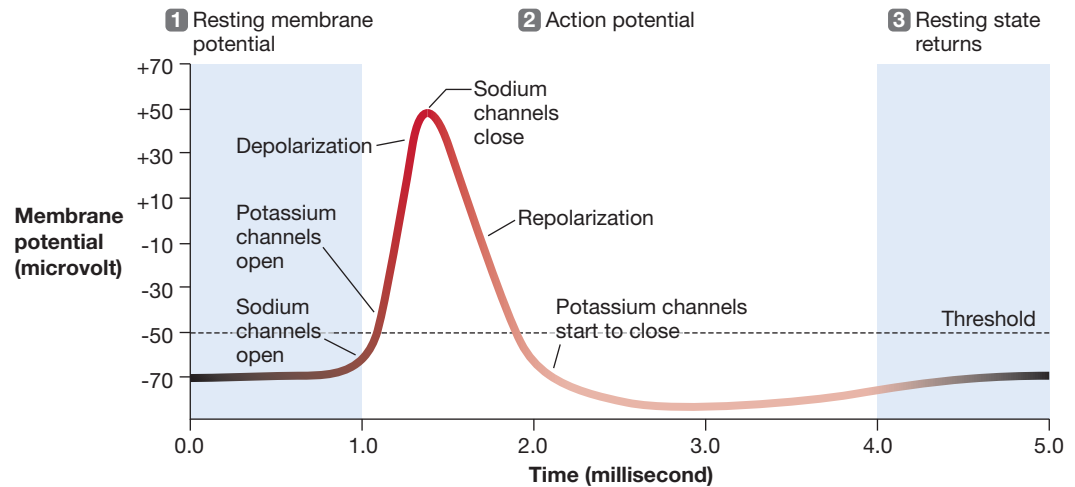
Neural communication depends on a neuron's ability to respond to incoming stimulation by changing electrically and then passing along signals to other neurons. An **action potential**, also called *neural firing*, is the electrical signal that passes along the axon and causes the release of chemicals that transmit signals to other neurons. The following sections examine some factors that contribute to an action potential's firing.

**action potential** The neural impulse that passes along the axon and subsequently causes the release of chemicals from the terminal buttons.

**CHANGES IN ELECTRICAL POTENTIAL LEAD TO ACTION** A neuron receives chemical signals from nearby neurons through its dendrites, and these signals tell the neuron whether to fire. The signals, which work by affecting polarization, arrive at the dendrites by the thousands and are of two types: *excitatory* and *inhibitory*. Excitatory signals depolarize the cell membrane, increasing the likelihood that the neuron will fire; inhibitory signals hyperpolarize the cell, decreasing the likelihood that the neuron will fire. Excitatory and inhibitory signals received by the dendrites are integrated within the neuron. If the total amount of excitatory input from the other neurons surpasses the receiving neuron's threshold, an action potential is generated.

When a neuron fires, the sodium gates in the cell membrane open, allowing sodium ions to rush into the neuron. This influx of sodium causes the inside of the neuron to become slightly more positively charged than the outside. A fraction of a second later, potassium channels open to allow the potassium ions inside the cell membrane to rush out. This change from a negative charge to a positive one inside the neuron is the basis of the action potential. As the sodium ion channels close, the sodium ions stop entering the cell; similarly, as the potassium ion channels close, potassium ions stop exiting the cell. The electrical charge inside the cell during this process starts out slightly negative in its initial resting state, then becomes positive as it fires and allows more positive ions inside the cell, and then through natural restoration it goes back to its slightly negative resting state (**FIGURE 3.15**).

**ACTION POTENTIALS SPREAD ALONG THE AXON** When the neuron fires, the cell membrane's depolarization moves along the axon like a wave, an action called *propagation*. Sodium ions rush through their ion channels, causing adjacent sodium channels to open. Thus, like toppling dominoes, sodium ion channels open successively, always moving down the axon away from the cell body to the terminal buttons. Because of the insulation provided by the myelin sheath, the action potential skips quickly along the axon, pausing only briefly to be recharged at each node of Ranvier on the axon. The entire process takes only about 1/1,000 of a second, permitting the fast and frequent adjustments required for coordinating motor activity.



**FIGURE 3.15 Action Potential** The electrical charge inside the neuron starts out slightly negative (resting membrane potential). As the neuron fires, it allows more positive ions inside the cell (depolarization). Through natural restoration (repolarization), it then returns to its slightly negative resting state.

## Real World PSYCHOLOGY

Deterioration of the myelin sheath leads to multiple sclerosis (MS), an especially tragic neurological disorder that begins in young adulthood. The earliest symptoms are often numbness in the limbs and blurry vision. Since the myelin insulation helps messages move quickly along axons, demyelination slows down neural impulses. The axons essentially short-circuit, and normal neural communication is interrupted. Motor actions become jerky, as those afflicted lose the ability to coordinate motor movements. Over time, movement, sensation, and coordination are severely impaired. As the myelin sheath disintegrates, axons are exposed and may start to break down. According to the Multiple Sclerosis Society of Canada, MS is the most common neurological disorder affecting young adults in Canada and Canadians have one of the highest rates of MS in the world. This is not surprising, because MS is more common in cold climates than in warm climates. It is unclear why cold weather makes MS more likely. However, growing up in a cold climate seems more relevant than moving to one; moving from a cold climate to a warmer one does not seem to reduce the risk of developing MS. There is also evidence for a genetic component to MS. A large study of 370 Canadian twin pairs found a greater concordance for monozygotic than dizygotic twins, although this effect occurred primarily among female twin pairs (Willer et al., 2003), perhaps because MS is more common among females than among males. There is no known cure for MS.

**ALL-OR-NONE PRINCIPLE** Any one signal received by the neuron has little influence on whether it fires. Normally, the neuron is barraged by thousands of excitatory and inhibitory signals, and its firing is determined by the number and frequency of those signals. If the sum of excitatory and inhibitory signals leads to a positive change in voltage that exceeds the neuron's firing threshold, an action potential is generated.

**all-or-none principle** The principle whereby a neuron fires with the same potency each time, although frequency can vary; it either fires or not—it cannot partially fire.

A neuron either fires or it does not; it cannot partially fire. The **all-or-none principle** dictates that a neuron fires with the same potency each time (i.e., it does not fire in a way that can be described as weak or strong). How often the neuron fires depends on the strength of stimulation. For the sake of comparison, suppose you are playing a video game in which you fire missiles by pressing a button. Every time you press the button, a missile is launched at the same velocity as the previous one. It makes no difference how hard you press the button. But if you keep your finger on the button, additional missiles fire in rapid succession. Thus

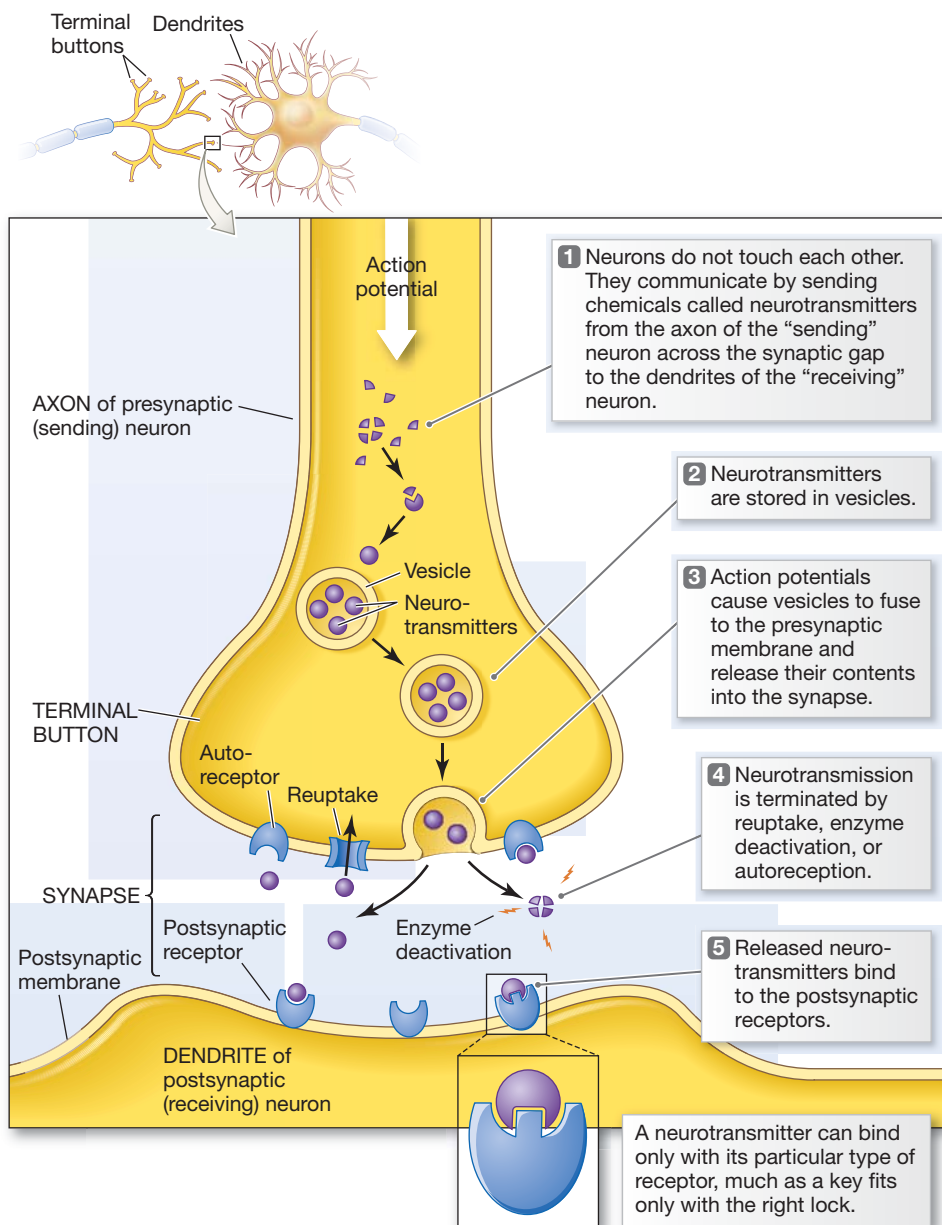
the strong stimulus—your finger holding down the button—controls the firing frequency. Likewise, if a neuron in the visual system, for example, receives information that a light is bright, it might respond by firing more rapidly and more often than when it receives information that the light is dim.

## Neurotransmitters Bind to Receptors across the Synapse

As noted above, neurons do not touch one another; they are separated by a small space known as the synapse or synaptic cleft, the site of chemical communication between neurons. Action potentials cause neurons to release chemicals from their terminal buttons. These chemicals travel across the synaptic cleft and are received by other neurons' dendrites. The neuron that sends the signal is called *presynaptic*, and the one that receives the signal is called *postsynaptic*.

How do these chemical signals work (FIGURE 3.16)? Inside each terminal button are small packages, or vesicles, that contain **neurotransmitters**, chemical

**neurotransmitter** A chemical substance that carries signals from one neuron to another.



**FIGURE 3.16** How Neurotransmitters Work

**receptors** In neurons, specialized protein molecules, on the postsynaptic membrane, that neurotransmitters bind to after passing across the synaptic cleft.

**reuptake** The process whereby a neurotransmitter is taken back into the presynaptic terminal buttons, thereby stopping its activity.

**agonist** Any drug that enhances the actions of a specific neurotransmitter.

**antagonist** Any drug that inhibits the action of a specific neurotransmitter.

substances that carry signals across the synaptic cleft. After an action potential travels to the terminal button, it causes the vesicles to release their neurotransmitters into the synaptic cleft. These neurotransmitters then spread across the synaptic cleft and attach themselves, or *bind*, to receptors on the postsynaptic neuron. **Receptors** are specialized protein molecules located on the postsynaptic membrane. The binding of a neurotransmitter with a receptor produces an excitatory or inhibitory signal for the postsynaptic neuron, thus encouraging or discouraging neural firing.

**NEUROTRANSMITTERS BIND WITH SPECIFIC RECEPTORS** Before the 1970s, most researchers believed that communication in the brain took place through the actions of just five or so neurotransmitters. Researchers now know that more than 60 chemicals transmit information in the brain and body. Different transmitters influence either emotion, thought, or behaviour. In much the same way as a lock opens only with the correct key, each receptor can be influenced by only one type of neurotransmitter.

Once neurotransmitters are released into the synapse, they continue to fill and stimulate that receptor, and they block new signals until their influence is terminated. The three major events that terminate the transmitters' influence in the synaptic cleft are *reuptake*, *enzyme deactivation*, and *autoreception*. **Reuptake** occurs when the neurotransmitter molecules are taken back into the presynaptic terminal buttons. The cycle of reuptake and release repeats continuously. An action potential prompts terminal buttons to release the transmitter into the synaptic cleft and then take it back for recycling. Enzyme deactivation occurs when an enzyme destroys the transmitter substance in the synaptic cleft. Different enzymes break down different neurotransmitters. Neurotransmitters can also bind with receptors on the presynaptic neuron. These *autoreceptors* monitor how much neurotransmitter has been released into the synapse. When excess is detected, the autoreceptors signal the presynaptic neuron to stop releasing the neurotransmitter.

All neurotransmitters trigger or inhibit action potentials. Their effects are a function of the receptors to which they bind, which in turn determine which neurons will fire or be less likely to fire. The same neurotransmitter can send excitatory or inhibitory postsynaptic signals, depending on the receptor's properties.

## Neurotransmitters Influence Mind and Behaviour

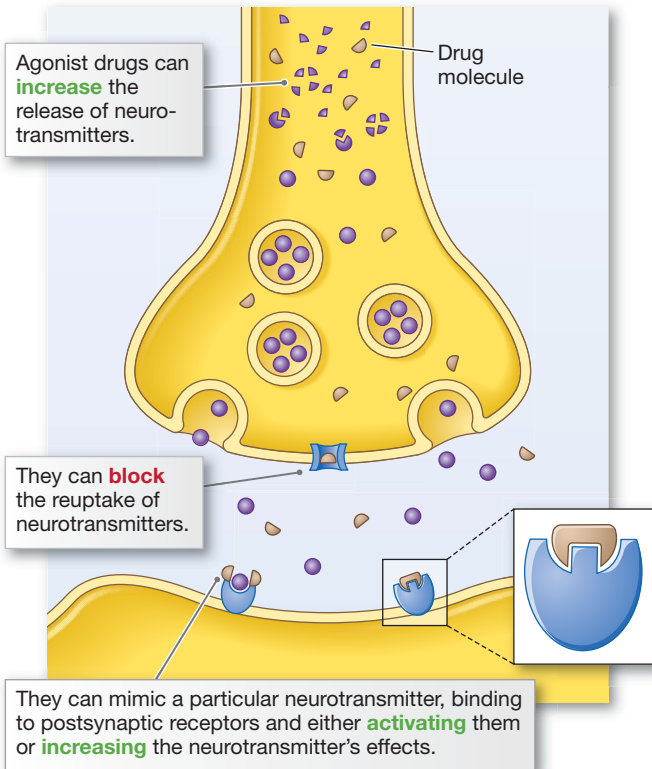
Much of what is known about neurotransmitters has been learned through the systematic study of drugs' and toxins' effects on emotion, on thought, and on behaviour. Drugs and toxins can alter neurotransmitters' actions in several ways: They can alter how neurotransmitters are synthesized, they can raise or lower the amounts of neurotransmitters released from the terminal buttons, and by blocking reuptake they can change the way neurotransmitters are deactivated in the synaptic cleft. Drugs and toxins that enhance neurotransmitters' actions are known as **agonists**; drugs inhibiting these actions are known as **antagonists** (FIGURE 3.17). Drugs and toxins can also mimic neurotransmitters and bind with their receptors as if they were the real thing. Addictive drugs such as heroin and cocaine, for example, have their effects because they are chemically similar to naturally occurring neurotransmitters; the receptors cannot differentiate between the ingested drug and the real neurotransmitter released from a presynaptic neuron. That is, although the relationship between a neurotransmitter and receptor is like a lock and key, the receptor cannot tell a real key from a forgery—either will open it.

Researchers often inject agonists or antagonists into animals' brains to assess a neurotransmitter's behavioural effects. In this way, they are working to develop drug

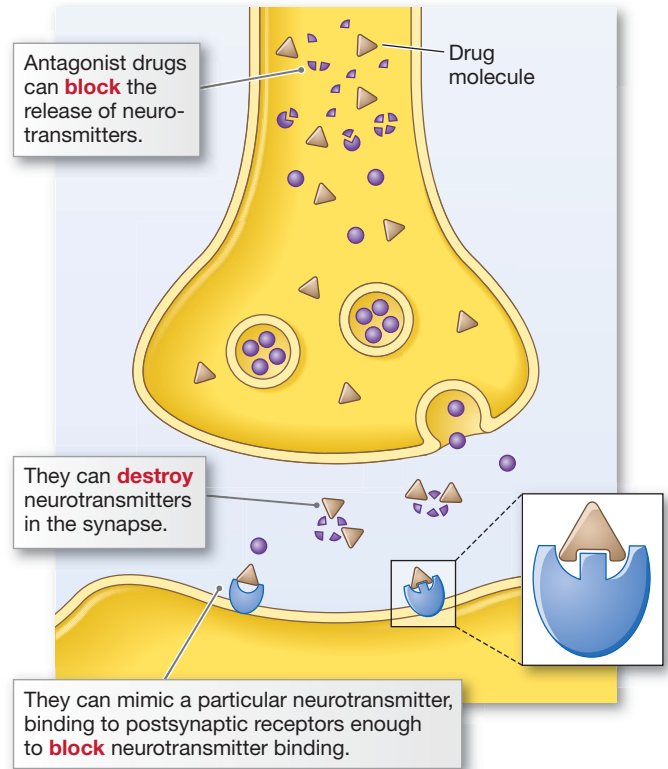


**FIGURE 3.17** How Drugs Work

**Agonists**



**Antagonists**



treatments for many psychological and medical disorders. For instance, researchers can test the hypothesis that a certain neurotransmitter in a specific brain region leads to increased eating. Injecting an agonist into that brain region should increase eating while injecting an antagonist should decrease eating.

**TYPES OF NEUROTRANSMITTERS** There are many kinds of neurotransmitters. Nine of them have been the focus of research in psychological science; these neurotransmitters are particularly important in understanding how we think, feel, and behave (TABLE 3.1).

The neurotransmitter **acetylcholine (ACh)** is responsible for motor control at the junctions between nerves and muscles. Terminal buttons release acetylcholine into synapses. After moving across the synapses, it binds with receptors on muscle cells, making the muscles contract or relax. For instance, ACh excites skeletal muscles and inhibits heart muscles. As is true of all neurotransmitters, whether ACh's effects will be excitatory or inhibitory depends on the receptors. Botulism, a form of food poisoning, inhibits the release of ACh from terminal buttons, leading to difficulty in breathing and chewing and often to death. Because of its ability to paralyze muscles, botulism is used in small, much less toxic doses for cosmetic surgery. Physicians inject botulism, popularly known as Botox, into the eyebrow region, paralyzing muscles that produce certain wrinkles (FIGURE 3.18). Because the effects wear off over time, a new dose of botulism needs to be injected every two to four months. If too much Botox is injected, however, the result can be an expressionless face, because Botox paralyzes the facial muscles we use to express emotions, as in smiling and frowning.

Acetylcholine is also involved in complex mental processes such as learning, memory, sleeping, and dreaming. Because ACh affects memory and attention, drugs

**acetylcholine (ACh)** The neurotransmitter responsible for motor control at the junction between nerves and muscles; also involved in mental processes such as learning, memory, sleeping, and dreaming.

**Table 3.1 Common Neurotransmitters and Their Major Functions**

Neurotransmitter	Functions
acetylcholine	Motor control over muscles Learning, memory, sleeping, and dreaming
epinephrine	Energy
norepinephrine	Arousal and vigilance
serotonin	Emotional states and impulsiveness Dreaming
dopamine	Reward and motivation Motor control over voluntary movement
GABA (gamma-aminobutyric acid)	Inhibition of action potentials Anxiety and intoxication
glutamate	Enhances action potentials Learning and memory
endorphins	Pain reduction Reward
substance P	Pain perception Mood and anxiety

**epinephrine** The neurotransmitter responsible for adrenaline rushes, bursts of energy caused by its release throughout the body.

**norepinephrine** The neurotransmitter involved in states of arousal and awareness.

**serotonin** A monoamine neurotransmitter important for a wide range of psychological activity, including emotional states, impulse control, and dreaming.

that are ACh antagonists can cause temporary amnesia. In a similar way, Alzheimer's disease, a condition characterized primarily by severe memory deficits, is associated with diminished ACh functioning (Geula & Mesulam, 1994). Drugs that are ACh agonists may enhance memory and decrease other symptoms, but so far drug treatments for Alzheimer's have experienced only marginal success.

Four of these transmitters (epinephrine, norepinephrine, serotonin, and dopamine) are called *monoamines*. Their major functions are to regulate states of arousal and affect (feelings) and to motivate behaviour. Monoamine oxidase (MAO) is an enzyme that interrupts the activity of all monoamines. As discussed earlier, men who have a gene that produces low levels of MAO and who have been mistreated as children are much more likely to be convicted of violent crimes.

The neurotransmitter **epinephrine** is found throughout the body, with small amounts in the brain. It was initially called *adrenaline* and is the basis for the phrase *adrenaline rush*, a burst of energy caused by its release in the body. **Norepinephrine** is involved in states of arousal and alertness. Norepinephrine is especially important for vigilance, a heightened sensitivity to what is going on around you. Norepinephrine appears useful for fine-tuning the clarity of attention; it inhibits responsiveness to weak synaptic inputs and strengthens or maintains responsiveness to strong synaptic inputs.

**Serotonin** is involved in many diverse behaviours; it is especially important for emotional states, impulse control, and dreaming. Low levels of serotonin are associated with sad and anxious moods, food cravings, and aggressive behaviour. Drugs that block serotonin reuptake and thus leave



"I'LL HAVE TO GET DR. KENDRICK TO REDUCE HIS DOSAGE OF PROZAC."



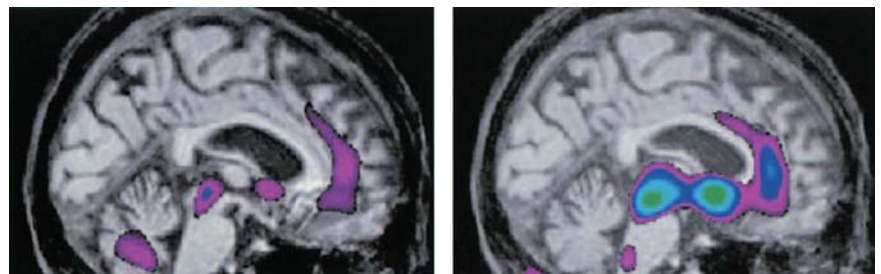
**FIGURE 3.18 Acetylcholine and Botox** Acetylcholine (ACh) is responsible for motor control between nerves and muscles. Botox inhibits the release of ACh, paralyzing muscles.

more serotonin in the synapse to bind with the postsynaptic neurons are now used to treat a wide array of mental and behavioural disorders, including depression, obsessive-compulsive disorders, eating disorders, and obesity (Tollesfson, 1995). One class of drugs that specifically target serotonin is prescribed widely to treat depression; these drugs, which include Prozac, are referred to as *selective serotonin reuptake inhibitors*, or *SSRIs*.

**Dopamine** serves many significant brain functions, especially motivation and motor control. Many theorists believe dopamine is the primary neurotransmitter that communicates which activities may be rewarding. Eating when hungry, drinking when thirsty, and having sex when aroused, for example, activate dopamine receptors and therefore are experienced as pleasurable. At the same time, dopamine activation is involved in motor control and planning, thereby guiding behaviour toward things—objects and experiences—that will lead to additional reward. Dopamine also is involved in controlling voluntary muscle movements. A lack of dopamine may also be involved in problems with movement. This is the case for the Canadian actor Michael J. Fox, who has become as well known for his unfortunate medical condition as for his acting ability. He is one of the many people, famous and nonfamous, who have developed the neurodegenerative disorder **Parkinson's disease (PD)**. First identified by the British physician James Parkinson in 1817, PD is marked by muscular rigidity, tremors, and difficulty initiating voluntary action. It affects about 1 in every 200 older adults and occurs in all known cultures. Although most PD patients do not experience symptoms until after age 50, the case of Michael J. Fox makes it clear that the disease can occur earlier.

A promising development in Parkinson's research is the transplanting of fetal tissue into human brains in the hope that the new fetal cells will produce dopamine.

In Canada, the first fetal transplant to treat Parkinson's took place at the Victoria General Hospital in 1991, on a 61-year-old woman who had suffered from the disease for more than 20 years (Mendez et al., 1992). The Dalhousie University physician who conducted this surgery has since found evidence that transplanted dopamine neurons thrive (**FIGURE 3.19**) and can last without problems for as long as 14 years (Mendez et al., 2008). Other clinical studies



**dopamine** A monoamine neurotransmitter involved in reward, motivation, and motor control.

**Parkinson's disease (PD)** A neurological disorder that seems to be caused by dopamine depletion, marked by muscular rigidity, tremors, and difficulty initiating voluntary action.

**FIGURE 3.19 Hope for Parkinson's Patients** In this study, neurosurgeons from Dalhousie University transplanted fetal tissue into two brain regions of a 48-year-old male. A brain scan using PET imaging indicates the survival and functioning of the transplanted dopamine neurons. (The areas in colour show increased dopamine.)

using random assignment have not found large differences between patients receiving fetal cell transplants and those undergoing sham surgery, which mimics the real surgery but does not involve transplantation (Olanow et al., 2003). These methods are still being developed, though, and researchers continue to explore how fetal and stem cell transplants might be used to treat brain disorders.

A more promising approach is *deep brain stimulation*, which involves surgically implanting electrodes deep within the brain and then using mild electricity to stimulate regions affected by the disorder, much the way a pacemaker stimulates the heart. The French physician Alim Louis Benabid of Grenoble University pioneered this method in 1987. Deep brain stimulation of motor regions of the brains of Parkinson's patients reverses many of the movement problems associated with the disease (DeLong & Wichmann, 2008). Researchers at the University of Toronto recently reported successful long-term results from deep brain stimulation treatment of Parkinson's, lasting as long as six years (Lozano et al., 2010).

**GABA** (gamma-aminobutyric acid) is the primary inhibitory transmitter in the nervous system and works throughout the brain. Without the inhibitory effect of GABA, synaptic excitation might get out of control and spread through the brain chaotically. Epileptic seizures may happen because of low levels of GABA (Upton, 1994). Drugs that are GABA agonists are also widely used to treat anxiety disorders. For instance, people with nervous disorders commonly use benzodiazepines, which include drugs such as Valium, to relax. Ethyl alcohol—the type people drink—has similar effects on GABA receptors, which is why alcohol typically is experienced as relaxing. GABA reception also may be the primary mechanism by which alcohol interferes with motor coordination. In contrast, **glutamate** is the primary excitatory transmitter in the nervous system, opening sodium gates in post-synaptic membranes, and is involved in fast-acting neural transmission throughout the brain. Glutamate receptors aid learning and memory by strengthening synaptic connections. Excessive glutamate may act as a neurotoxin, killing neurons by overexciting them. In 1987, 150 Canadians became seriously ill when they ingested mussels that contained a substance similar to glutamate. Four people died, and some of the survivors had symptoms of severe brain injury, especially memory loss. Autopsies of those who died revealed that neurons in the hippocampus, one of the primary brain areas for memory, were damaged. A controversial theory suggests that the flavour enhancer monosodium glutamate (MSG), glutamate in sodium form, may raise blood levels of glutamate high enough to cause neuronal injury or death (Olney, 1990). The evidence suggests, however, that massive quantities of MSG would have to be consumed to cause permanent damage to adults. According to Health Canada, although MSG is generally safe, some people seem to experience an allergic-type response and therefore should avoid food containing it.

**Endorphins** are involved in both natural pain reduction and reward (FIGURE 3.20). In the early 1970s, the pharmacology researchers Candace Pert and Solomon Snyder established that opiate drugs such as heroin and morphine bind to receptors in the brain, and this finding led to the discovery of naturally occurring substances that bind to those sites. Called *endorphins* (short for *endogenous morphine*), these substances are part of the body's natural defence against pain. Pain is useful because it signals to animals, human and nonhuman, that they are hurt or in danger and therefore should try to escape or withdraw, but pain can also interfere with adaptive functioning. If pain prevented animals from engaging in behaviours such as eating, competing, and mating, they would fail to pass along their genes.

**GABA** (gamma-aminobutyric acid) The primary inhibitory transmitter in the nervous system.

**glutamate** The primary excitatory transmitter in the nervous system.

**endorphins** A neurotransmitter involved in natural pain reduction and reward.

### FIGURE 3.20 Exercise and Endorphins

Endorphins are involved in both pain reduction and reward, and scientists think that endorphin production can be stimulated by strenuous exercise. An endurance event, such as a marathon or a speed skating competition, will yield an enormous endorphin rush. Here, the Canadian men's team wins gold at the 2010 Vancouver Olympics.



Endorphins' painkilling, or analgesic, effects help animals perform these behaviours even when they are in pain. In humans, administration of drugs, such as morphine, that bind with endorphin receptors reduces the subjective experience of pain. Apparently, morphine alters the way pain is experienced rather than blocking the nerves that transmit pain signals: People still feel pain, but report detachment and do not experience the pain as aversive (Foley, 1993).

**Substance P** is another neurotransmitter involved in pain perception as well as mood states and anxiety. This mysterious-sounding substance was first identified in 1931 by the pharmacology researchers Ulf von Euler and John Gaddum, who referred to it in their notes simply by the initial "P." Substance P helps transmit signals about pain to the brain. Probably the best evidence for it can be found at your local Mexican restaurant, where you can conduct your own experiment. Chili peppers, such as jalapeños, contain the substance capsaicin, which activates sensory neurons and leads to the release of substance P in the brain. This neural activity makes your tongue and mouth burn, your eyes water, and your hand reach for the nearest pitcher of water—though water spreads capsaicin around and causes the release of more substance P, which only intensifies the pain.

**substance P** A neurotransmitter involved in pain perception.



## SUMMING UP

### How Does the Nervous System Operate?

Neurons are the nervous system's basic units. Their primary task is to take in information, integrate that information, and pass signals to other neurons. A neuron receives information at the dendrites and processes that information in its cell body. It passes signals down its axon and then to other neurons' dendrites by firing. The insulating myelin sheath surrounding the axon allows the firing, or action potential, to travel, or propagate, rapidly. When a neuron is in a resting state, it is (slightly) negatively charged. Whether a neuron fires depends on the combination of excitatory and inhibitory signals the dendrites receive. Excitatory neurotransmitters make the postsynaptic neuron more likely to fire, and inhibitory neurotransmitters make the postsynaptic neuron less likely to fire. This firing results from the changes in the electrical charge across the cell membrane: Sodium ions rush in when the sodium channels open, and potassium ions rush out when the potassium channels open. When the channels close, sodium ions stop entering and potassium ions stop exiting, allowing the neuron to return to its resting state. The intensity of the excitatory signal affects the frequency of neural firing but not its strength—neurons fire on an all-or-none basis.

Action potentials cause vesicles to release neurotransmitters into the synaptic cleft. Neurotransmitters diffuse across the synaptic cleft and bind with specific postsynaptic receptors. These signals are terminated through reuptake, enzyme deactivation, or the actions of autoreceptors. Substances that enhance neurotransmitters' actions are agonists; those that inhibit action are antagonists. The number of known substances that act as neurotransmitters is now more than 60 and growing, but certain neurotransmitters are especially important for psychological research: Acetylcholine is involved in motor movement as well as complex mental processes, dopamine is involved in emotion and motor movement, serotonin is important in mood regulation and dreaming, GABA and glutamate are related to general inhibition and excitation, endorphins are important in pain reduction, and substance P is important in pain perception.



## MEASURING UP

1. Neurons communicate by firing. Put the following steps in the correct order so they describe this process.
  - a. The presynaptic neuron “reuptakes” the neurotransmitter from the synapse.
  - b. If the receptors allow a sufficient excess of excitatory neurotransmitters into the cell, the postsynaptic neuron will respond by opening its sodium and potassium gates.
  - c. Neurotransmitters bind with receptors on the postsynaptic neuron’s dendrites.
  - d. Excitatory and inhibitory messages are compared in the cell body of the postsynaptic neuron.
  - e. Neurotransmitters are released into the synapse by a presynaptic neuron.
  - f. The charge inside the cell goes from negative to positive.
  - g. The gates open in succession as the information is passed along the axon away from the cell body and toward the terminal buttons.
  - h. The sodium and potassium gates close, and the neuron returns to its resting potential.

2. Match each major neurotransmitter with its major functions.

The neurotransmitters are

- a. substance P
- b. glutamate
- c. acetylcholine
- d. serotonin
- e. endorphins
- f. dopamine
- g. GABA

The major functions are

1. emotional states, dreaming
2. reward, motivation, voluntary muscle control
3. enhancing action potentials, facilitating learning and memory
4. pain perception, mood, and anxiety
5. motor control, learning, memory, dreaming
6. reward, pain reduction
7. inhibiting action potentials, reducing anxiety, producing intoxication

### LEARNING OBJECTIVE

Identify the basic structures in the brain and their primary functions.

**central nervous system (CNS)** The brain and spinal cord.

**peripheral nervous system (PNS)** All nerve cells in the body that are not part of the central nervous system. The PNS includes the somatic and autonomic nervous systems.

## What Are the Basic Brain Structures and Their Functions?

The nervous system is an amazing network, responsible for everything we think, feel, or do. It is divided into two functional units: the **central nervous system (CNS)**, which consists of the spinal cord and brain, and the **peripheral nervous system (PNS)**, which consists of all the other nerve cells in the body. The two systems are anatomically separate, but their functions are highly interdependent. The PNS transmits a variety of information to the CNS, which organizes and evaluates that information and then directs the PNS to perform specific behaviours or make bodily adjustments. The discussion below first considers the CNS, focusing on the relation between the brain and psychological function.

Consider the human brain’s complexity. The first animals’ nervous systems were probably little more than a few specialized cells with the capacity for electrical signaling. An adult human brain today weighs approximately 1.4 kilograms and has the consistency of a soft-boiled egg. The brain is best viewed as a collection of interacting neural circuits that have accumulated and developed throughout human

evolution. Through the process of adapting to the environment, the brain has evolved specialized mechanisms to regulate breathing, food intake, sexual behaviour, and bodily fluids, as well as sensory systems to aid in navigation and assist in recognizing friends and foes. Everything we are and do is accomplished by the brain and, for more rudimentary actions, the spinal cord. Early in life, overabundant connections form among the brain's neurons; subsequently, life experiences help “prune” some of these connections to strengthen the rest.

The brain's basic structures and their functions enable us to accomplish feats such as seeing, hearing, remembering, and interacting with others. Understanding these relationships also helps us understand psychological disorders. As we learn more about the brain, however, we must avoid jumping to conclusions about brain/behaviour relationships that are not warranted by the data.

### THE BRAIN: A BRIEF HISTORY OF UNDERSTANDING ITS FUNCTIONS

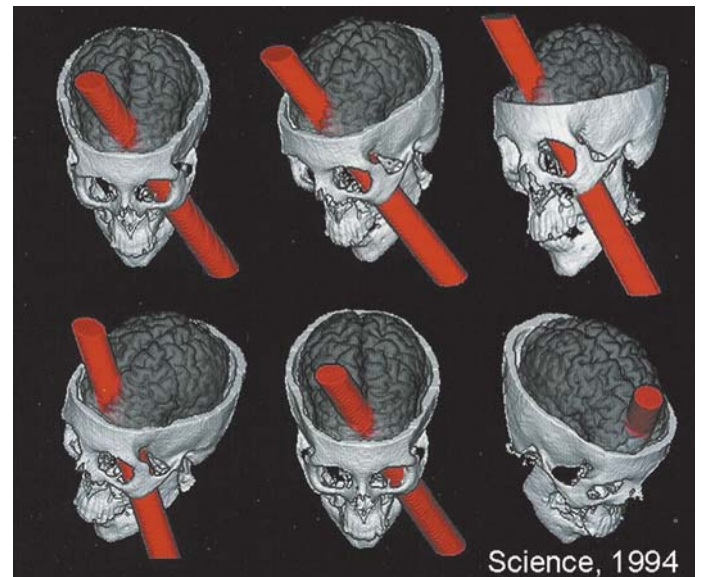
Psychological scientists have learned a great deal of what they know about the functioning of different brain regions through the careful study of people whose brains have been damaged by disease or injury. Perhaps the most famous historical example of brain damage is the case of Phineas Gage. In 1848, Gage was a 25-year-old foreman on the construction of Vermont's Rutland and Burlington Railroad. One day, he dropped his tamping iron on a rock, igniting some blasting powder. The resulting explosion drove the iron rod—about a metre long and two and a half centimetres in diameter—into his cheek, through his frontal lobes, and clear out through the top of his head (FIGURE 3.21). Gage was still conscious as he was hurried back to town on a cart. Able to walk, with assistance, upstairs to his hotel bed, he wryly remarked to the awaiting physician, “Doctor, here is business enough for you,” and said he expected to return to work in a few days. In fact, Gage lapsed into unconsciousness and remained unconscious for two weeks. Afterward, his condition steadily improved, and he recovered remarkably well, at least physically.

Unfortunately, Gage's accident led to major personality changes. Whereas the old Gage had been regarded by his employers as “the most efficient and capable” of workers, the new Gage was not. As one of his doctors later wrote, “The equilibrium or balance, so to speak, between his intellectual faculties and animal

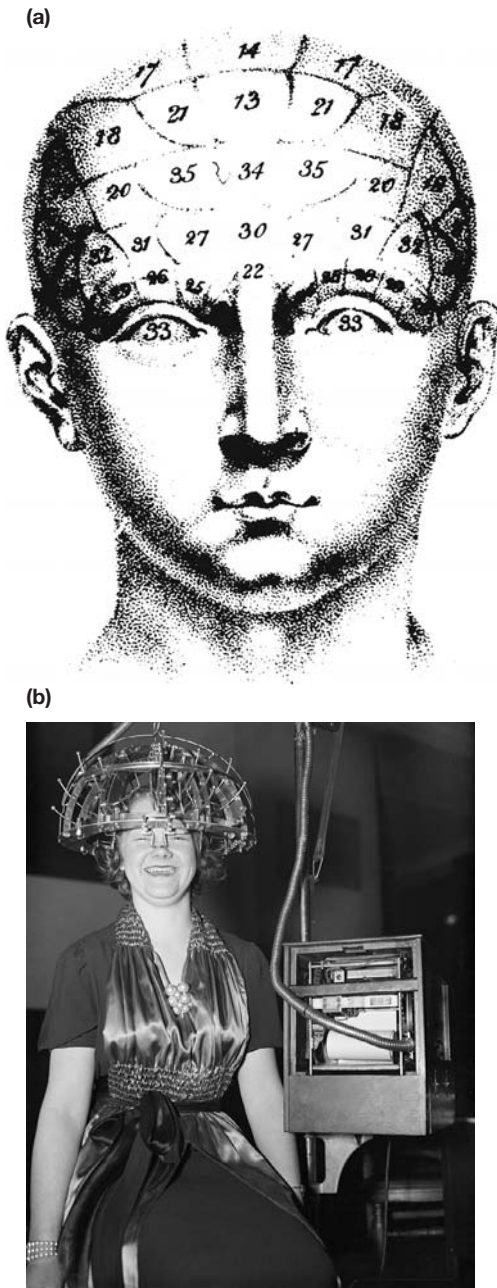
**FIGURE 3.21 Phineas Gage** As discussed below, analysis of Gage's damaged skull provided the basis for the first modern theories of the prefrontal cortex's role in both personality and self-control. **(a)** This photo shows Gage's death mask next to his skull. **(b)** This computer-generated path image reconstructs the rod's probable path into the skull.



**(a)**



**(b)**



**FIGURE 3.22 Phrenology and the Psychograph** (a) In the early nineteenth century, Johann Spurzheim created phrenological maps of the skull, including this one, where each numbered region corresponds to a different characteristic. (b) Psychographs, such as the one depicted here, were marketed as being able to “do the work of a psychoanalyst” by showing “your talents, abilities, strong and weak traits, without prejudice or flattery.”

propensities seems to have been destroyed. He is fitful, irreverent, indulging at times in the grossest profanity, . . . impatient of restraint or advice when it conflicts with his desires. . . . A child in his intellectual capacity and manifestations, he has the animal passions of a strong man.” In summary, Gage was “no longer Gage.”

Unable to get his foreman’s job back, Gage exhibited himself in various New England towns and at the New York Museum (owned by P. T. Barnum), worked at the stables of the Hanover Inn at Dartmouth College, and drove coaches and tended horses in Chile. After a decade, his health began to decline, and in 1860 he started having epileptic seizures and died within a few months. Gage’s recovery was initially used to argue that the entire brain works uniformly and that the healthy parts of Gage’s brain had taken over the damaged parts’ work. However, the medical community eventually recognized that Gage’s psychological impairments had been severe and that some areas of the brain in fact have specific functions. Gage’s case provided the basis for the first modern theories of the role of a part of the brain called the prefrontal cortex in personality and self-control. Reconstruction of Gage’s injury through examination of his skull has made it clear that the prefrontal cortex was the area most damaged by the tamping rod (Damasio, Grabowski, Frank, Galaburda, & Damasio, 1994). Recent studies of patients with similar injuries reveal that this brain region is particularly concerned with social phenomena, such as following social norms, understanding what other people are thinking, and feeling emotionally connected to others. People with damage to this region do not typically have problems with memory or general knowledge, but they often have profound disturbances in their ability to get along with others.

The brain was not always recognized as the mind’s home. The ancient Egyptians, for example, viewed the heart as more important; they elaborately embalmed each dead person’s heart, which was to be weighed in the afterlife to determine the deceased’s fate. The person’s brain, however, they simply threw away. But in the following centuries, especially among the Greeks and Romans, recognition grew that the brain was essential for normal mental functioning. Much of this change came from observing people with brain injuries. At least since the time of the Roman gladiators, it was clear that a blow to the head often produced disturbances in mental activity, such as unconsciousness or the loss of speech.

By the beginning of the nineteenth century, anatomists understood the brain’s basic structure reasonably well. But debates raged over how the brain produced mental activity. Did different parts do different things? Or were all areas of the brain equally important in cognitive activities such as problem solving and memory (an idea called *equipotentiality*)? In Germany in the early nineteenth century, the neuroscientist Franz Gall and his assistant, the physician Johann Spurzheim, proposed their theory of *phrenology*, based on the idea that the brain operates through functional localization. *Phrenology* is the practice of assessing personality traits and mental abilities by measuring bumps on the human skull. The theory of phrenology was so popular that in the 1930s an enterprising company manufactured 33 Psychographs. Psychographs were devices used to tell about participants’ personalities based on the locations and sizes of bumps on their heads. That these machines were popular at state fairs and amusement parks suggests few people, if any, took the personality readings seriously (FIGURE 3.22).

Although phrenology was an influential theory in its day because it was based on the seemingly scientific principle that brain functions were localized, its validity could not be tested scientifically. Taking this general idea of localization, the American behavioural psychologist Karl Lashley set out to identify the places in the brain where learning occurred. Lashley believed that specific brain regions (namely, parts of the cortex—discussed below) were involved in motor control and



sensory experiences, but that all other parts of the brain contributed equally to mental abilities. Today, Lashley's theory has been largely discredited, and we now know that the brain consists of a patchwork of highly specialized areas.

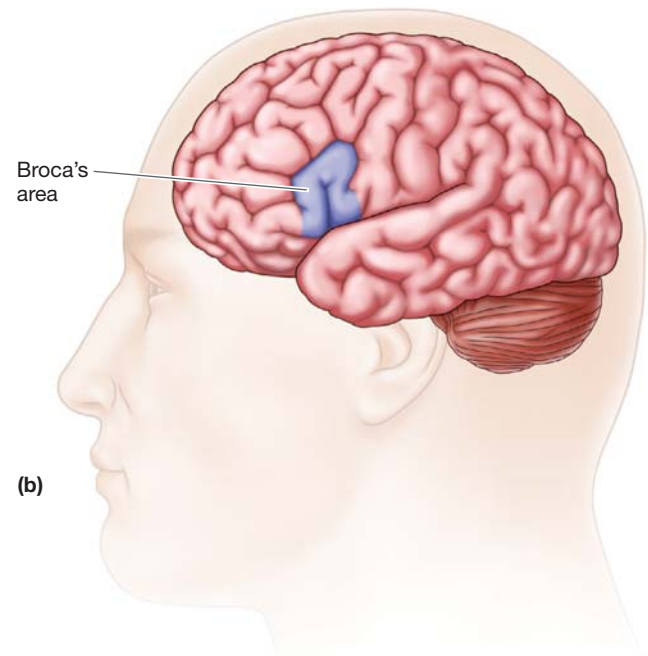
The first strong evidence that the brain regions perform specialized functions came from the work of the French physician and anatomist Paul Broca (Finger, 1994). In 1861, Broca performed an autopsy on his patient Monsieur Leborgne. Before his death, Leborgne had lost the ability to say anything other than the word *tan* but could still understand language. When he examined Leborgne's brain, Broca found substantial damage to the front left side, caused by a large lesion. This observation led him to conclude that this particular region was important for speech. Broca's theory has survived the test of time. This left frontal region became known as **Broca's area**, and it has since been repeatedly confirmed to be crucial for the production of language (FIGURE 3.23). In 1934, Wilder Penfield, of McGill University, became the first director of the world-renowned Montreal Neurological Institute, which remains at the forefront of neuroscience research. Penfield's studies helped develop cures for epilepsy and also mapped out the sensory and motor responses that occurred when specific brain regions were stimulated (discussed further in Chapter 5, "Sensation and Perception"). Penfield's mapping work showed the clear specificity of psychological functioning for distinct brain regions.

The debate over whether psychological processes are located in specific parts of the brain or distributed throughout the brain continued so long, in part, because until fairly recently researchers have not had methods for studying ongoing mental activity in the working brain. The invention of brain imaging methods in the late 1980s changed that situation swiftly and dramatically. Since then, research has exploded, cutting across various levels of analysis, linking specific brain areas with particular behaviours and mental processes. The new imaging techniques have advanced our understanding of the human brain the way the development of telescopes advanced our understanding of astronomy—and the brain's structures and functions may be as complex as distant galaxies. Although philosophers have long debated what it means to be conscious of something, psychological scientists now examine, even measure, consciousness and other mental states that were previously viewed as too subjective to be studied.

**Broca's area** The left frontal region of the brain, crucial for the production of language.

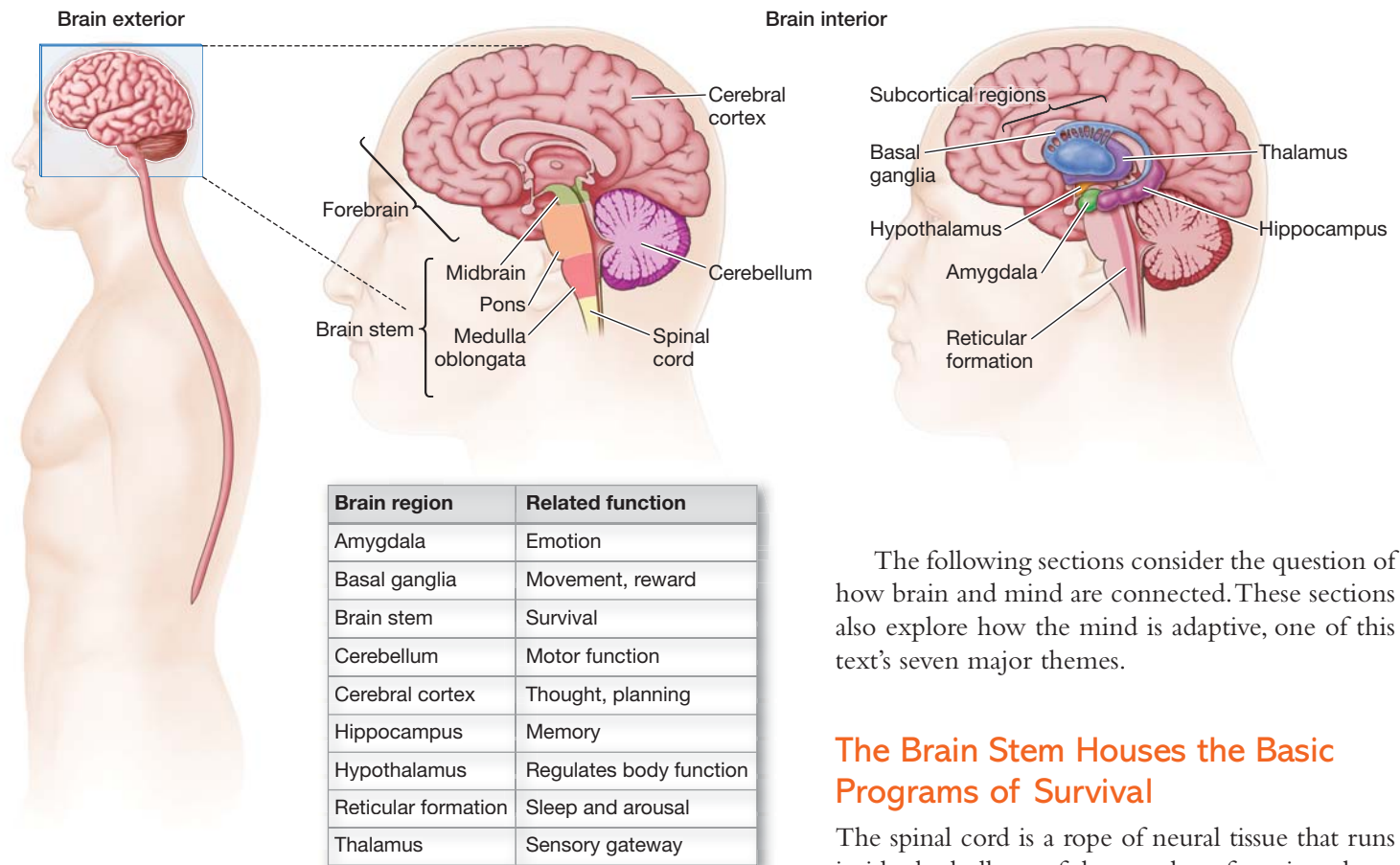


(a)



(b)

**FIGURE 3.23 Broca's Area** (a) Paul Broca studied Monsieur Leborgne's brain and identified the lesioned area as crucial for speech production. (b) This illustration shows the location of Broca's area.



**FIGURE 3.24** The Structures of the Brain

**brain stem** A section of the bottom of the brain, housing the most basic programs of survival, such as breathing, swallowing, vomiting, urination, and orgasm.

**cerebellum** A large, convoluted protuberance at the back of the brain stem, essential for coordinated movement and balance.

The following sections consider the question of how brain and mind are connected. These sections also explore how the mind is adaptive, one of this text's seven major themes.

### The Brain Stem Houses the Basic Programs of Survival

The spinal cord is a rope of neural tissue that runs inside the hollows of the vertebrae from just above the pelvis up into the base of the skull (FIGURE 3.24).

The spinal cord coordinates each reflex—a handful of neurons' simple conversion of sensation into action—but its most important function is to carry sensory information up to the brain and carry signals from the brain to the body parts below. In cross-section, the cord is seen to be composed of two distinct tissue types: the *grey matter*, which is dominated by neurons' cell bodies, and the *white matter*, which consists mostly of axons and the fatty sheaths that surround them. Grey and white matter are clearly distinguishable throughout the brain as well.

In the base of the skull, the spinal cord thickens and becomes more complex as it transforms into the **brain stem**. Consisting of the *medulla oblongata*, the *pons*, and the *midbrain*, the brain stem houses the nerves that control the most basic functions of survival, such as breathing, swallowing, vomiting, urination, and orgasm. As a continuous extension of the spinal cord, the brain stem performs functions for the head similar to those that the spinal cord performs for the rest of the body. Many reflexes emerge from here, analogous to the spinal reflexes; gagging is one example.

The brain stem also contains networks of neurons, known collectively as the *reticular formation*, that project up into the cerebral cortex (outer portion of the brain) and affect general alertness. The reticular formation is also involved in inducing and terminating the different stages of sleep (as discussed in Chapter 4, "The Mind and Consciousness").

### The Cerebellum Is Essential for Movement

The **cerebellum** (Latin, "little brain") is a large protuberance connected to the back of the brain stem (see Figure 3.24). Its size and convoluted surface make it look like

an extra brain. The cerebellum is extremely important for proper motor function, and lesions to its different parts produce very different effects. Damage to the little nodes at the very bottom causes head tilt, balance problems, and a loss of smooth compensation of eye position for head movement. Try turning your head while looking at this book and notice that your eyes remain focused on the material. Your eyes would not be able to do that if an injury affected the bottom of your cerebellum. Damage to the ridge that runs up its back would affect your walking. Damage to the bulging lobes on either side would cause a loss of limb coordination, so you would not be able to perform tasks such as reaching smoothly to pick up a pen.

The cerebellum's most obvious role is in motor learning. It seems to be "trained" by the rest of the nervous system and operates independently and unconsciously. The cerebellum allows you, for example, to ride a bicycle effortlessly while thinking about what you will eat for lunch. Functional imaging studies indicate an even broader role for the cerebellum, suggesting it is involved in various cognitive processes, including making plans, remembering events, using language, and experiencing emotion. Researchers have observed the cerebellum's activation when a person experiences a painful stimulus or observes a loved one receiving that stimulus, so the cerebellum may be involved in the experience of empathy (Lamm, Batson, & Decety, 2007; Singer et al., 2004).

## Subcortical Structures Control Emotions and Basic Drives

Above the brain stem and cerebellum is the *forebrain* (see Figure 3.24), which consists of the two cerebral hemispheres (left and right). From the outside, the most noticeable feature of the forebrain is the *cerebral cortex* (discussed in the next section). Below this are the *subcortical* regions, so named because they lie under the cortex. Subcortical structures that are important for understanding psychological functions include the *hypothalamus*, the *thalamus*, the *hippocampus*, the *amygdala*, and the *basal ganglia*. Some of these structures belong to the *limbic system*; *limbic* means "border" and separates the evolutionarily older (brain stem and cerebellum) and newer (cerebral cortex) parts of the brain. The brain structures in the limbic system are especially important for controlling basic drives, such as eating and drinking, and emotions (as discussed in Chapter 9, "Motivation and Emotion").

**HYPOTHALAMUS** The **hypothalamus** is the brain's master regulatory structure. Indispensable to the organism's survival, it receives input from almost everywhere in the body and brain and projects its influence to almost everywhere in the body and brain. It affects many internal organs' functions, regulating body temperature, body rhythms, blood pressure, and blood glucose levels. It is also involved in many basic drives, including thirst, hunger, aggression, and lust.

**THALAMUS** The **thalamus** is the gateway to the cortex: Almost all incoming sensory information must go through the thalamus before reaching the cortex. The only exception to this rule is the sense of smell, the oldest and most fundamental sense; it has a direct route to the cortex. During sleep, the thalamus shuts the gate on incoming sensations while the brain rests. (The thalamus is discussed further in Chapter 5, "Sensation and Perception.")

**HIPPOCAMPUS AND AMYGDALA** The **hippocampus** (Greek, "sea horse," for its sea horse shape) plays an important role in the storage of new memories. It seems to do this important work by creating new interconnections within the cerebral cortex with each new experience. Karl Lashley, in his research discussed above,

**hypothalamus** A small brain structure that is vital for temperature regulation, emotion, sexual behaviour, and motivation.

**thalamus** The gateway to the brain; it receives almost all incoming sensory information before that information reaches the cortex.

**hippocampus** A brain structure important for the formation of certain types of memory.

failed to find the location of memory by removing parts of rats' cerebral cortices (plural of *cortex*). Had he damaged their hippocampal formations as well, his results would have been quite different.

Consistent with its role in memory formation, the hippocampus has recently been shown to grow larger with increased use. One hypothesis suggests that the hippocampus may be involved in how we remember the arrangements of both places and objects in space, such as how streets are laid out in a city or how furniture is positioned in a room. The best study to support this theory focused on London taxi drivers. Maguire and colleagues (2003) found that one region of the hippocampus was much larger in London taxi drivers' brains than in most other London drivers' brains. Is a person with a large hippocampus more likely to drive a taxi? Or does the hippocampus grow as the result of navigational experience? London taxi drivers are, after all, well known for their expertise; to acquire a commercial license a London taxi driver must take an exam testing knowledge of the city's streets. That the volume of grey matter in the hippocampal region was highly correlated with the number of years of experience as a taxi driver suggests that the hippocampus increases its volume to store more accurate and larger representations of the spatial world. Thus it changes with experience. This phenomenon is just one of many examples of the way the brain's size and structure change in response to experiences.

**amygdala** A brain structure that serves a vital role in our learning to associate things with emotional responses and in processing emotional information.

The **amygdala** (Latin, "almond," for its almond shape), located immediately in front of the hippocampus, serves a vital role in our learning to associate things in the world with emotional responses: an unpleasant food with disgust, for example. The amygdala thus enables the organism to overrule instinctive responses by connecting memories of things to the emotions engendered by those things. The amygdala also intensifies memory's function during times of emotional arousal. For example, a frightening experience can be seared into your memory for life, although (as discussed further in Chapter 7, "Attention and Memory") your memory of the event may not be completely accurate. Research by the psychologist Adam Anderson, at the University of Toronto, also shows that emotional arousal can influence what people attend to in their environments (Anderson, Yamaguchi, Grabski, Lacka, 2006; Schmitz, De Rosa, & Anderson, 2009).

The amygdala plays a special role in our responding to stimuli that elicit fear. Affective processing of frightening stimuli in the amygdala is a hard-wired circuit that has developed over the course of evolution to protect animals from danger. The amygdala is also involved in evaluating a facial expression's emotional significance (Adolphs et al., 2005). Imaging studies have found that the amygdala activates especially strongly in response to a fearful face (Whalen et al., 2005).

Recent neuroimaging investigations have also implicated the amygdala in the processing of more positive emotions, including sexual arousal. Hamann and colleagues (2004) have found that activity within the amygdala increases when people view sexually arousing stimuli, such as nude photos or videos of sexual activity, and that the amygdala activates markedly higher in men. It has long been observed that males are more responsive than females to visual sexual stimuli; this study suggests that the amygdala may play a role in that greater responsiveness.

**basal ganglia** A system of subcortical structures that are important for the initiation of planned movement.

**THE BASAL GANGLIA** The **basal ganglia** are a system of subcortical structures crucial for planning and producing movement. They receive input from the entire cerebral cortex and project to the motor centres of the brain stem and, via the thalamus, back to the cortex's motor planning area. Evidence indicates that

damage to the basal ganglia can impair the learning of movements and of habits, such as automatically looking for cars before you cross the street.

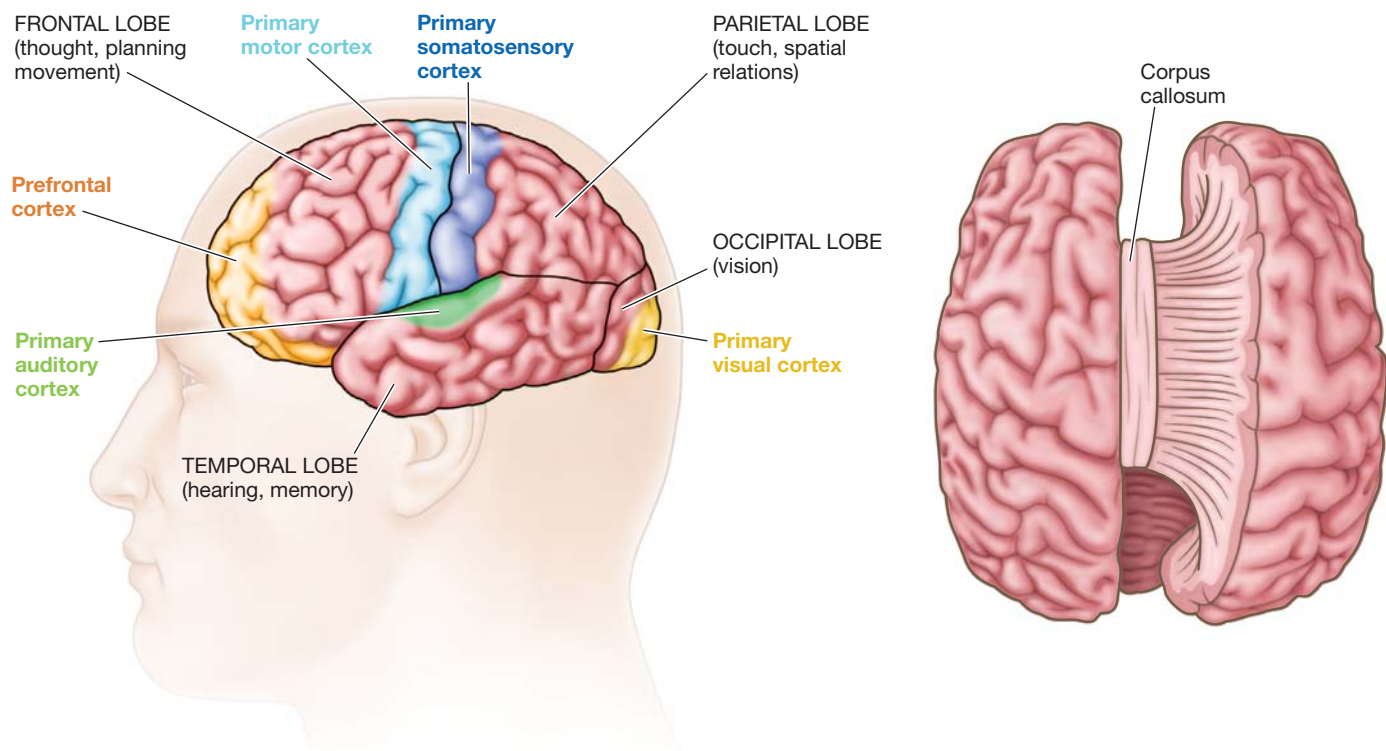
One structure in the basal ganglia, the *nucleus accumbens*, provides a good example of how environment interacts with the brain. Research has shown that the nucleus accumbens is important for experiencing reward. As discussed in Chapter 6, nearly every pleasurable experience, from eating chocolate (if you like chocolate) to looking at a person you find attractive, activates dopamine neurons in the nucleus accumbens. One brain imaging study found that viewing expensive sports cars led to greater activation of the nucleus accumbens in men than did viewing less expensive economy cars. Society generally values expensive objects, so this study and others indicate that cultural beliefs help make particular objects desirable and that the more desirable objects are, the more they activate basic reward circuitry in our brains (Erk, Spitzer, Wunderlich, Galley, & Walter, 2002).

### The Cerebral Cortex Underlies Complex Mental Activity

The **cerebral cortex** is the outer layer of the cerebral hemispheres and gives the brain its distinctive, wrinkled appearance. (*Cortex* is Latin for “bark”—the kind on trees.) In humans, the cortex is relatively enormous—the size of a large sheet of newspaper—and folded in against itself many times so as to fit within the skull. It is the site of all thoughts, detailed perceptions, and consciousness—in short, of everything that makes us human. It is also the source of culture and communication, allowing us to learn fine distinctions and intricate details of the outside world, to understand other people, to follow rules, to perform complex behaviours, and to *think* before we act. Each cerebral hemisphere has four “lobes”: the *occipital*, *parietal*, *temporal*, and *frontal* (FIGURE 3.25). The *corpus callosum*, a massive bridge of

**cerebral cortex** The outer layer of brain tissue, which forms the convoluted surface of the brain.

FIGURE 3.25 The Lobes and Hemispheres of the Cerebral Cortex



millions of axons, connects the hemispheres and allows information to flow between them.

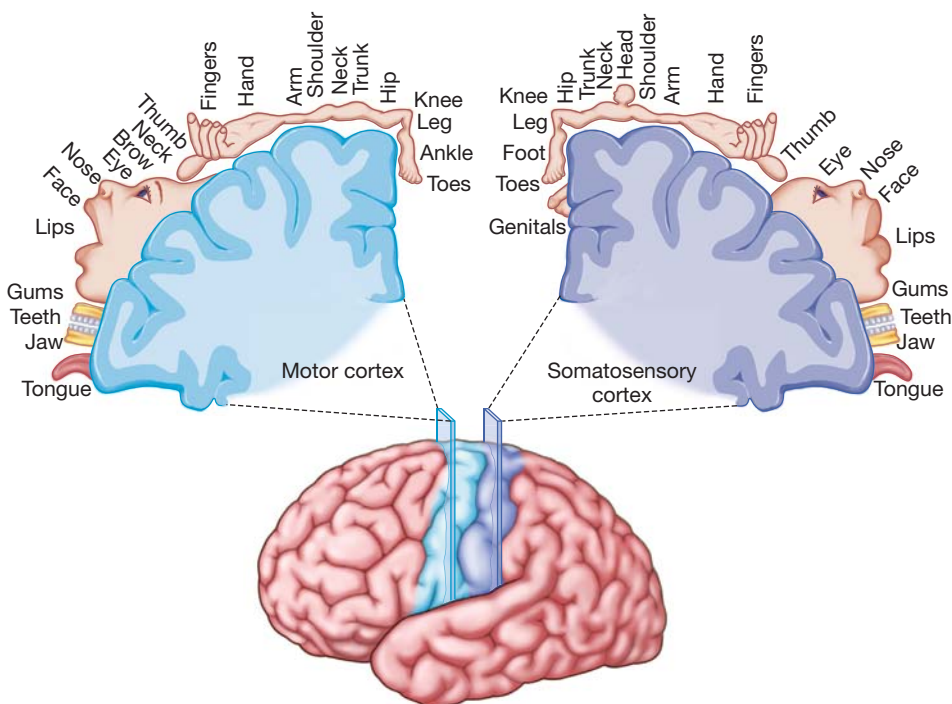
**occipital lobes** Regions of the cerebral cortex, at the back of the brain, important for vision.

**parietal lobes** Regions of the cerebral cortex, in front of the occipital lobes and behind the frontal lobes, important for the sense of touch and of the spatial layout of an environment.

The **occipital lobes**, at the back portion of the head, are devoted almost exclusively to vision. They consist of many visual areas, of which the *primary visual cortex* is by far the largest and is the major destination for visual information. As discussed further in Chapter 5, visual information is typically organized for the cerebral cortex in a way that preserves spatial relationships: That is, the image, relayed from the eye, is “projected” more or less faithfully onto the primary visual cortex. Two objects near one another in a visual image, then, will activate neurons near one another in the primary visual cortex. Surrounding the primary visual cortex is a patchwork of secondary visual areas that process various attributes of the visual image, such as its colours, forms, and motions.

The **parietal lobes** are devoted partially to touch: They include the *primary somatosensory* (Greek, “bodily sense”) *cortex*, a strip running from the top of the brain down the side. The labour is divided between the left and right cerebral hemispheres: The left hemisphere receives touch information from the right side of the body; the right hemisphere receives touch information from the left side of the body. This information is represented along the primary somatosensory cortex in a way that groups nearby sensations: Sensations on the fingers are near sensations on the palm, for example. The result, covering the primary somatosensory area, is a distorted representation of the entire body: the *somatosensory homunculus* (Greek, “little man”; **FIGURE 3.26**). The homunculus is distorted because more cortical area is devoted to the body’s more sensitive areas, such as the face and fingers. Our knowledge of the homunculus is based on Wilder Penfield’s mappings from his research at the Montreal Neurological Institute, mentioned earlier. Penfield examined patients who were to undergo surgery for epilepsy, to avoid damage to brain areas vital for functions such as speech. After a local anesthetic was applied to the scalp and while the patient was awake,

**FIGURE 3.26 The Somatosensory and Motor “Homunculus”** Wilder Penfield’s mappings of the brain provided the basis for knowledge of the homunculus. The cortical representation of the body surface is organized in strips that run down the side of the brain. Connected areas of the body tend to be represented next to each other in the cortex, and more sensitive skin regions have more cortical area devoted to them.



Penfield would electrically stimulate regions of the brain and ask the patient to report what he or she was experiencing. Penfield's studies provided important evidence about the amount of brain tissue devoted to each sensory experience.

One of the most interesting neurological disorders can result from a stroke or other damage to the right parietal region. In this syndrome, *hemineglect*, patients fail to notice anything on their left sides. Looking in a mirror, they will shave or put makeup on only the right sides of their faces. If two objects are held up before them, they will see only the one on the right. Asked to draw a simple object, they will draw only its right half (FIGURE 3.27).

The **temporal lobes** hold the *primary auditory cortex*, the brain region responsible for hearing. Also within the temporal lobes are specialized visual areas (for recognizing detailed objects such as faces), plus the hippocampus and amygdala (both critical for memory, as discussed above). At the intersection of the temporal and occipital cortices is the *fusiform face area*. Its name comes from the fact that this area is much more active when people look at faces than when they look at other things. In contrast, other regions of the temporal cortex are more activated by objects, such as houses or cars, than by faces. Damage to the fusiform face area can cause specific impairments in recognizing people but not in recognizing objects. Scientists have vigorously debated whether this region really is specific to faces or simply is involved in any task in which an expert has to classify objects (such as a guitar enthusiast knowing the differences between a Stratocaster and a Telecaster). Although the debate continues, recent evidence suggests that this region is more important for faces than for expertise (Rhodes, Byatt, Michie, & Puce, 2004).

The **frontal lobes** are essential for planning and movement. The rearmost portion of the frontal lobes are the motor areas, such as the *premotor cortex* and the *primary motor cortex*. The motor cortex includes neurons that project directly to the spinal cord to move the body's muscles. Its responsibilities are divided down the middle of the body, like those of the sensory areas: The left hemisphere controls the right arm, for example, whereas the right hemisphere controls the left arm. The rest of the frontal lobe consists of the **prefrontal cortex**, which occupies about 30 percent of the brain in humans. Scientists have long thought that what makes humans unique in the animal kingdom is our extraordinarily large prefrontal cortex. Recent evidence, however, indicates that what separates humans from other animals is not how much of the brain the prefrontal cortex occupies but rather the complexity and organization of its neural circuits—the way it is put together (Bush & Allman, 2004; Schoenemann, Sheehan, & Glotzer, 2005).

Parts of the prefrontal cortex are responsible for directing and maintaining attention, keeping ideas in mind while distractions bombard us from the outside world, and developing and acting on plans. Indispensable for rational activity, the prefrontal cortex is especially important for many aspects of human social life, such as understanding what other people are thinking, behaving according to cultural norms, and even contemplating our own existence. It provides both our sense of self and our capacity to empathize with others or feel guilty about harming them.

In the early twentieth century, mental health professionals employed a procedure called *lobotomy*, deliberately damaging the prefrontal cortex, to treat many mental patients (FIGURE 3.28). This form of brain surgery generally left patients lethargic and emotionally flat, and therefore much easier to manage in mental hospitals, but it also left them disconnected from their social surroundings. Most lobotomies were performed in the late 1940s and early 1950s.



**FIGURE 3.27 Hemineglect** This drawing, made by a hemineglect patient, omits much of the flower's left side.

**temporal lobes** The lower region of the cerebral cortex, important for processing auditory information and for memory.

**frontal lobes** The region at the front of the cerebral cortex concerned with planning and movement.

**prefrontal cortex** A region of the frontal lobes, especially prominent in humans, important for attention, working memory, decision making, appropriate social behaviour, and personality.

**FIGURE 3.28 Lobotomy** Dr. Walter Freeman, of the United States, performs a lobotomy by inserting an ice pick–like instrument under the upper eyelid of his patient to cut the nerve connections in the front part of the brain, 1949.



## SUMMING UP

### What Are the Basic Brain Structures and Their Functions?

The nervous system's different parts all have essential roles. The spinal cord is involved in basic movement and reflexes. The brain stem serves survival functions, controlling breathing and heart rate. At the back of the brain stem is the cerebellum, a work-horse that learns routine habits of movement and possibly of thought. Beneath the cortex, the thalamus serves as a way station through which sensory information travels, the hypothalamus regulates bodily systems and controls the hormonal system, the hippocampus is involved in memory, and the amygdala influences emotional states, especially fear. Finally, the cerebral cortex is the outer surface of the brain, divided into occipital, parietal, temporal, and frontal lobes. Each lobe serves specific functions; the frontal lobe is essential for both higher-level thought and social behaviour.

## MEASURING UP

1. Match each lobe of the brain with its functions.

The lobes are

- a. frontal
- b. occipital
- c. parietal
- d. temporal

The functions are

1. hearing
2. thought
3. touch
4. vision

2. Match each of the following brain structures with its role or function. (You will need to remember these terms and facts to understand later discussions of learning, memory, loving, mental illness, anxiety, and other aspects of mind and behaviour.)

The brain structures are

- a. brain stem
- b. cerebellum
- c. basal ganglia
- d. hypothalamus
- e. thalamus
- f. hippocampus
- g. amygdala
- h. cerebral cortex

The roles and functions are

1. primary structure for memory
2. sensory relay station
3. important for emotions
4. divided into four lobes
5. regulates vital functions such as body temperature
6. regulate planned movement and reward
7. regulates breathing and swallowing
8. "little brain," involved in movement

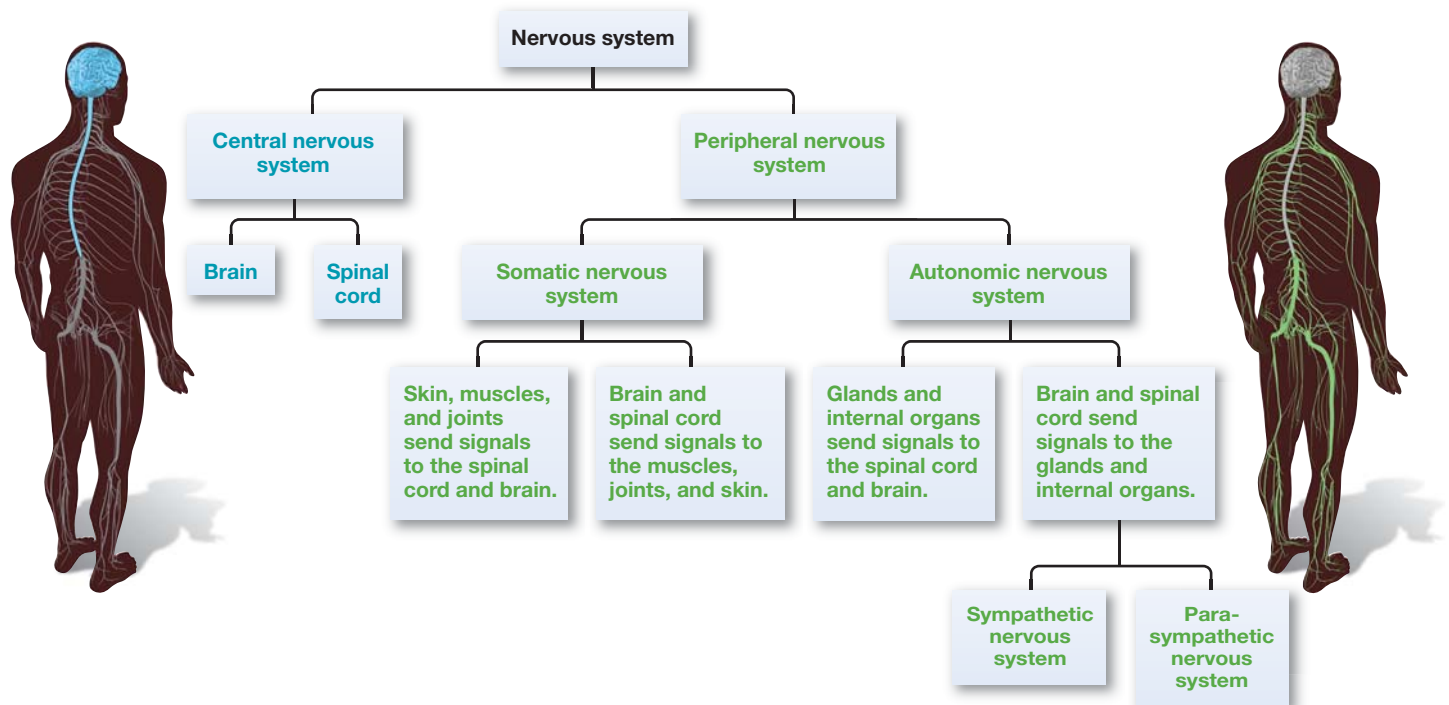
### LEARNING OBJECTIVE

Describe the key structures in the endocrine system and how they communicate to affect behaviour.

## How Are Neural Messages Integrated into Communication Systems?

As noted in the section above, the nervous system consists of two functional units: the central nervous system (CNS), just discussed, and the peripheral nervous system (PNS), which transmits a variety of information to the CNS and responds to messages from the CNS to perform specific behaviours or make bodily adjustments. This section describes the interaction of the nervous system and a different mode of communication, the *endocrine system*, in the production of psychological activity.





**FIGURE 3.29** The Major Divisions of the Nervous System

## The Peripheral Nervous System Includes the Somatic and Autonomic Systems

The PNS has two primary components, which themselves are referred to as nervous systems: the *somatic nervous system* and the *autonomic nervous system* (FIGURE 3.29). The **somatic nervous system** transmits sensory signals to the CNS via nerves (bundles of axons). Specialized receptors in the skin, muscles, and joints send sensory information to the spinal cord, which relays it to the brain. In addition, the CNS sends signals through the somatic nervous system to muscles, joints, and skin to initiate, modulate, or inhibit movement. The second major component of the PNS, the **autonomic nervous system (ANS)** regulates the body's internal environment by stimulating glands (such as sweat glands) and by maintaining internal organs (such as the heart). Nerves in the ANS carry *somatosensory* signals to the CNS, providing information about, for example, the fullness of your stomach or how anxious you feel.

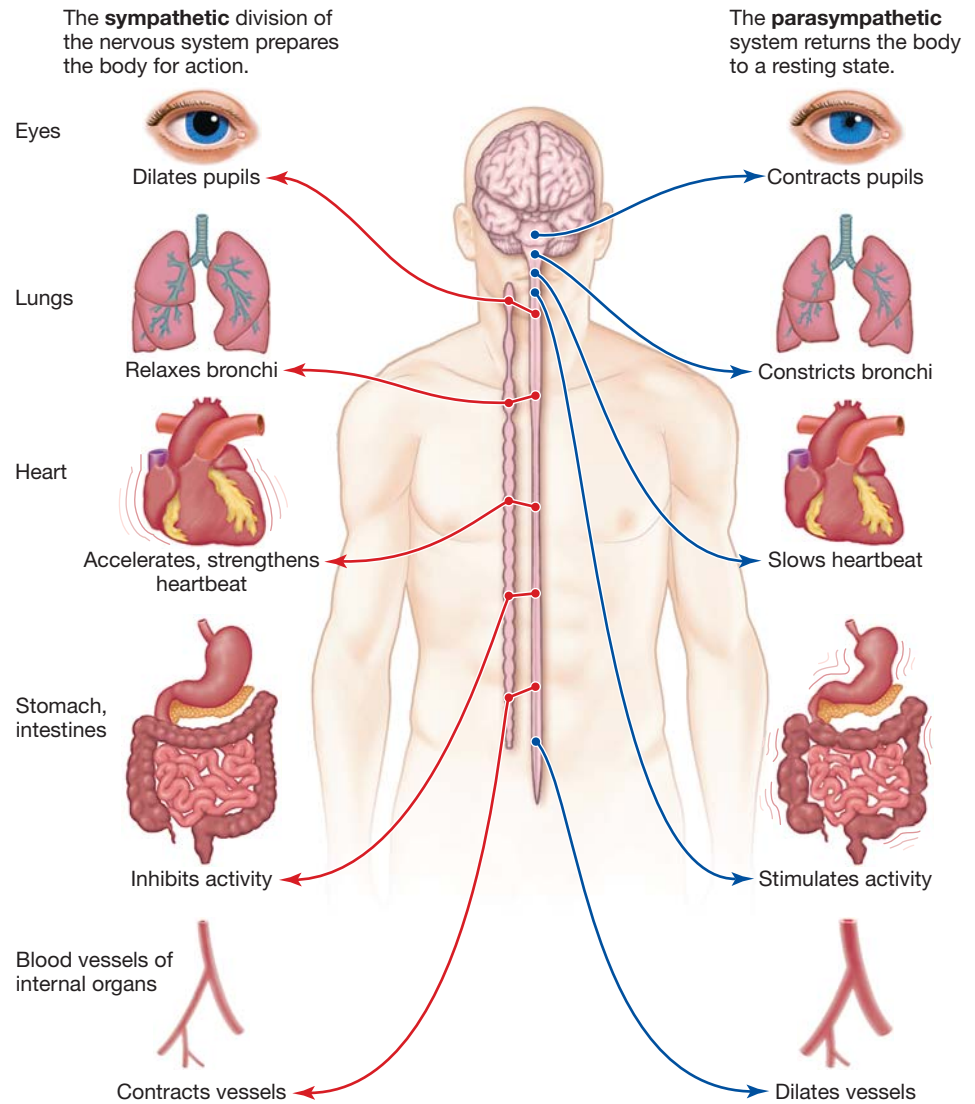
**SYMPATHETIC AND PARASYMPATHETIC DIVISIONS** Two types of signals, sympathetic and parasympathetic, travel from the CNS to organs and glands in the PNS (FIGURE 3.30). To understand them, imagine you hear a fire alarm. In the second after you hear the alarm, signals go out to parts of your body that tell those parts to prepare for action. As a result, blood flows to skeletal muscles, epinephrine is released to increase heart rate and blood sugar, your lungs take in more oxygen, your digestive system suspends activity as a way of conserving energy, your pupils dilate to maximize visual sensitivity, and you perspire to keep cool. These preparatory actions are prompted by the autonomic nervous system's **sympathetic division**. Should there be a fire, you will be physically prepared to flee. If the alarm turns out to be false, your heart will return to its normal steady beat, your breathing will slow, you will resume digesting food, and you will stop perspiring. This return to

**somatic nervous system** A major component of the peripheral nervous system; it transmits sensory signals to the CNS via nerves.

**autonomic nervous system (ANS)** A major component of the peripheral nervous system; it regulates the body's internal environment by stimulating glands and by maintaining internal organs such as the heart, gall bladder, and stomach.

**sympathetic division of ANS** A division of the autonomic nervous system; it prepares the body for action.

**FIGURE 3.30** The Sympathetic and Parasympathetic Systems



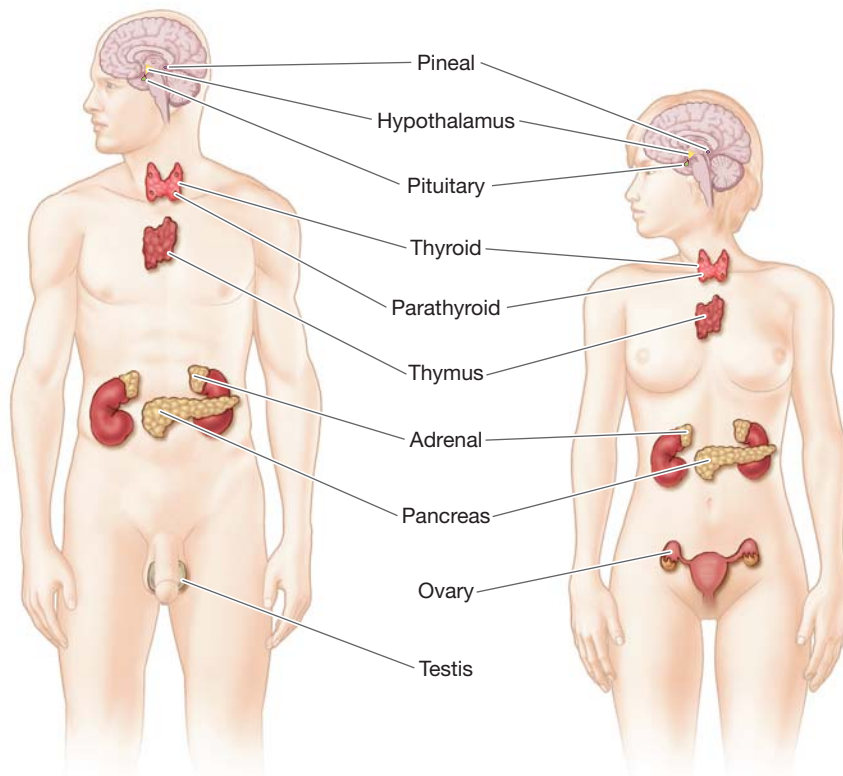
**parasympathetic division of ANS**

A division of the autonomic nervous system; it returns the body to its resting state.

a normal state will be prompted by the ANS’s **parasympathetic division**. Most of your internal organs are controlled by inputs from sympathetic and parasympathetic systems. The more aroused you are, the greater the sympathetic system’s dominance.

It does not take a fire alarm to activate your sympathetic nervous system. When you meet someone you find attractive, for example, your heart beats quickly, you perspire, you might start breathing heavily, and your pupils widen. Such signs of sexual arousal, which happens when the ANS’s sympathetic division is activated, provide nonverbal cues during social interaction. The sympathetic nervous system is also activated by psychological states such as anxiety or unhappiness. Certain people worry a great deal or do not cope well with stress; their bodies are in a constant state of arousal. Important research by Hans Selye, at the Université de Montréal, demonstrated that chronic activation of the sympathetic nervous system is associated with medical problems that include ulcers, heart disease, and asthma. Selye’s work is discussed further in Chapter 10, “Health and Well-Being.”

**FIGURE 3.31** The Major Endocrine Glands



**endocrine system** A communication system that uses hormones to influence thoughts, behaviours, and actions.

**hormones** Chemical substances, typically released from endocrine glands, that travel through the bloodstream to targeted tissues, which are subsequently influenced by the hormones.

**gonads** The main endocrine glands involved in sexual behaviour: in males, the testes; in females, the ovaries.

## The Endocrine System Communicates through Hormones

Like the nervous system, the **endocrine system** is a communication network that influences thoughts, behaviours, and actions. Both systems work together to regulate psychological activity. For instance, from the nervous system the brain receives information about potential threats to the organism, and through the endocrine system it prepares the organism to deal with those threats. (The threats could involve physical injury or be mental, such as nervousness at having to talk in front of a group.) The main difference between the two systems is in their modes of communication: The endocrine system uses hormones, whereas the nervous system uses electrochemical signals. **Hormones** are chemical substances released into the bloodstream by the ductless *endocrine glands*, such as the pancreas, thyroid, and testes or ovaries (**FIGURE 3.31**). Once released, hormones travel through the bloodstream until they reach their target tissues, where they bind to receptor sites and influence the tissues. Because they travel through the bloodstream, hormones can take from seconds to hours to exert their effects; once hormones are in the bloodstream, their effects can last for a long time and affect multiple targets.

**HORMONES' EFFECTS ON SEXUAL BEHAVIOUR** An example of hormonal influence is in sexual behaviour. The main endocrine glands influencing sexual behaviour are the **gonads**—the testes



*"You've been charged with driving under the influence of testosterone."*

## Real World PSYCHOLOGY

in males and the ovaries in females. Although many people talk about “male” and “female” hormones, the two major gonadal hormones are identical in males and females, but the quantity differs: *androgens* such as testosterone are more prevalent in males, whereas *estrogens* such as estradiol and progesterone are more prevalent in females. Gonadal hormones influence both the development of secondary sex characteristics and adult sexual behaviour.

For males, successful sexual behaviour depends on having at least a minimum amount of testosterone. Prior to puberty, surgical removal of the testes, or *castration*, diminishes the capacity for developing an erection and lowers sexual interest. Yet a man castrated after puberty will be able to perform sexually if he receives an injection of testosterone. That testosterone injections do not increase sexual behaviour in healthy men implies that a healthy man needs only a minimum amount of testosterone to perform sexually (Sherwin, 1988).

Gonadal hormones' influence on females is much more complex. Many nonhuman female animals experience a finite period, *estrus*, when the female is sexually receptive and fertile. During estrus, the female displays behaviours designed to attract the male. Surgical removal of the ovaries terminates estrus: no longer receptive, the female ends her sexual behaviour. However, injections of estrogen reinstate estrus. Women's sexual behaviour may have more to do with androgens than with estrogens (Morris, Udry, Khan-Dawood, & Dawood, 1987). In pioneering work by Barbara Sherwin, of McGill University, women with higher levels of testosterone report greater interest in sex, and testosterone injections increase women's sexual interest after surgical removal of the uterus (Sherwin, 1994; Sherwin, 2008). Although women's sexual activity is not particularly linked to the menstrual cycle (Breedlove, Rosenzweig, & Watson, 2007), it appears that when ovulating, women find men who look and act masculine more attractive (Gangestad, Simpson, Cousins, Garver-Apgar, & Christensen, 2004), and they show greater activity in brain regions associated with reward when viewing attractive male faces (Rupp et al., 2009). In addition, women report having lower self-esteem when ovulating, and their greater motivation to find a mate during that time may increase women's efforts to appear attractive (Hill & Durante, 2009). Indeed, one study found that women showed up for a laboratory study wearing more revealing clothing when their fertility was highest (Durante, Li, & Haselton, 2008).

## Actions of the Nervous System and Endocrine System Are Coordinated

All the communication systems described in this chapter link neurochemical and physiological processes to behaviours, thoughts, and feelings. These systems are fully integrated and interact to facilitate survival, using information from the organism's environment to direct adaptive behavioural responses. Ultimately, the endocrine system is under the central nervous system's control. The brain interprets external and internal stimuli, then sends signals to the endocrine system, which responds by initiating various effects on the body and on behaviour.

Most of the central control of the endocrine system is accomplished by the hypothalamus, located just above the roof of the mouth (see Figure 3.24). How does this central control work? At the base of the hypothalamus is the **pituitary gland**, which governs the release of hormones from the rest of the endocrine glands. Neural activation causes the hypothalamus to secrete a

**pituitary gland** Located at the base of the hypothalamus; the gland that sends hormonal signals controlling the release of hormones from endocrine glands.

particular *releasing factor*. The releasing factor causes the pituitary to release a hormone specific to that factor, and the hormone then travels through the bloodstream to endocrine sites throughout the body. Once the hormone reaches the target sites, it touches off the release of other hormones, which subsequently affect bodily reactions or behaviour. The pituitary is often referred to as the “master gland” of the body: By releasing hormones into the bloodstream, it controls all other glands and governs major processes such as development, ovulation, and lactation.

This integration can be extremely finely tuned. For example, consider physical growth. *Growth hormone (GH)*, an extract from the pituitary gland, prompts bone, cartilage, and muscle tissue to grow or helps them regenerate after injury. Since the 1930s, many people have administered or self-administered GH to increase body size and strength. Toronto’s sports-medicine specialist Dr. Anthony Galea (**FIGURE 3.32**) was suspected of providing performance-enhancing drugs, including growth hormone, to athletes such as the Canadian Olympic gold-medal sprinter Donovan Bailey, the American baseball player Alex Rodriguez, and the golfing phenomenon Tiger Woods. Galea, who admits using GH personally, denies that he ever provided it to his famous clients, who agree that they have not received illegal treatments from him. Many athletes have sought a competitive advantage through GH, however.

Similarly, GH has helped make the current generation of young adults in Japan considerably taller than their parents’ generation (Murata, 2000). This increase has come about thanks to the increased availability and consumption of dietary protein in Japan after World War II. How is GH related to protein intake? *Growth hormone releasing factor (GRF)* stimulates the release of GH, which relies on protein to build bones and muscles. Researchers at the University of Toronto have found that GRF also selectively stimulates the eating of protein but not of fats or carbohydrates, perhaps by making protein especially enjoyable (Dickson & Vaccarino, 1994). The area of the hypothalamus connected to GRF neurons is involved in sleep/wake cycles, and thus the bursts of GH, the need



**FIGURE 3.32 Growth Hormone: Sports Medicine?** Dr. Anthony Galea has taken human growth hormone, but denies having given it to athletes to enhance their sports performances.

for protein, and the consumption of protein are controlled by the body's internal clock. All these connections illustrate how the CNS, the PNS, and the endocrine system work together to ensure the organism's survival: These systems prompt the behaviours that provide the body with the substances it needs when it needs them.

## SUMMING UP

### How Are Neural Messages Integrated into Communication Systems?

The central nervous system, consisting of the brain and spinal cord, attends to the body and the environment, initiates actions, and directs the peripheral nervous system and endocrine system to respond appropriately. All three systems use chemicals to transmit their signals, but transmission in the nervous system occurs across synapses whereas transmission in the endocrine system uses hormones that travel through the bloodstream. Gonadal hormones (estrogen, progesterone, and testosterone) are important in the development of secondary sex characteristics and in the sex drive. The hypothalamus controls the endocrine system by directing the pituitary to release specific hormones. The various communication systems are integrated and promote behaviour that is adaptive to the environment.

## MEASURING UP

1. Match each statement with one or more of the following terms: peripheral nervous system (PNS); somatic nervous system; autonomic nervous system (ANS); sympathetic division; parasympathetic division.
  - a. You are studying quietly in the library when a friend jumps out from behind a partition and scares you, making your heart race. Your \_\_\_\_\_ has been affected.
  - b. When you calm down and return to your former (not scared) state, your \_\_\_\_\_ is affected.
  - c. Jasey-Jay Anderson, winner of a gold medal in snowboarding at the 2010 Olympics, must have a remarkable \_\_\_\_\_.
  - d. \_\_\_\_\_ works directly with the central nervous system (CNS) to coordinate behaviour.
  - e. \_\_\_\_\_ consists of two main parts, which maintain homeostasis.
2. Which of the following statements are true? Mark as many as apply.
  - a. Only gays and lesbians secrete testosterone and estrogen.
  - b. All (normal) people of both sexes secrete testosterone and estrogen.
  - c. Men have gonads, and women have ovaries.
  - d. The endocrine system acts more slowly than the nervous system.
  - e. Hormones are secreted from several places in the body, including the brain.
  - f. The pituitary gland is called the master gland.
  - g. The central nervous system and the peripheral nervous system work together, whereas the endocrine system works independently.
  - h. Women's sexual responsiveness is related more to androgens (such as testosterone) than to estrogen.

## How Does the Brain Change?

Despite the great precision and the specificity of its connections, the brain is extremely malleable. Over the course of development, after injury, and throughout our constant stream of experience, the brain continually changes, a property known as **plasticity**. The brain can reorganize itself based on which parts of it are used lightly and which are used heavily. Research into the way the brain changes is providing major insights into the mind. The latest brain research techniques and the knowledge derived from them are direct outgrowths of science's biological revolution.

The brain follows a predictable development pattern, with different structures and abilities progressing at different rates and maturing at different points in life. Reptiles hatch from their leathery eggs ready to go; in contrast, human infants require lots of both sleep and high-quality nutrition before they can function independently. As children's bodies grow and develop, their brains grow and develop, actively rewiring in major ways for many years. In addition, every life experience refines and retunes an individual brain's connections. Thus brain plasticity reflects the interactive nature of our biological and psychological influences.

### The Interplay of Genes and Environment Wires the Brain

The brain's development follows set sequences programmed in the genes: Babies' general vision develops before their ability to see depth, for example, and the prefrontal cortex is not anatomically fully mature until early adulthood. But even with these meticulously specified genetic instructions, environment plays a major role. Gene expression depends utterly on environment. Which cells express which genes, and to what extent, is determined by environment. Through the constant interplay between nature and nurture, environment affects our DNA's activity and the products of that activity.

**CELL IDENTITY BECOMES FIXED OVER TIME** In the developing embryo, each new cell receives signals, from its surroundings, that determine what type of cell it will become. If cells from one part of an embryo are surgically transplanted to another part, the transplant's success depends on how developed the cells' identity is. Tissue transplanted early enough completely transforms into whatever type is appropriate for its new location. As an embryo develops, each cell becomes more and more committed to its identity, so transplanting cells too late may disfigure the organism. Many people are therefore excited about the possibility of transplanting fetal cells, which are undeveloped enough to become any type of tissue, to cure diseases and even restore mobility to people who have lost some motor abilities. This work is in its infancy, so to speak, but it promises breakthroughs in how mental illness and other psychological conditions are treated. Neural cells transplanted early enough take on the identity appropriate to their new location, and the organism develops normally.

**EXPERIENCE FINE-TUNES NEURAL CONNECTIONS** Connections form between brain structures when growing axons are directed by certain chemicals that tell them where to go and where not to go. The major connections are established by chemical messengers, but the detailed connections are governed by experience. If a cat's eyes are sewn shut at birth, depriving the animal of visual input, the visual cortex fails to develop properly; if the sutures are removed



#### LEARNING OBJECTIVES

Explain how culture and other environmental factors change the brain.

Describe the similarities and differences in females' and males' brains and explain the limitations on what we can infer from sex differences in the brain.

**plasticity** A property of the brain that allows it to change as a result of experience, drugs, or injury.

weeks later, the cat is permanently blind, even though its eyes function normally. Adult cats that are similarly deprived do not lose their sight (Wiesel & Hubel, 1963). Evidently, ongoing activity is necessary in the visual pathways to refine the visual cortex enough for it to be useful. In general, such plasticity has *critical periods*, times in which certain experiences must occur for development to proceed normally.

To study experience's effects on development, researchers reared rats in two different laboratory environments. One group was raised in a normal environment for laboratory rats: featureless boxes with bedding at the bottom, plus dishes for food and water. The other group was raised in an enriched environment, with many interesting things to look at, puzzles to solve, obstacles to run, toys to play with, running wheels to exercise on, and even balance beams to hone athletic skills on. This second group's "luxury" items might simply have approximated rat life in the wild, allowing normal rat development, while the mental deprivation of the first group's environment caused the unused portions of those rats' brains to atrophy. As a result, the second group developed bigger, heavier brains than the first group (Rosenzweig, Bennett, & Diamond, 1972). Thus experience is important for normal development and maybe even for superior development.

## Culture Affects the Brain

Humans are social animals, and our daily social interactions, which vary among cultures (and subcultures and individuals), are reflected in the ways our brains are organized. *Cultural neuroscience* studies cultural variables' effects on the brain, the mind, genes, and behaviour. This subdiscipline is necessarily multidisciplinary, bringing together information about brain functions (i.e., methods and data from brain imaging), analyses of social and emotional processes (e.g., recognizing faces, deciding whom to trust), and examinations of perceptual processes. It exemplifies the way that psychological science works across multiple levels of analysis.

Growing evidence indicates that cultural experiences shape perception and cognition to the extent that cultural differences contribute to different patterns of brain activity. For instance, as discussed in Chapter 1, people from Eastern cultures tend to focus on background (i.e., context) whereas people from Western cultures tend to focus on foreground. Measurements of eye movements have shown that American participants spend more time looking at objects than do Chinese participants, who are much more likely to look at those objects' surroundings (Chua, Boland, & Nisbett, 2005). In recent brain imaging studies comparing participants in the United States and Singapore, researchers presented images whose backgrounds and foregrounds varied in complexity and found differences in brain activity in a number of visual brain regions, supporting the general conclusion that Westerners focus more on objects than do Easterners (Goh et al., 2007; Gutchess et al., 2006).

Does this mean that people from different cultures see the world in fundamentally different ways? One way to address this question is to examine whether the cultural groups differ in early or late stages of visual processing. If they differ in early stages, such as those in the primary visual cortex, their visual systems most likely process the raw information differently. If the groups differ in later visual processing, they might be employing learned preferences for attending to different aspects of the visual world. In one recent brain imaging study



(Hedden, Ketay, Aron, Markus, & Gabrieli, 2008), investigators asked participants to judge whether lines were absolute (i.e., did the line match the line shown on a previous trial?) or relative (i.e., did the line match the proportional scaling of the previous line to its surrounding?). On some trials, the absolute and relative judgments were at odds with each other (i.e., the line was the same length, but differed in proportional scaling). As the researchers had hypothesized, the European American participants found the relative task most difficult and the Asian participants, who preferred to make relative judgments, found the absolute task most difficult. For both kinds of participants, performing the most difficult task led to increased activity in brain regions involved in focusing attention on that task. These findings indicate no cultural differences in how the participants understood the tasks but cultural differences in how the participants paid attention to the tasks. Such differences suggest that within cultural contexts people learn which features in the environment, being more important, merit more attention.

A similar pattern governs people's responses to facial expressions of emotion. Cultures differ slightly in how they express emotions, and as discussed further in Chapter 9, evidence indicates that people are better at identifying emotional expressions from members of their own cultures than from members of other cultures. This occurs in part, it seems, because people have more experience in interpreting emotional expressions among those with whom they interact regularly. If so, this greater recognition should mean that people's brain responses are enhanced when they are interpreting emotional expressions within their own cultural groups than from other cultural groups. In a recent brain imaging study, investigators showed pictures of neutral facial expressions and fearful facial expressions, both kinds on Japanese and American faces, to participants in Japan and the United States (Chiao et al., 2008). As noted earlier in this chapter, the amygdala shows increased activity when people view fearful expressions, and in this study amygdala activity was greatest when participants viewed fearful expressions within their own cultural group. Thus cultural experience appears to fine-tune the brain's responses to such important environmental cues (FIGURE 3.33).

## The Brain Rewires Itself throughout Life

Although an organism's plasticity decreases with age, the human brain retains the ability to rewire itself throughout life, and into very old age it can grow new connections among neurons and even grow new neurons. The rewiring and growth within the brain represents learning's biological basis. Because the laws of learning and of brain development are as certain as the laws of gravity, it is impossible for a person with a normally developing brain not to learn. One of this book's seven themes is that we are often unaware of what we can and cannot control in our lives, and frequently we cannot control what we learn in any particular situation.

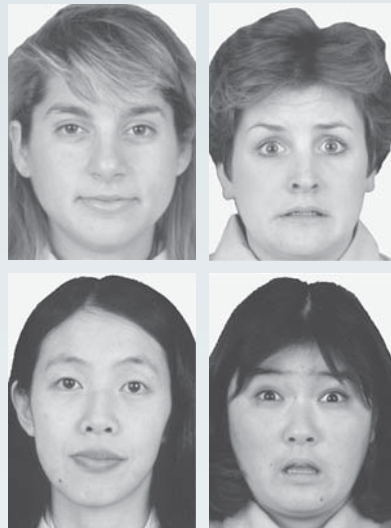
**CHANGE IN THE STRENGTH OF CONNECTIONS UNDERLIES LEARNING** In every moment of life, we gain memories: experiences and knowledge that are acquired instantaneously and may be recalled later, as well as habits that form gradually. All these memories are reflected in the brain's physical changes.

### FIGURE 3.33 Scientific Method: Chiao's Study of How Culture Affects the Brain

**Hypothesis:** People are better at identifying emotional expressions from members of their own cultures than from members of other cultures.

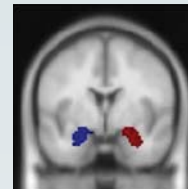
**Research Method:**

**1** Participants in Japan and the United States were shown pictures of neutral expressions and fear expressions portrayed by Japanese and American faces.

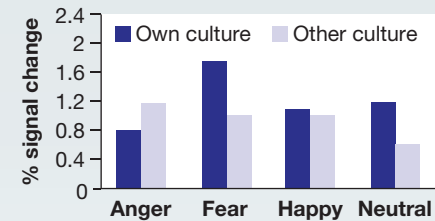


**Results:** Participants showed greatest amygdala activity in response to fear expressed by members of their own cultural group.

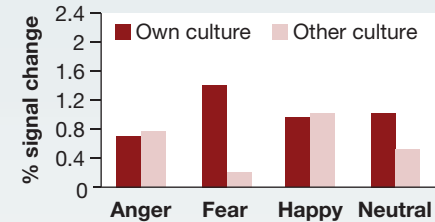
**2** Participants' amygdala activity was measured using fMRI scans.



**Left amygdala**



**Right amygdala**



**Conclusion:** Cultural experience appears to fine-tune the brain's response to important environmental clues.

Psychological scientists widely accept that changes in the brain are most likely not in its larger wiring or general arrangement but mainly in the strength of existing connections. One possibility is that when two neurons fire simultaneously, the synaptic connection between them strengthens, making them more likely to fire together in the future; conversely, *not* firing simultaneously tends to weaken two neurons' connection. This theory, first proposed by the renowned Canadian psychologist Donald Hebb in the 1940s and summarized by the catchphrase "Fire together, wire together," is consistent with a great deal of experimental evidence and many theoretical models. It accounts for both the "burning in" of an experience (a pattern of neural firing becomes more likely to recur, and its recurrence leads the mind to recall an event) and the ingraining of habits (repeating a behaviour makes the repeater tend to perform that behaviour automatically).

Until very recently, scientists believed that, uniquely among bodily organs, adult brains produced no new cells—presumably to avoid obliterating the connections already established in response to experience. But even as the existing neural connections get strengthened, plasticity enables the brain to grow new neurons (Eriksson

et al., 1998); this process, *neurogenesis*, appears to be a major factor in recovery from brain injury. A fair amount of neurogenesis apparently occurs in the hippocampus. Recall from earlier in this chapter that memories are retained within (or at least require) the hippocampus initially but are eventually transferred to the cortex, so the hippocampus is continuously overwritten. Perhaps, without disrupting memory, neurons in the hippocampus can be lost and replaced.

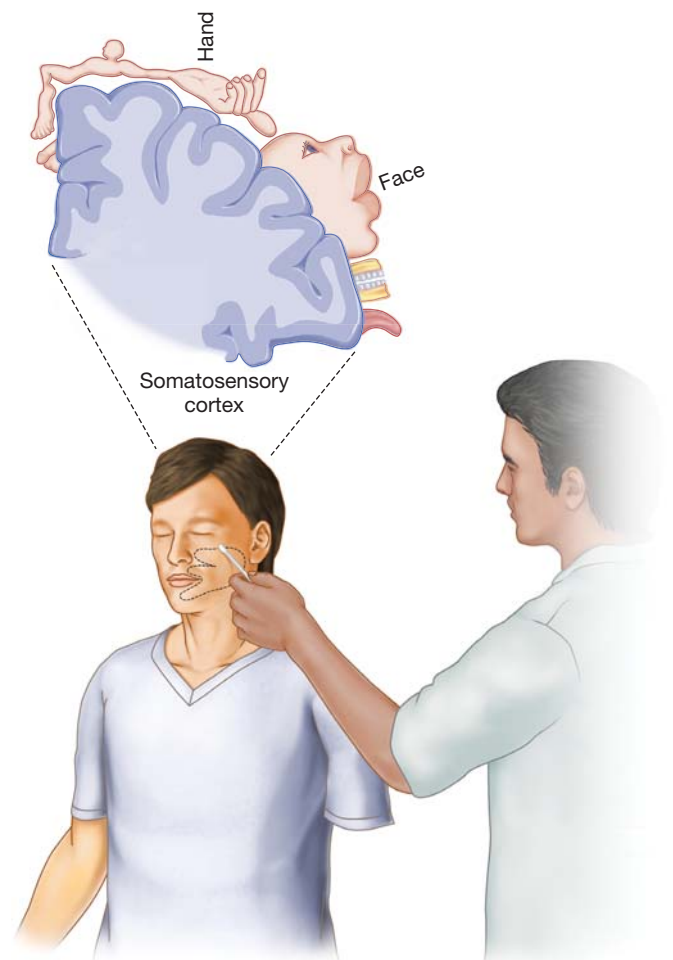
Elizabeth Gould and her colleagues have demonstrated that environmental conditions can play an important role in neurogenesis. For example, they have found that for rats, shrews, and marmosets, stressful experiences, such as being confronted by strange males in their home cages, interfere with neurogenesis during development and adulthood (Gould & Tanapat, 1999). When animals are housed together, they typically form dominance hierarchies that reflect social status. Dominant animals—those who possess the highest social status—show greater increases in new neurons than do subordinate animals (Kozorovitskiy & Gould, 2004). Thus social environment can strongly affect brain plasticity, a dynamic process we are only beginning to understand. Neurogenesis may underlie neural plasticity. If so, further research might enable us, through neurogenesis, to reverse the brain's natural loss of neurons and slow down age-based mental decline. Imagine how humans' quality of life would improve if our minds remained nimble throughout our lives.

**CHANGES IN THE BRAIN** The functions of portions of the cerebral cortex shift in response to activity. Recall the somatosensory homunculus (see Figure 3.26), in which more cortical tissue is devoted to body parts that receive more sensation or are used more. Again, wiring in the brain is affected by amount of use. Another example of changes in cortical maps, discussed earlier, is the enlargement of hippocampi in experienced London taxi drivers.

Cortical reorganization can also have bizarre results. For example, an amputee can be afflicted with a *phantom limb*, the intense sensation that the amputated body part still exists. Some phantom limbs are experienced as moving normally, such as being used to gesture in conversation, whereas some are frozen in position. Moreover, a phantom limb often is accompanied by pain sensations, which may result from the misgrowth of the severed pain nerves at the stump; the cortex misinterprets the pain as coming from the place where those nerves originally came from. This phenomenon suggests that the brain has not reorganized in response to the injury and that the missing limb's cortical representation remains intact. However, the neurologist V. S. Ramachandran has discovered that an amputee who has lost a hand may, when his or her eyes are closed, perceive a touch on the cheek as if it were on the missing hand (Ramachandran & Hirstein, 1998). Apparently, on the somatosensory homunculus the hand is represented next to the face. The unused part of the amputee's cortex (the part that would have responded to the now-missing limb) assumes to some degree the function of the closest group, representing the face. Somehow, the rest of the brain has not kept pace with the somatosensory area enough to figure out these neurons' new job, so the neurons are activated by a touch on the amputee's face (FIGURE 3.34).

**FIGURE 3.34 Cortical Remapping**

**Following Amputation** The participant felt a cotton swab touching his cheek as touching his missing hand. This effect may occur because the hand and face are near each other in somatosensory space.



**THE PUZZLE OF SYNESTHESIA** Recall the puzzle of synesthesia, presented at the opening of this chapter. How can we explain why some people taste words or hear colours? Can we use our knowledge of the structure and organization of the brain to create a brain-based model of synesthesia?

V. S. Ramachandran, the neurologist who conducted many of the studies on phantom limbs (discussed in the previous section), has also conducted a series of experiments to better understand what is happening when someone reports, for example, that a sound is lime green or that chicken tastes pointy (Ramachandran & Hubbard, 2001). Synesthesia tends to run in families and thus must have a genetic basis, and Ramachandran inferred that the genes involved were related to brain formation. Because the brain area involved in seeing colours is physically close to the brain area involved in understanding numbers, he theorized that in people with colour/number synesthesia, these two brain areas have some connections or cross-wiring. The process of linking these areas would have resembled the process of linking areas of an amputee's brain (again, discussed just above): One portion of the brain would have adopted another portion's role.

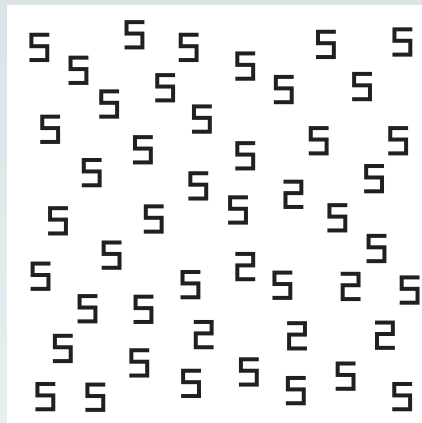
To test his hypothesis, Ramachandran examined MRIs taken of synesthetes when they looked at black numbers on a white background. He found evidence of neural activity in the brain area responsible for colour vision. Control participants without synesthesia did not experience activity in this brain area when they looked at the same numbers (**FIGURE 3.35**).

One major difference between a phantom limb and synesthesia, however, is that the phantom limb is caused primarily by environment (the loss of the limb) while synesthesia is caused primarily by genetics. Why has this sensory anomaly

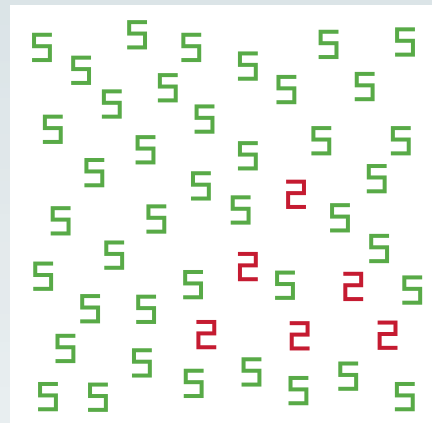
**FIGURE 3.35 Try for Yourself: Synesthesia Test**

Two stimuli used by Ramachandran and Hubbard (2003) to study synesthesia:

Look first at the square on the left, and as quickly as possible count the number of 2s.



Now do the same task with the square on the right.



**Explanation:** Unless you have synesthesia and it causes you to see particular numbers in particular colours, you were much faster at counting the 2s on the right. They “popped out” at you because they are a different colour from the 5s. Some synesthetes are equally fast at both tasks because they see the numbers in different colours. This test is one of many used to determine if someone has colour-related synesthesia.

remained in the gene pool? Ramachandran suggests that it confers an adaptive advantage: Synesthete's brains are wired to connect seemingly disparate topics, and the ability to make remote associations is an important part of creativity. As an example, Ramachandran and his collaborator E. M. Hubbard ask us to consider Shakespeare's line "It is the East and Juliet is the sun." The likening of Juliet to the sun is a metaphor, but where did it come from? Its association of a woman and a bright light resembles a synesthetic experience. In fact, these authors conclude that creative people experience a higher incidence of synesthesia than do noncreative people (2003).

### CRITICAL THINKING SKILL

## Recognizing Unstated Assumptions

All human interactions are based partly on assumptions. All conversations assume the parties have some knowledge in common but not all knowledge. When you enter a classroom, you assume the instructor will act differently than your fellow students. In writing this textbook, the authors explained information they assumed would be new for most readers, but they did not define words they assumed most readers would know.

When you are trying to understand a complex topic, begin by recognizing your and other people's unstated assumptions about that topic. Once you make those assumptions explicit, you can apply reason to them.

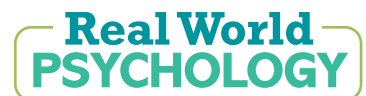
Consider, for example, common assumptions about genetic influences and the brain. Many people assume that if a trait or tendency is passed along genetically, then those who inherit that trait or tendency cannot change it in themselves. By this thinking, those who inherit shyness, intelligence, or boldness cannot change how shy, intelligent, or bold they are.

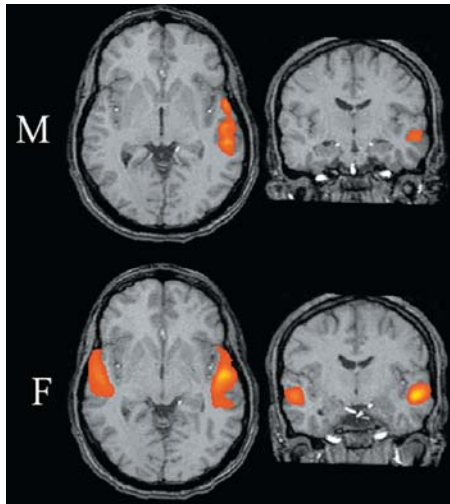
When people learn about sex differences in the brain, they often assume that the brain does not change and that it "causes" sex differences in behaviours. In reality, the brain reflects genetic inheritance and experience, and together these variables determine the size, function, and structure of the brain.

In fact, because nature is inextricably intertwined with nurture, no biological effects can occur independently from environment. Just as all learning is influenced by assumptions, all choices are influenced by past learning and its influence on both thoughts and feelings.

## Females' and Males' Brains Are Similar and Different

The interplay of biological and environmental effects on the brain is reflected in the similarities and differences between females' and males' brains. Everything that influences a person is reflected in his or her brain, of course, and females and males differ in their life experiences and hormonal makeups. These hormonal differences might influence brain development in a way that influences the way males and females differ on some cognition tasks, such as on the ease with which they mentally rotate objects or recall parts of a story (Kimura, 1999).





**FIGURE 3.36 Male versus Female Brains** A considerable body of evidence indicates that female brains are more bilaterally organized for language. For example, researchers studied men and women listening to someone reading aloud. As these fMRI images show, the men listened with one side of their brains, whereas the women tended to listen with both sides.

The study of the brain's *sexual dimorphism*—that is, sex differences in anatomical structures—has a long history. Many comparisons of males' and females' brains, especially the earliest comparisons, were pseudoscience used to show that female brains were inferior (for a review, see Halpern, 2000). The unstated assumption was always that if two groups (in this case, females and males) were different, one had to be inferior. But people do not have to be the same to be equal. In fact, evidence suggests that men and women may perform a task, such as remembering a recent occurrence, equally well but using different parts of the brain. For example, Richard Haier and colleagues (2005) have found that females and males may solve some complex problems, such as items on IQ tests, differently: Females show greater use of language-related brain regions, and males show greater use of spatial-related brain regions, even when participants are matched for intelligence.

Among the several intriguing differences between males' and females' brains are differences in brain size and in the distribution of language functions in the two hemispheres. Males generally have larger brains than females, but larger is not necessarily better. In fact, one developmental process in the brain involves disconnecting neurons so that only the most useful connections remain. Jay Giedd and his colleagues (1997) at the U.S. National Institutes of Health concluded that, among both sexes, brain structures' sizes are highly variable. They reported that boys' brains are approximately 9 percent larger than girls' brains, with some differences in the rate of maturation for different parts of the brain for girls and boys.

As will be discussed in Chapter 4, to some extent the brain's two hemispheres are lateralized, meaning that each is dominant for different cognitive functions. A considerable body of evidence says that female brains are more bilaterally organized for language. In other words, the brain areas important in processing language are more likely to be found in both halves of females' brains, whereas the equivalent language areas are more likely to be in only one hemisphere, usually the left, in males' brains (FIGURE 3.36). One source of data that supports this distinction is people's experiences following strokes. Even when patients are matched on the location and severity of the brain damage caused by a stroke, men and women are affected differently. For example, some studies have found that women are less impaired in language than men are following a stroke (Jiang, Sheikh, & Bullock, 2006). A possible reason for women's better outcomes is that, because language is represented in both halves of women's brains, damage to half of a woman's brain will have less effect on that woman's ability to process language than it would if most of the language areas were in the damaged half of the brain. A related hypothesis, in accord with the idea that women's brains are more bilaterally organized, is that the halves of women's brains are connected by more neural fibres than men's are. Remember that a thick band of neurons, the corpus callosum, connects the brain's two halves (see Figure 3.25), and some researchers have found that a portion of this connective tissue is larger in women (Gur & Gur, 2004).

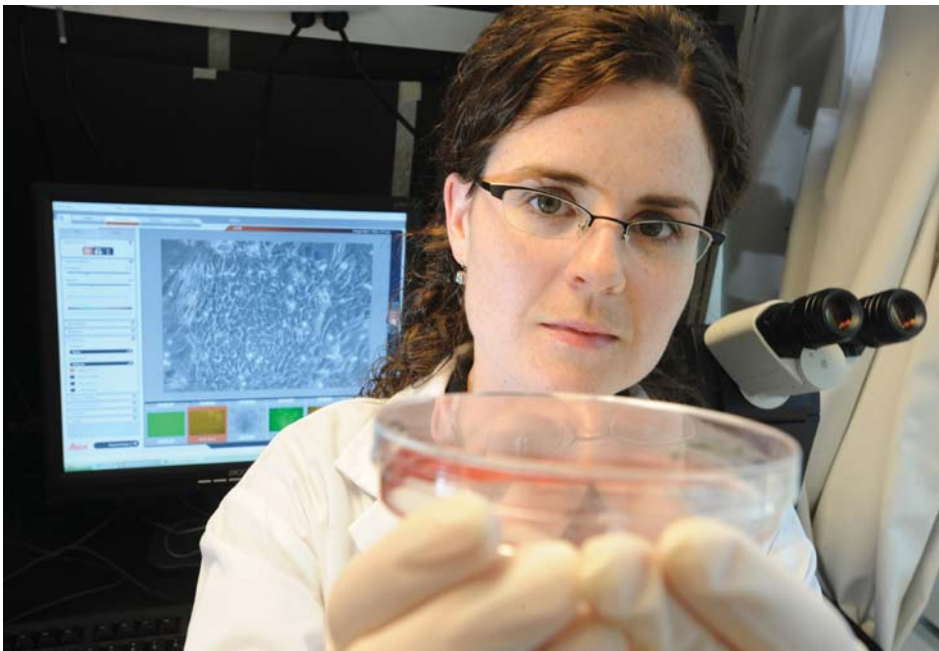
Before we can be confident about recent findings of sex differences in the brain, much more research is needed. We need to better understand normal, healthy brain development. We also need to better understand brain and behaviour relationships before we can reason about human sex differences from our knowledge of brain structures (Halpern et al., 2007). Finally, although we tend to focus on the ways in which males and females are different, we need to keep in mind that their brains are similar in many (perhaps most) ways.

## The Brain Can Recover from Injury

Just as the brain reorganizes in response to amount of use, it also reorganizes in response to brain damage. Following an injury in the cortex, the surrounding grey matter assumes the function of the damaged area, like a local business scrambling to pick up the customers of a newly closed competitor. This remapping seems to begin immediately, and it continues for years. Such plasticity involves all levels of the nervous system, from the cortex down to the spinal cord.

Reorganization is much more prevalent in children than adults, in accord with the critical periods of normal development. Young children afflicted with severe and uncontrollable epilepsy that has paralyzed one or more limbs sometimes undergo *radical hemispherectomy*, the surgical removal of an entire cerebral hemisphere. The remaining hemisphere eventually takes on most of the lost hemisphere's functions, and the children regain almost complete use of their limbs. This procedure is not possible in adults, in whom the lack of neural reorganization would lead to inevitable and permanent paralysis and loss of function.

As discussed earlier in this chapter, one of the most exciting areas of current neurological research is the transplantation of human fetal tissue into the brain to repair damage (**FIGURE 3.37**). The transplanted tissue consists specifically of *stem cells*, “master” cells that not only can regenerate themselves but also can develop into any type of tissue, such as muscle or nerve cells. This relatively new procedure is being explored as a possible treatment for strokes and degenerative diseases such as Parkinson's and Huntington's. The significant challenge is to get the newly introduced cells to make the proper connections so that the damaged circuits regrow. Many people oppose the use of fetal tissue for any research purposes, however, on religious or other philosophical grounds. Fortunately, many new methods are emerging that allow researchers to create stem cells by reprogramming adult cells (Kim et al., 2008).



**FIGURE 3.37 Stem Cell Potential**

Dr. Cheryl Seguin and her research colleagues in Toronto have developed methods to turn human stem cells into human organs, including lungs, liver, and pancreas.

## SUMMING UP

### How Does the Brain Change?

Although neural connections are intricate and precise, they are malleable. The human genome, the blueprint for normal development, is affected by environmental factors, such as injury, sensory stimulation, sensory deprivation, and life experiences. During development and throughout our lifetimes of learning, the circuitry is reworked and updated. Culture, as context for experience, affects the organization and structure of the brain. The brain can reorganize after a brain injury, though children's recovery ability is far greater than adults'. An understanding of genetic transmission and of brain organization, along with the knowledge that brain regions are specialized for different perceptions, has allowed researchers to unravel the puzzle of synesthesia. Females' and males' brains differ in several ways, although the similarities are more obvious. Males' brains tend to be larger, and evidence suggests that females' brains are organized more bilaterally.

## MEASURING UP

1. A person's brain changes in response to environment, including all of that person's experiences. Place an X next to the statements below that support this idea.
  - a. Males' brains generally are larger than females' because males have more stimulating environments.
  - b. The sizes of London taxi drivers' hippocampi were correlated with how long the participants had been London taxi drivers.
  - c. Some amputees can feel sensations in their amputated limbs when their eyes are closed and their faces are touched.
  - d. Many drugs can mimic neurotransmitters' actions.
  - e. Laboratory rats raised in enriched environments developed heavier brains than laboratory rats raised in standard environments.
  - f. Phineas Gage's personality changed profoundly after his frontal cortex was damaged.
  - g. Some brain responses to selected stimuli vary due to cultural influence.
2. Indicate whether the following statements, about the ways in which females' and males' brains differ, are true or false.
  - a. Males' brains generally are larger than females' brains.
  - b. Males' and females' brains have no differences.
  - c. Researchers have found that sex differences in the brain explain why males tend to hold executive positions more than females do.
  - d. Sex differences in the brain prove that males and females have essentially different abilities.
  - e. A larger brain is a better brain—more advanced, plus more complex in its organization.



## CONCLUSION

The human body is a biological machine, produced by a genome that has been shaped by millions of years of evolution. Some 30,000 genes provide instructions for producing proteins, and this modest process builds a brain that thinks, feels, and acts. In psychological science, the biological revolution has revealed that these genes not only build the common structures of the human body but also are partly responsible for differences in the personalities, mental abilities, and physical appearances of individuals. At the genetic level of analysis, so far we have only a minimal understanding of our mental lives' complexity. We are beginning to understand the relationship between our environments and our genes, but we do not know how environment causes our genes to turn on and off. Understanding genetic expression's inner workings may lead to profound insights into what makes us human and how our minds work.

Evolution has bestowed on humans a marvelous 1.4-kilogram organ called the brain. This complex assemblage of cells coordinates messages about environment and bodily state using systems of neurons and of hormones, and these systems determine the ways in which we are all similar and all different. There are more neural connections in the human brain than there are stars in our galaxy (Kandel, Schwartz, & Jessell, 1995), and the messages transmitted across those connections are modulated by subtle variations in the actions of dozens of chemicals in the synapses. Psychological scientists are quickly developing methods to better understand how the brain works and the different brain regions' functions. We know that the brain changes dramatically through experiences (with culture as the context for those experiences) and that the brain's plasticity allows for recovery from certain injuries. More and more, psychological scientists are looking to the workings of the brain to understand the rich complexity of human experience. As discussed throughout this book, contemporary research is helping us understand the biological underpinnings of human mental life.

## CHAPTER SUMMARY

### What Is the Genetic Basis of Psychological Science?

- **Heredity Involves Passing Along Genes through Reproduction:** The Human Genome Project has mapped the genes that make up humans' 23 chromosomal pairs. Genes' variations are either dominant or recessive. The genome represents the genotype, and the observable characteristics are the phenotype. Many characteristics are polygenic.
- **Genotypic Variation Is Created by Sexual Reproduction:** Because half of each chromosome comes from each parent and the two halves are joined randomly, there is enormous potential variation in the resulting zygote's genome. Mutations also give rise to variations.
- **Genes Affect Behaviour:** Behavioural geneticists can quantify the similarity and variation in a population's shared characteristics. Twin studies, research on adoptees, and other investigations of hereditary and genetic influence provide insight into heritability.
- **Social and Environmental Contexts Influence Genetic Expression:** Gene expression is a complex interaction between genetic makeup and environmental context.
- **Genetic Expression Can Be Modified:** Genetic manipulation has been achieved in mammals such as mice, but has proved difficult in humans. However, animal studies using the technique of "knocking out" genes to determine their effects on behaviours and on disease are a valuable tool for understanding genetic influences.

### How Does the Nervous System Operate?

- **Neurons Are Specialized for Communication:** Neurons are the basic building blocks of the nervous system. They receive and send chemical messages. All neurons have the same basic structure, but neurons vary by function and by location in the nervous system.
- **Action Potentials Cause Neural Communication:** Changes in a neuron's electrical charge are the basis of an action potential, or neural firing. Firing is the means of communication within networks of neurons.
- **Neurotransmitters Bind to Receptors across the Synapse:** Neurons do not touch; they release chemicals (neurotransmitters) into the synapse, a small gap between the neurons. Neurotransmitters bind with the receptors of postsynaptic neurons, thus changing the charge in those neurons. Neurotransmitters' effects are halted by reuptake of the neurotransmitters into the presynaptic neurons, enzyme deactivation, or autoreception.
- **Neurotransmitters Influence Mind and Behaviour:** Neurotransmitters have been identified that influence aspects of the mind and of behaviour in humans, including emotions, motor skills, sleep, learning and memory, pain control, and pain perception. Drugs and toxins mimic neurotransmitters' actions or reduce neurotransmitters' availability.

### What Are the Basic Brain Structures and Their Functions?

- **The Brain Stem Houses the Basic Programs of Survival:** The top of the spinal cord forms the brain stem, which is involved in basic functions such as breathing and walking as well as general arousal.

- **The Cerebellum Is Essential for Movement:** The cerebellum ("little brain"), the bulging structure connected to the back of the brain stem, controls balance and is essential for movement.
- **Subcortical Structures Control Emotions and Basic Drives:** The subcortical structures play a key part in psychological functions because they control vital functions (the hypothalamus), sensory relay (the thalamus), memories (the hippocampus), emotions (the amygdala), and the planning and producing of movement (the basal ganglia).
- **The Cerebral Cortex Underlies Complex Mental Activity:** The lobes of the cortex play specific roles in controlling vision (occipital), touch (parietal), hearing and speech comprehension (temporal), and planning and movement (frontal).

### How Are Neural Messages Integrated into Communication Systems?

- **The Peripheral Nervous System Includes the Somatic and Autonomic Systems:** The body's internal environment is regulated by the autonomic system, which is divided into the alarm response (sympathetic) and the return-to-normal response (parasympathetic). The somatic system relays sensory information.
- **The Endocrine System Communicates through Hormones:** Both endocrine glands and organs produce and release chemical substances, which travel to body tissues through the bloodstream and influence a variety of processes, including sexual behaviour.
- **Actions of the Nervous System and Endocrine System Are Coordinated:** Most of the central control of the endocrine system occurs through the actions of both the hypothalamus and the pituitary gland; the latter controls the release of hormones from the rest of the endocrine glands.

### How Does the Brain Change?

- **The Interplay of Genes and the Environment Wires the Brain:** Chemical signals influence cells' growth and function. Environmental experiences, especially during critical periods, are necessary for cells to develop properly and for them to make more detailed connections.
- **Culture Affects the Brain:** Daily social interactions, which vary among cultures (and subcultures and individuals), are reflected in each brain's unique organization.
- **The Brain Rewires Itself throughout Life:** Although plasticity decreases with age, the brain retains the ability to rewire itself throughout life. This ability is learning's biological basis.
- **Females' and Males' Brains Are Similar and Different:** Although males' and females' brains are predominantly similar, males' brains are larger than females' (on average), and females' verbal abilities are organized more bilaterally (more equally in both hemispheres). There are sex differences in the rate of development for some areas of the brain.
- **The Brain Can Recover from Injury:** The brain can reorganize its functions in response to brain damage, although this capacity decreases with age. Anomalies in sensation and in perception, such as synesthesia, are attributed to cross-wiring connections in the brain.

## KEY TERMS

acetylcholine (ACh), p. 103	all-or-none principle, p. 100	autonomic nervous system (ANS), p. 119	basal ganglia, p. 114	central nervous system (CNS), p. 108
action potential, p. 99	amygdala, p. 114	axon, p. 97	brain stem, p. 112	cerebellum, p. 112
agonist, p. 102	antagonist, p. 102		Broca's area, p. 111	cerebral cortex, p. 115
			cell body, p. 97	

- |                          |                             |  |                                      |  |
|--------------------------|-----------------------------|--|--------------------------------------|--|
| chromosomes, p. 83       | glutamate, p. 106           | neurotransmitter, p. 101                   | phenotype, p. 86                     | serotonin, p. 104                      |
| dendrites, p. 97         | gonads, p. 121              | nodes of Ranvier,<br>p. 98                 | pituitary gland, p. 122              | somatic nervous system,<br>p. 119      |
| dizygotic twins, p. 89   | heritability, p. 91         | norepinephrine, p. 104                     | plasticity, p. 125                   | substance P, p. 107                    |
| dominant gene, p. 85     | hippocampus, p. 113         | occipital lobes, p. 116                    | prefrontal cortex,<br>p. 117         | sympathetic division of<br>ANS, p. 119 |
| dopamine, p. 105         | hormones, p. 121            | parasympathetic division<br>of ANS, p. 120 | receptors, p. 102                    | synapse, or synaptic cleft,<br>p. 97   |
| endocrine system, p. 121 | hypothalamus, p. 113        | parietal lobes, p. 116                     | recessive gene, p. 85                | synesthesia, p. 81                     |
| endorphins, p. 106       | interneurons, p. 96         | Parkinson's disease<br>(PD), p. 105        | resting membrane<br>potential, p. 98 | temporal lobes, p. 117                 |
| epinephrine, p. 104      | monozygotic twins,<br>p. 89 | peripheral nervous<br>system (PNS), p. 108 | reuptake, p. 102                     | terminal buttons, p. 97                |
| frontal lobes, p. 117    | motor neurons, p. 96        |  | sensory neurons,<br>p. 96            | thalamus, p. 113                       |
| GABA, p. 106             | myelin sheath, p. 98        |  |                                      |  |
| gene, p. 83              | neuron, p. 96               |  |                                      |  |
| genotype, p. 86          |                             |  |                                      |  |

## ■ PRACTICE TEST

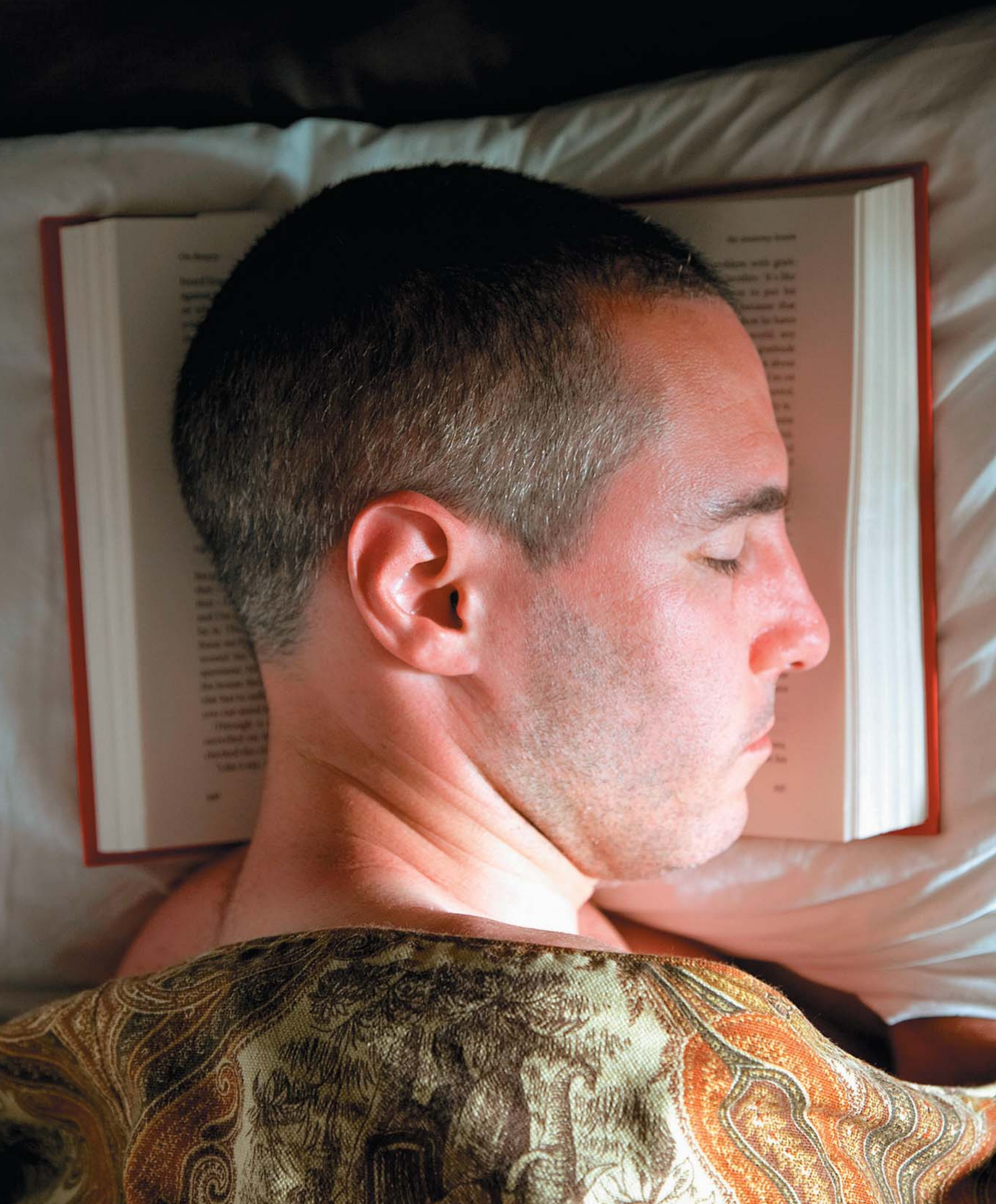
- Complete the following analogy: Genes are to chromosomes as \_\_\_\_\_ are to \_\_\_\_\_.
  - recipes, ingredients
  - seeds, vegetables
  - bricks, walls
  - feet, shoes
- Which of the following statements are true regarding the relationship between genetic makeup and environment?
  - Environmental factors can influence gene expression.
  - The presence of certain genes can influence an organism's susceptibility to environmental stressors.
  - Genes and environment can interact to affect phenotype.
- Which *two* labels accurately describe neurons that detect information from the physical world and pass that information along to the brain?
  - motor neuron
  - sensory neuron
  - interneuron
  - efferent neuron
  - afferent neuron
- You witness a major car accident on your way to school. You pull over and rush to help one of the victims, who has severe cuts across his forehead and legs. When you ask if he is in pain, he says no. Which neurochemical is likely keeping the man pain free despite his obvious injuries?
  - dopamine
  - GABA
  - glutamate
  - endorphins
  - substance P
- Who do you predict would have a larger hippocampus?
  - someone who plays computer games requiring the exploration of complex virtual worlds
  - someone who plays computer games requiring extraordinarily quick reflexes and body awareness
- Someone suffers a stroke that causes damage to the left motor cortex. Which of the following impairments will the person most likely exhibit?
  - an inability to comprehend spoken language
  - an inability to recognize faces
  - paralysis of the left side of the body
  - paralysis of the right side of the body
- Because it determines other glands' activities, the \_\_\_\_\_ is sometimes called "the master gland."
  - pituitary
  - pancreas
  - thyroid
  - gonad
- The adage *You can't teach an old dog new tricks* is consistent with which phenomenon?
  - plasticity
  - critical periods
  - cortical reorganization
  - synesthesia
- True or false: Differences in the brains of people from different cultures necessarily reveal underlying differences in biology.

## ■ PSYCHOLOGY AND SOCIETY

- A relative who suffers from arthritic pain finds a website on the benefits of magnet therapy. The website claims that magnets can bring relief to arthritic joints by increasing blood flow and oxygen levels. Using the critical thinking skills discussed in this chapter, write a letter helping your relative evaluate the website's claims.
- Scan the news for a story that mentions a particular brain area. For example, check newspapers' science sections or look for sports stories involving head injuries. Then use this textbook and other reputable sources of information to research this brain area. Imagine you are charged with teaching fellow introductory psychology students about this area, and prepare a short lecture explaining its location and key functions (you may wish to include a drawing or diagram to help explain the location). In your lecture, describe how an understanding of this brain area contributes to your understanding of the news story.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.





# The Mind and Consciousness

THE MOVIE *THE DIVING BELL AND THE BUTTERFLY* (2007) tells the story of Jean-Dominique Bauby, a French fashion magazine editor who suffered a devastating stroke at age 43. Twenty days later, Bauby woke up to a nightmare: Nearly all his voluntary muscles were paralyzed. Even though he was awake and alert, he could not communicate with those around him. This rare condition, *locked-in syndrome*, occurs when part of the brain stem gets damaged. As a psychological state, it has been compared to being buried alive: Imagine seeing all the sights around you and hearing every noise, but being unable to respond physically to your sensations. Imagine feeling every itch, but being unable to scratch yourself or move to gain relief. Bauby proved able to blink his left eye, and eventually a speech therapist taught him to use that eye to communicate. As she sat beside him pointing to letters of the alphabet, Bauby blinked to select the letter he wanted. Letter by letter, he formed words, sentences, and so on. In fact, through this painstakingly slow process, Bauby wrote a memoir, blinking to an assistant one letter at a time. Although Bauby died of heart failure only days after the

## How Is the Conscious Mind Experienced?

- Consciousness Is a Subjective Experience
- There Are Variations in Conscious Experience
- Splitting the Brain Splits the Conscious Mind
- Unconscious Processing Influences Behaviour
- Brain Activity Produces Consciousness

## What Is Sleep?

- Sleep Is an Altered State of Consciousness

- Sleep Is an Adaptive Behaviour
- Sleep and Wakefulness Are Regulated by Multiple Neural Mechanisms
- People Dream while Sleeping

## What Is Altered Consciousness?

- Hypnosis Is Induced through Suggestion
- Meditation Produces Relaxation
- People Can Lose Themselves in Activities

## How Do Drugs Affect Consciousness?

- People Use—and Abuse—Many Psychoactive Drugs
- Critical Thinking Skill: Providing Examples of Slippery Slope Thinking
- Alcohol Is the Most Widely Abused Drug
- Critical Thinking Skill: Showing How Circular Reasoning Is a Misuse of Operational Definitions
- Addiction Has Psychological and Physical Aspects

book was published in 1997, his memoir, *The Diving Bell and the Butterfly*, received critical acclaim (FIGURE 4.1A). The movie based on it, by the artist and filmmaker Julian Schnabel, received a prize at the 2007 Cannes Film Festival.

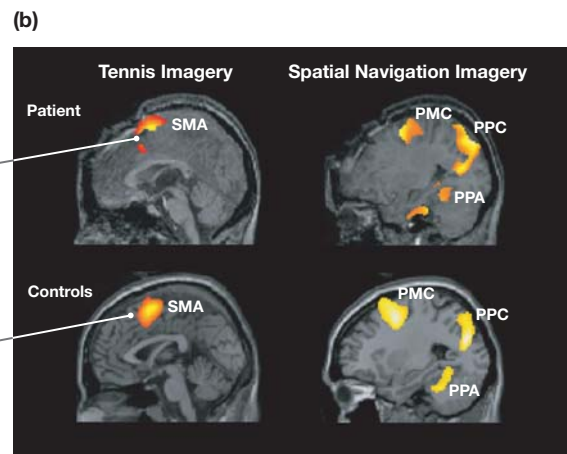
Bauby's use of blinking to communicate was triumphant in part because it was so slow and difficult. Recent scientific advances have raised the possibility that patients like Bauby will be able to communicate much more quickly and easily: We might be able to "read" their thoughts by imaging brain activity in real time. Communication of this kind is the goal of scientists working with Erik Ramsay, an American with locked-in syndrome. In 2000, 16-year-old Ramsay suffered a brain stem injury in a car accident. Four years later, researchers planted electrodes in the speech region of his left hemisphere, and for the past several years Ramsay has been listening to recordings of vowel sounds and mentally simulating those sounds. His simulation of each vowel sound should produce its own pattern of brain activity. Ultimately, the researchers hope to use this brain activity to create a voice synthesizer that will translate Ramsay's neural patterns into understandable speech. Their initial results have been promising. Within a few years, they speculate, Erik might be able to communicate through his voice synthesizer (Bartels et al., 2008).

Other researchers have obtained similarly promising results. An international team of researchers used brain imaging to demonstrate that a 23-year-old English woman who was in an apparent coma could respond to requests to imagine either playing tennis or walking through her house (Owen et al., 2006). This woman's pattern of brain activity was quite similar to the patterns of control subjects who also imagined playing tennis or walking through a house (FIGURE 4.1B). The researchers believe that although the woman could not give outward signs of awareness, she was able to understand language and respond to the experimenters' requests. This finding's implications are extraordinary. Could the researchers' method be used to reach other people who are in comas, aware of their surroundings, but unable to communicate? Indeed, this research team has now evaluated 54 coma patients, some at Cambridge and the rest in Liege, Belgium, and has found five who could willfully control brain activity to communicate (Monti et al., 2010). One 29-year-old Belgian man was able to answer five of six yes/no questions correctly by thinking of one type of image to answer "yes" and another type to answer "no." The ability to communicate from coma might allow some patients to express thoughts, ask for more medication, and increase the quality of their lives.

How do you know you are conscious? You know this only because you are experiencing the outside world (through seeing, hearing, touching) and you are aware that you are thinking. But what gives rise to consciousness? Is it the many neurons firing in your brain? If so, how do these brain circuits' actions give rise to your experiences?

**FIGURE 4.1 Challenging the Definition of Consciousness**

**(a)** Jean-Dominique Bauby suffered from locked-in syndrome. As seen here, he dictated his memoir to an assistant by blinking his left eye. **(b)** Brain imaging has shown that a young woman in a coma, with no outward signs of awareness, responded to directions to visualize playing tennis and walking around with neural activity similar to that of healthy volunteers.



An iPad's circuits produce images and sound when they are energized, but gadgets like iPads are not conscious in the same way humans are. Is the difference biological? Not entirely. Your body includes many highly active biological systems, such as your immune system, that do not produce the sort of consciousness you are experiencing right now, for example, as you contemplate these questions.

In considering consciousness and its variations, this chapter has two main points, which are highlighted in the examples above. First, people can be conscious of their surroundings even when they do not appear to be. Indeed, as noted below, people who are deeply asleep still show awareness of their surroundings; they generally do not roll off the bed, for example. Second, conscious experiences are associated with brain activity, and understanding this brain activity might help us better understand consciousness, the nature of which has been one of psychology's most vexing mysteries.

## How Is the Conscious Mind Experienced?

*What's on your mind?* Having a conscious mind that thinks, feels, daydreams, and so on is one defining aspect of being human. Despite the fact that each normally functioning human has some degree of self-awareness, consciousness is difficult to study scientifically. On the one hand, consciousness is very real; scientists can differentiate between being “conscious” and being “unconscious.” On the other hand, one of the biological sciences' greatest unanswered questions is how neural activity in the brain gives rise to a person's subjective experience of the world—the state of being conscious. At every minute, our brains are regulating our body temperatures, controlling our breathing, calling up memories as necessary, and so on, but we are not conscious of the brain operations that do these things. Similarly, our brains are extremely active during sleep, even though we are not conscious at the time. Why are we conscious only of certain experiences? What is consciousness?

**Consciousness** refers to moment-by-moment subjective experiences, such as reflecting on one's current thoughts or paying attention to one's immediate surroundings. Psychological scientists study two components of consciousness: the *contents* of consciousness (the things we are conscious of) and the *level* of consciousness (such as coma, sleep, and wakefulness). In addition to considering consciousness in terms of content and level, psychological scientists differentiate between doing things consciously (e.g., choosing to wear one outfit over another) and doing things unconsciously (e.g., automatically scratching an itch). In discussing actions, we refer to conscious intentions rather than conscious awareness. So, throughout this chapter, *consciousness* refers to awareness, to experiences. The chapter will also take up the issue of which behaviours are under conscious control and which seem to occur more automatically, without conscious intent.

Philosophers have long debated the nature of consciousness. In the seventeenth century, the philosopher René Descartes stated that the mind is physically distinct from the brain, a view of consciousness called *dualism*. Most psychological scientists now reject dualism, instead believing that the brain and mind are inseparable. According to this view, the activity of neurons in the brain produces the contents of consciousness: the sight of a face, the smell of a rose. More specifically, each type of content—each sight, each smell—has an associated pattern of brain activity. The activation of this particular group of neurons in the brain somehow gives rise to the conscious experience. Likewise, when people drink too much, their conscious experience is changed (i.e., they become drunk) because alcohol affects how the brain works. Therefore, studying the brain helps psychological scientists study consciousness, and advances in the ability to image the working brain have provided new insights into conscious experience. After considering how the brain gives rise to conscious experience, this

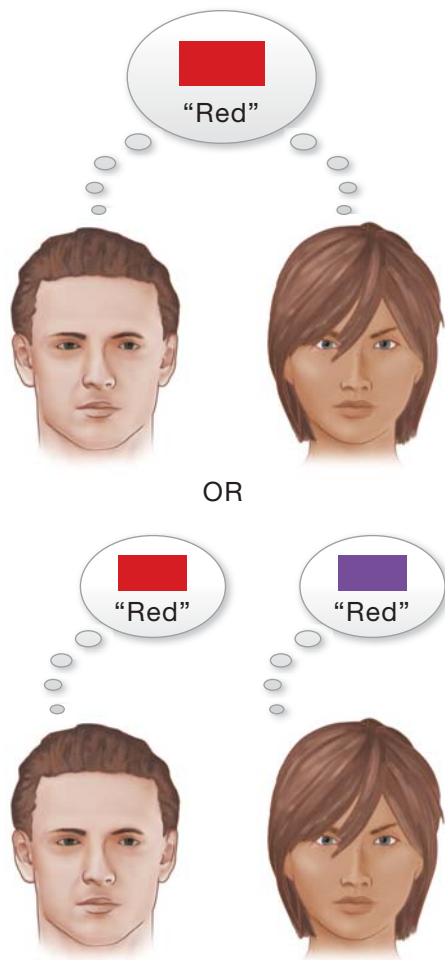
### LEARNING OBJECTIVES

Define consciousness.

Summarize research findings on the role played by the interpreter in split-brain and normal people.

**consciousness** The subjective experience of the world and of mental activity.





**FIGURE 4.2 Qualia: Seeing Red** One difficult question related to consciousness is how people experience qualia, the phenomenological percepts of the world. For instance, does red look the same to everyone who has normal colour vision?

chapter discusses how these experiences differ because of natural variation (e.g., sleep), natural manipulation (e.g., meditation), and artificial manipulation (e.g., drugs).

## Consciousness Is a Subjective Experience

Because each of us experiences consciousness personally—that is, subjectively—we cannot know if any two people experience the world in exactly the same way. What does the colour red look like to you? How does an apple taste? In the 1920s, philosophers coined the term *qualia* to describe the properties of our subjective experiences, such as our perceptions of things (FIGURE 4.2). As discussed in Chapter 1, early pioneers in psychology attempted to understand consciousness through introspection, but psychologists largely abandoned this method because of its subjective nature. Qualia exist, but their subjective nature makes them difficult to study empirically. So, when as children we played the game “I spy, with my little eye,” players might have been looking at the same thing—say, “something that is red”—but they might have been experiencing that thing differently. In other words, there is no way to know whether each player’s experience of the thing and its colour was the same or whether each player was using the same words to describe a different experience. The labels applied to experience do not necessarily do justice to the experience. When you experience heartbreak and a friend consoles you by saying “I know how you feel,” does your friend definitely know?

Despite scientists’ difficulty in understanding experiences of qualia, growing evidence indicates that imaging methods can help identify commonalities in brain activity across experiences. Scientists cannot (yet) read your mind by looking at your brain activity, but they can identify objects you are looking at by looking at your brain activity (Kay, Naselaris, Prenger, & Gallant, 2008). For instance, researchers can use fMRI (see Chapter 2, “Research Methodology”) to determine, based on your pattern of brain activity at that moment, whether the picture you are looking at is of a house, a shoe, a bottle, or a face (O’Toole et al., 2005). Similarly, brain imaging can reveal whether a person is looking at a striped pattern that is moving up and down or one moving side to side, whether a person is looking at a picture or a sentence, and so on (Norman et al., 2006). Frank Tong and colleagues (1998) studied the relationship between consciousness and neural responses in the brain. Participants were shown images in which houses were superimposed on faces. Neural activity increased within the temporal lobe’s fusiform face area when participants reported seeing a face, but neural activity increased within temporal lobe regions associated with object recognition when participants reported seeing a house (on brain regions, see Chapter 3, “Biological Foundations”). This finding suggests that different types of sensory information are processed by different brain regions: The particular type of neural activity determines the particular type of awareness (FIGURE 4.3). As psychological science is beginning to reveal, common brain activity may give rise to people’s subjective experiences.

How might reading brain activity allow researchers to improve the lives of those with spinal injuries? In our daily interactions with the world, we use our arms and hands to manipulate objects around us, such as when we type on keyboards, play computer games with joysticks, change television channels with remotes, and control cars with steering wheels. Imagine being able to manipulate such objects simply by thinking about using them. In groundbreaking research that provides hope for those with paralysis, neuroscientists have taught monkeys how to control a robot arm using only their thoughts (Carmena et al., 2003). As the media have quipped, “Monkey see, robot do.”

How did the researchers accomplish this remarkable feat? The first step was to implant small electrodes in the frontal and parietal lobes of two rhesus monkeys and



## FIGURE 4.3 Scientific Method: The Relationship between Consciousness and Neural Responses in the Brain

**Hypothesis:** Specific patterns of brain activity can predict what a person is seeing.

### Research Method:

**1** Participants were shown images with houses superimposed on faces.



**2** Participants were asked to report whether they saw a house or a face.

**3** Researchers used fMRI to measure neural responses in participants' brains.



**Results:** Activity increased in the fusiform face area when participants reported seeing a face, but temporal cortex regions associated with object recognition became active when participants reported seeing a house.

**Conclusion:** Type of awareness is related to which brain region processes the particular sensory information.

then record impulses from those electrodes while the monkeys learned to play a simple computer game. These brain areas were chosen because they are known to be involved in controlling complex movement. In the computer game, the monkeys used a joystick that allowed them to perform actions—such as steering a cursor and squeezing a trigger to achieve a goal—that involved moving a robotic arm they could see but not touch. By examining the recordings from the various brain regions, the researchers determined which patterns of brain activity led to specific motor actions. They then unplugged the joystick so that it no longer controlled the movement of the robotic arm, and they made movements of the robotic arm directly dependent on the pattern of neuronal firing from the monkeys' motor cortices. At first, the monkeys moved their arms wildly as if controlling the joystick, but it was not their arm movements that controlled the robot; it was their thoughts. “The most amazing result, though, was that after only a few days of playing with the robot in this way, the monkey suddenly realized that she didn’t need to move her arm at all,” says the lead neuroscientist, Miguel Nicolelis, describing one of the experiment’s subjects (FIGURE 4.4). “Her arm muscles went completely quiet, she kept the arm at her side and she controlled the robot arm using only her brain and visual feedback. Our analyses of the brain signals showed that the animal learned to assimilate the robot arm into her brain as if it were her own arm” (“Gazette: Monkeys Move Matter, Mentally,” 2004).

How soon might this research help those who are paralyzed? A team led by the American researcher John Donoghue implanted a small computer chip into five quadriplegic individuals. The chip reads signals from hundreds of neurons in the motor cortex. The first human to benefit from this technology was 25-year-old Matthew Nagle, who had been paralyzed from the neck down following a knife attack in 2001. The implanted device, called BrainGate, has allowed him to use a remote control to perform physical actions—such as changing television channels and opening and closing curtains—entirely with his thoughts. As in the rhesus monkey research, the brain’s firing pattern is translated into signals that control the movement of a robotic arm.



**FIGURE 4.4 Advances in Motor Control**

The neurobiologist Miguel Nicolelis, a Brazilian native, with one of the monkeys used in his study of the brain’s motor command signals. Dr. Nicolelis’s research has revealed new information on how reading brain activity may be used to improve the lives of people who are paralyzed.

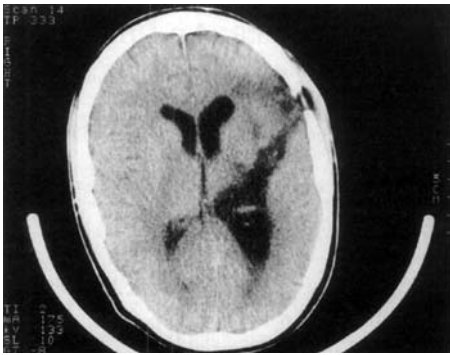
## Real World PSYCHOLOGY

The goal of this research is to allow paralyzed individuals, through brain activity, to control prosthetic devices that will assist them in all aspects of daily living.

### There Are Variations in Conscious Experience

As you read this chapter, what are you conscious of, and how conscious are you? Is your mind wandering, occasionally or often? Is your stomach rumbling? Are you sitting comfortably? Are you drowsy? Is your mental state artificially pepped up thanks to coffee, soda, an energy drink? As you go through any day, you experience variations in consciousness. Your level of consciousness varies naturally through the day in your sleep/wake cycle. It will also, as discussed below, be affected by your actions (such as meditating to relax) and by consciousness-altering substances you consume (such as caffeine and alcohol).

As William James, one of the first North American psychologists, described it, conscious experience is a continuous stream of thoughts that often floats from one thought to another. It is a unified and coherent experience—there is a limit to how many things you can be conscious of at the same time. You cannot pay attention to reading while also watching a television show, doing your calculus homework, and instant messaging with several friends. As you focus on developments in the show, you might realize you have no idea what you just read or what your friend just replied. Likewise, all at the same time you cannot think about what you will do tomorrow, what kind of car you would like to own, and where you most recently went on vacation. While driving to a familiar destination, have you ever begun to think about something other than your driving? Before you knew it, you had arrived. But how did you get there? You knew you had driven, but you could not remember details of the drive, such as whether you stopped at traffic lights or passed other vehicles. In general, we can execute routine or *automatic* tasks (such as driving, walking, or catching a baseball) that are so well learned that we do them without much conscious effort. Indeed, paying too much attention can interfere with these automatic behaviours. By contrast, difficult or unfamiliar tasks require greater conscious effort. Such *controlled* processing is slower than automatic processing, but it helps us perform in complex or novel situations. Thus if a rainstorm starts while you are driving, you will need to pay more attention to your driving and be very conscious of the road conditions.



**FIGURE 4.5 Awareness in an Apparent Vegetative State** The patient, a stabbing victim, appeared to be in a vegetative state, but neurophysiological assessment of brain activity two months after his injury showed he processed the meaning of sentences presented to him (through headphones and on a computer screen). This finding indicated some awareness of his surroundings in spite of his obvious brain injury (note the knife wound on the right of the image). Techniques of this kind are useful for evaluating the comprehension of patients who are unable to communicate.

**CONSCIOUSNESS AND COMA** As the Belgian cognitive neuroscientist Steven Laureys (2007) notes, medical advances mean that a greater number of people are surviving traumatic brain injuries; doctors now save the lives of many people who previously would have died from injuries sustained in car accidents or on battlefields, for example. However, surviving is just the first step toward recovery, and many of those who sustain serious brain injuries fall into comas. Most people who regain consciousness after such injuries do so within a few days, but some people do not regain consciousness for weeks. In this state, they have sleep/wake cycles—they open their eyes and appear to be awake, close their eyes and appear to be asleep—but they do not seem to respond to their surroundings. When this condition lasts longer than a month, it is known as a *persistent vegetative state*. However, as noted above, evidence indicates that the brain can process information in this state (Gawryluk, D’Arcy, Connolly, & Weaver, 2010). In one dramatic example, researchers from Dalhousie University used event-related potentials (ERPs), which measure the electrical activity of the brain (see Chapter 2), to demonstrate awareness in a man who had been stabbed in the brain and was in an apparent vegetative state (FIGURE 4.5; Connolly, Mate-Kole, &

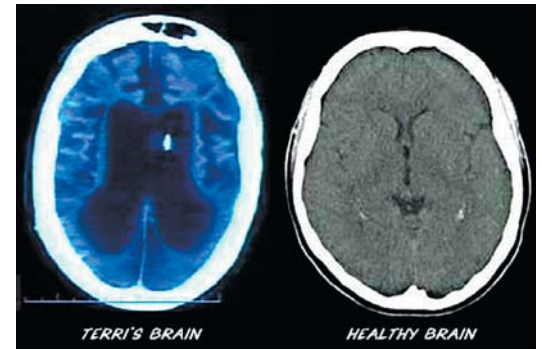
Joyce, 1999). The longer the persistent vegetative state lasts, the less likely the person is to ever recover consciousness or show normal brain activity. In the United States, the patient Terri Schiavo spent more than 15 years in a persistent vegetative state. Eventually, her husband wanted to terminate her life support, but her parents wanted to continue it. Both sides waged a legal battle. Her parents believed that although Schiavo was in a coma, she was aware and occasionally had even responded to their presence. Schiavo's husband and doctors disputed these claims, believing her to be in an irreversible vegetative state with no hope of recovery. Indeed, an EEG of Schiavo's brain showed no activity. A court ruled in the husband's favour, and life support was terminated. After Schiavo's death, an autopsy revealed substantial and irreversible damage throughout her brain and especially in cortical regions known to be important for consciousness (FIGURE 4.6A).

Between the vegetative state and full consciousness is the *minimally conscious state*, in which people make some deliberate movements, such as following an object with their eyes, and may try to communicate. The prognosis for those in a minimally conscious state is much better than for those in a persistent vegetative state. Consider the case of the Polish railroad worker Jan Grzebski, who in June 2007 woke up from a 19-year coma (FIGURE 4.6B). Grzebski remembers events that were going on around him for those 19 years, including his children's marriages. There is some indication that he tried to speak on occasion but was not understood. He now spends much of his time watching television or going out in his wheelchair, and he finds the world prettier than it was under communism (Scislowka, 2007). In 2003, Terry Wallis, an American, began to talk with family members 19 years after an auto accident placed him in a minimally conscious state similar to Grzebski's. During his 19-year coma, Wallis had shown hints of awareness and occasionally seemed responsive to visitors. Recall as well the young English woman, discussed above, who appeared to be in a coma but, at researchers' requests, mentally imagined walking through her house or playing tennis and thus showed signs of being minimally conscious rather than in a persistent vegetative state. Although differentiating between states of consciousness by behaviour alone is difficult, brain imaging may prove useful for identifying the extent of a patient's brain injury and likelihood of recovery.

As discussed throughout this book, science often creates ethical issues. One such issue is whether brain evidence should be used to make end-of-life decisions (see "On Ethics" later in this chapter). The outcome of Terry Schiavo's case, for example, remains highly controversial. Examining the brain of a person in an apparent coma, however, increases the chances of making well-informed medical decisions. Emerging evidence indicates that stimulating the thalamus (using a device something like a heart pacemaker) increases awareness among those in minimally conscious states, but when is this procedure advisable? A 38-year-old man, unable to communicate for more than six years following brain injury but still showing fMRI evidence of brain activity, was able to interact meaningfully and consistently with others, using vocalizations and social movements, after six months of thalamic stimulation (Schiff et al., 2007). That a similar procedure was ineffective for Terri Schiavo further reinforces the evidence that her cortex had deteriorated beyond recovering. Thus brain imaging might be useful for determining which patients are good candidates for treatment.

## Splitting the Brain Splits the Conscious Mind

Studying people who have undergone brain surgery to treat disorders has given researchers a better understanding of the conscious mind. Often this surgery has

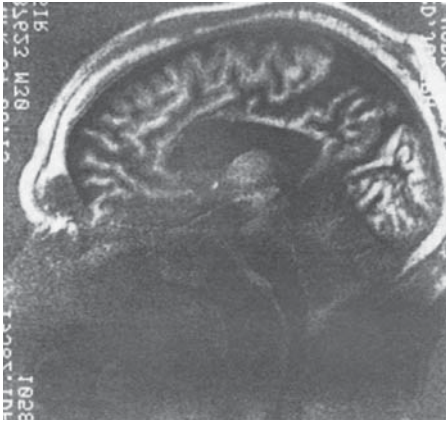


(a)



(b)

**FIGURE 4.6 The Range of Consciousness** (a) Terry Schiavo spent more than 15 years in a persistent vegetative state before she was taken off life support. Her parents and their supporters believed she showed some awareness, despite brain scans that showed no brain activity. (b) Jan Grzebski was in a minimally conscious state for 19 years before he awoke and reported that he had in fact been aware of events around him.

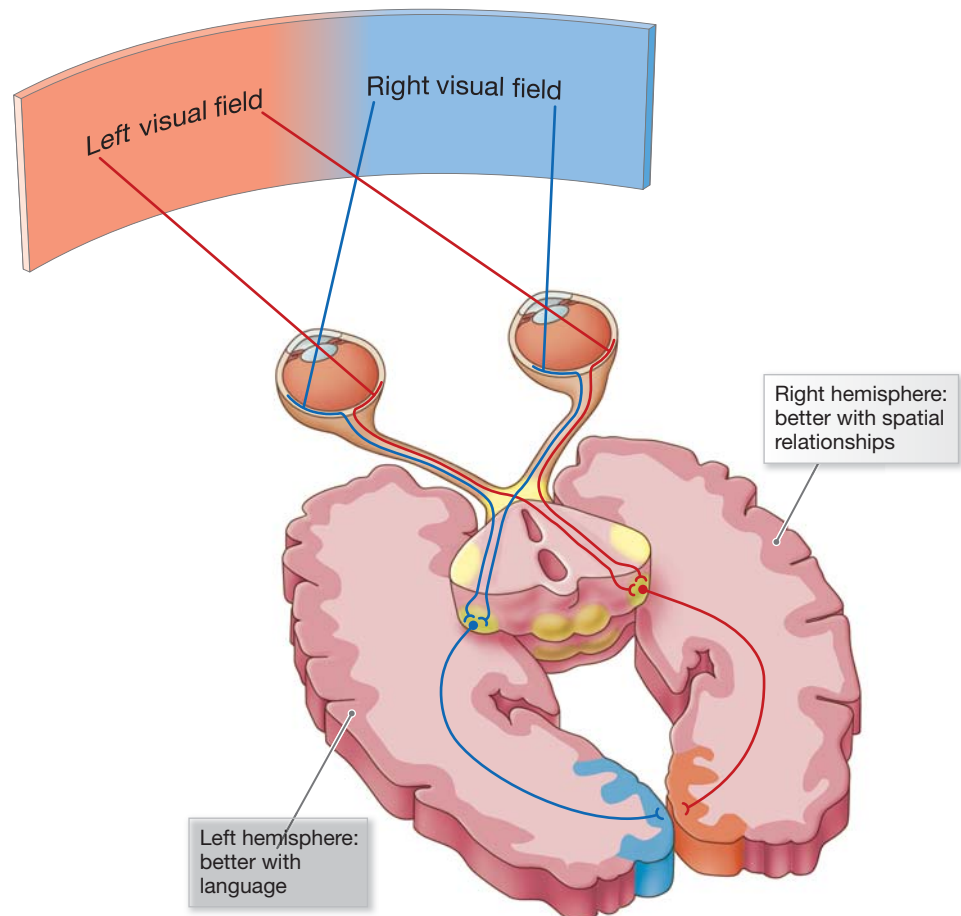


**FIGURE 4.7 The Corpus Callosum**

This MRI shows a patient's brain after the corpus callosum was completely sectioned.

**split brain** A condition in which the corpus callosum is surgically cut and the two hemispheres of the brain do not receive information directly from each other.

**FIGURE 4.8 Visual Input** Images from the left side go to the brain's right hemisphere, and images from the right side go to the left hemisphere.



attempted to treat epilepsy by removing the part of the brain in which the seizures began. Another strategy, pioneered in the 1940s and still practiced on occasion when other interventions have failed, is to cut connections within the brain to try to isolate the site of seizure initiation, so a seizure that begins at that site will less likely spread throughout the cortex. (Chapter 7, “Attention and Memory,” includes a discussion of H.M., one of psychology’s most famous case studies because of the memory loss he suffered as a result of brain surgery conducted to stop his severe seizures.)

The major connection between the hemispheres that may readily be cut without damaging the grey matter is the massive fibre bundle called the *corpus callosum* (FIGURE 4.7). Most epilepsy responds to treatment with modern medications, but in rare, extreme cases that do not respond to medications, the corpus callosum may be cut completely as a means of treatment. When the corpus callosum is severed, the brain’s halves are almost completely isolated from each other, a condition called **split brain**. This surgical procedure has provided many important insights into the basic organization and specialized functions of each brain hemisphere. But this procedure also raises an interesting question: “If you split the brain, do you split the mind?”

What is it like to have your brain split in half? Although you might think it would lead to dramatic personality changes, perhaps the most obvious thing about split-brain patients after their operations is how normal they are. Unlike patients following other types of brain surgery, split-brain patients have no immediately apparent major problems. In fact, some early investigations suggested the surgery had not affected the patients in any discernible way. They could walk normally, talk

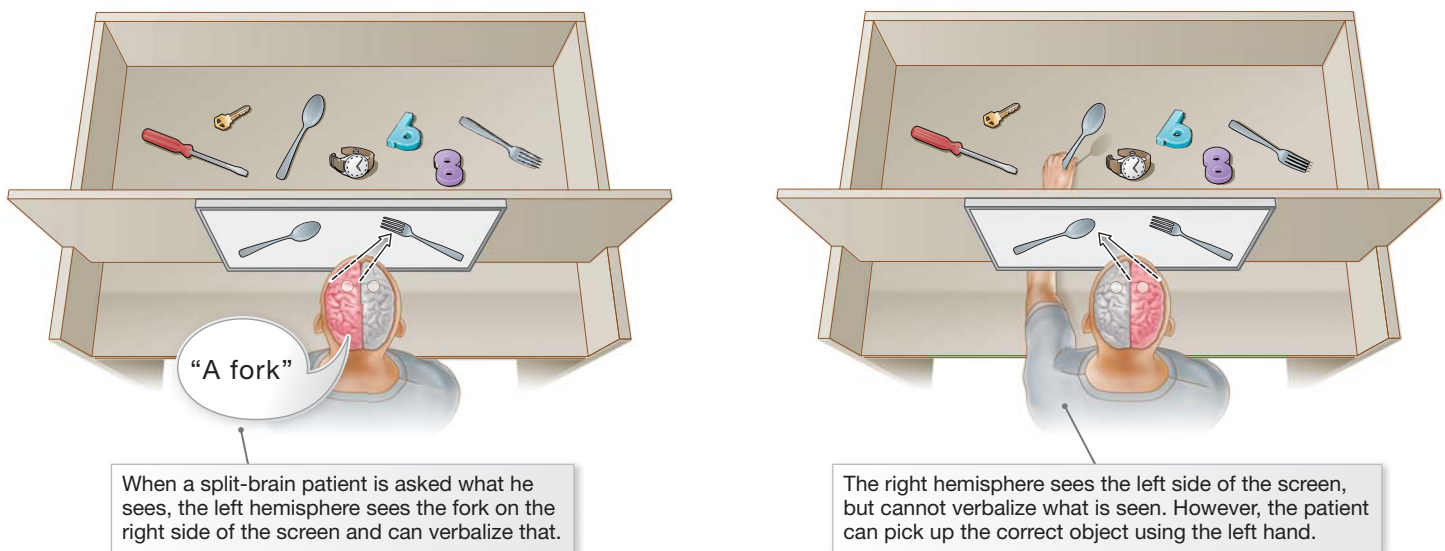
normally, think clearly, and interact socially. In the 1960s, this book's co-author Michael Gazzaniga, working with the Nobel laureate Roger Sperry, conducted a series of tests on the first split-brain participants. The results were stunning: Just as the brain had been split in two, so had the mind!

As discussed in Chapter 5, images from the visual field's left side (left half of what you are looking at) go to the right hemisphere, and those from the right side go to the left; the left hemisphere also controls the right hand, and the right hemisphere controls the left hand. With a split-brain patient, these divisions allow researchers to provide information to and get information from a single hemisphere at a time (**FIGURE 4.8**).

Psychologists have long known that in most people the left hemisphere is dominant for language. If a split-brain patient sees two pictures flashed on a screen briefly and simultaneously—one to the visual field's right side and one to the left side—the patient will report that only the picture on the right was shown. Why is this? Because the left hemisphere, with its control over speech, sees only the picture on the right side, so it is the only picture a person with a split brain can talk about. The mute right hemisphere (or “right brain”), having seen the picture on the left, is unable to articulate a response. The right brain can act on its perception, however: If the picture on the left was, for example, of a spoon, the right hemisphere can easily pick out an actual spoon from a selection of objects, using the left hand (which is controlled by the right hemisphere). Still, the left hemisphere does not know what the right one saw. Splitting the brain, then, produces two half brains, each with its own perceptions, thoughts, and consciousness (**FIGURE 4.9**).

Further explorations have revealed much more about the division of labour within the brain. In all the split-brain patients studied, the left hemisphere was far more competent at language than the right, so much so that in many patients the right hemisphere had no discernable language capacity. In some patients, though, the right hemisphere displayed some rudimentary language comprehension, such as being able to read simple words. Interestingly, such right hemisphere language capabilities tend to improve in the years following the split-brain operation, presumably as the right hemisphere attains communication skills unnecessary when that hemisphere was connected to the fluent left brain.

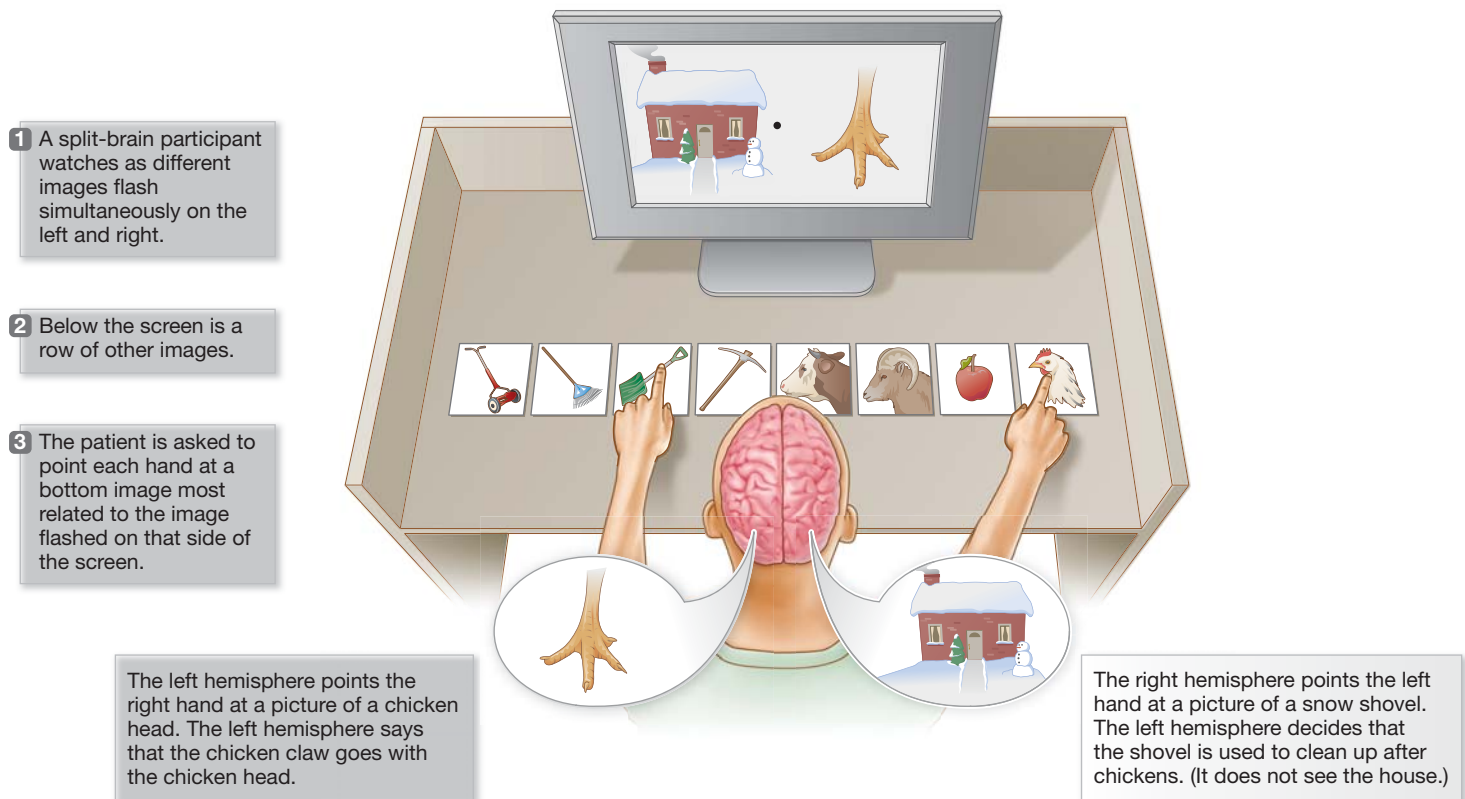
**FIGURE 4.9** Split-Brain Experiment: The Left Hemisphere versus the Right Hemisphere



The right hemisphere, however, has its own competencies, which complement those of the left. The left brain is generally hopeless at spatial relationships. In one experiment, a split-brain participant is given a pile of blocks and a drawing of a simple arrangement in which to put them—for example, a square. When using the left hand, controlled by the right hemisphere, the participant arranges the blocks effortlessly. When using the right hand, controlled by the left brain, the participant produces only an incompetent, meandering attempt. During this dismal performance, the right brain presumably grows frustrated, because it makes the left hand try to slip in and help!

**THE INTERPRETER** Another interesting dimension to the relationship between the brain's hemispheres is how they work together to reconstruct our experiences. This collaboration can be demonstrated by asking a disconnected left hemisphere what it thinks about previous behaviour that has been produced by the right hemisphere. In one such experiment, the split-brain patient sees different images flash simultaneously on the left and right sides of a screen, while below those images is a row of other images. The patient is asked to point with each hand to a bottom image that is most related to the image flashed on that side of the screen above. In one such study, a picture of a chicken claw was flashed to the left hemisphere, and a picture of a snow scene to the right hemisphere. In response, the left hemisphere pointed the right hand at a picture of a chicken head, and the right hemisphere pointed the left hand at a picture of a snow shovel. The (speaking) left hemisphere could have no idea what the right hemisphere had seen. When the participant was asked why he pointed to those pictures, he (or, rather, his left hemisphere) calmly replied, "Oh, that's simple. The chicken claw goes with the chicken, and you need a shovel to clean out the chicken shed." The left hemisphere evidently had interpreted the left hand's response in a manner consistent with the left brain's knowledge (FIGURE 4.10).

**FIGURE 4.10 The Left Hemisphere Interpreter** On the basis of limited information, the left hemisphere attempts to explain behaviour governed by the right hemisphere.



The left hemisphere's propensity to construct a world that makes sense is called the **interpreter**, because the left hemisphere is interpreting what the right hemisphere has done (Gazzaniga, 2000). In this last example, the left hemisphere interpreter created a ready way to explain the left hand's action, which was controlled by the disconnected right hemisphere. The explanation was unrelated to the right hemisphere's real reason for commanding that action. Yet to the patient, the movement seemed perfectly plausible once the action had been interpreted. Usually, the interpreter's explanations come readily. To give another example: If the command *Stand up* is flashed to a split-brain patient's right hemisphere, the patient will stand up. But when asked why he has stood up, the patient will not reply, "You just told me to," because the command is not available to his (speaking) left hemisphere. Instead, unaware of the command, he will say something like, "I just felt like getting a soda." His left hemisphere is compelled to concoct a story that explains, or interprets, his action after it has occurred.

Such interpretation does not always happen instantly. Sometimes it takes the patient's left hemisphere as long to figure out why the left hand is acting as it would take an outside observer. In one session, Gazzaniga and his colleagues presented the word *phone* to the right hemisphere of patient J.W. and asked him to verbalize what he saw. J.W. replied that he did not see anything. Of course, J.W. was speaking from his left hemisphere, which did not see the word *phone*, and his right hemisphere was mute. However, when a pen was placed in his left hand and he was asked to draw what he saw, J.W. immediately started drawing a phone. Outside observers who had not seen the word *phone* took some time to make out what J.W. was drawing. J.W.'s left hemisphere was in the same boat. Fortunately, J.W. tended to articulate what he was thinking (a helpful trait in a research subject). He was initially confused by what he was drawing and started guessing about what it was. Not until the picture was almost complete did the outside observers, including J.W.'s left hemisphere, understand what his left hand was drawing. At that point, J.W. exclaimed, "Duh, it's a phone!" The communication between the hemispheres occurred on the paper and not within his head. J.W.'s right hemisphere drew what it saw; after viewing the drawing, his left hemisphere identified it as a phone. In the meantime, his interpreter struggled to guess what his hand was drawing.

**THE INTERPRETER SPECULATES** The interpreter strongly influences the way we view and remember the world. Shown a series of pictures that form a story and asked later to choose which of another group of pictures they had seen previously, normal participants have a strong tendency to falsely "recognize" pictures consistent with the theme of the original series and to reject those inconsistent with the theme. The left brain, then, tends to "compress" its experiences into a comprehensible story and to reconstruct remembered details based on the gist of that story. The right brain seems simply to experience the world and remember things in a manner less distorted by narrative interpretation.

Sometimes the left brain interpreter makes life more difficult than it needs to be. In one experiment, human or (nonhuman) animal participants must predict, on each trial, whether a red light or a green light will flash. A correct prediction produces some small reward. Both lights flash in a random sequence, but overall the red light flashes 70 percent of the time. Participants pretty quickly notice that the red light comes on more often. So to receive the most reward, what strategy do they follow? After doing this task a number of times, most animals simply choose the red light—the most probable response—100 percent of the time; by doing so, they receive rewards on 70 percent of the trials. This strategy makes great sense in terms of adaptiveness, in that it guarantees the animals receive the maximum

**interpreter** A left hemisphere process that attempts to make sense of events.

rewards, yet humans do something much different. They try to figure out patterns in the way the lights flash, and they choose the red light about 70 percent of the time. That is, overall their choices match the frequency of how often red flashes, but because the lights flash randomly, on any given trial humans may choose incorrectly. Indeed, when humans choose the red light 70 percent of the time, they generally receive rewards on only 58 percent of the trials.

Why do humans not follow the optimal strategy, which even rats can figure out? According to Dartmouth College's George Woford and colleagues (2000), the left hemisphere interpreter leads people to search for patterns that might not even exist. To test this idea, the researchers had two split-brain patients perform a version of the task described above. The patients' right hemispheres tended to respond in the optimal way that animals did (choosing the same thing 100 percent of the time), whereas the patients' left hemispheres chose red only 70 percent of the time. The left hemisphere interpreter's tendency to seek relationships between things may be adaptive in some contexts, but it can produce less-than-optimal outcomes when such relationships (e.g., patterns) do not exist.

The split brain is a rare condition, of course, and nearly all people have two hemispheres that communicate and co-operate on the tasks of daily living. Maryse Lassonde, at the Université de Montréal, studies the rare condition in which the corpus callosum does not develop properly. Patients with this condition do not show all the characteristics of those with surgical split brains, but they show impairments in tasks that require information flow between the hemispheres (Lassonde & Ouimet, 2010). The popular media have sometimes exaggerated this research's findings, suggesting that certain people are "left brain" logical types and others are "right brain" artistic types. In reality, although the hemispheres are specialized for certain functions, such as language or spatial navigation, most cognitive processes involve both hemispheres' coordinated efforts. Split-brain research provides a unique opportunity to study each hemisphere's capacities.

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### Unconscious Processing Influences Behaviour

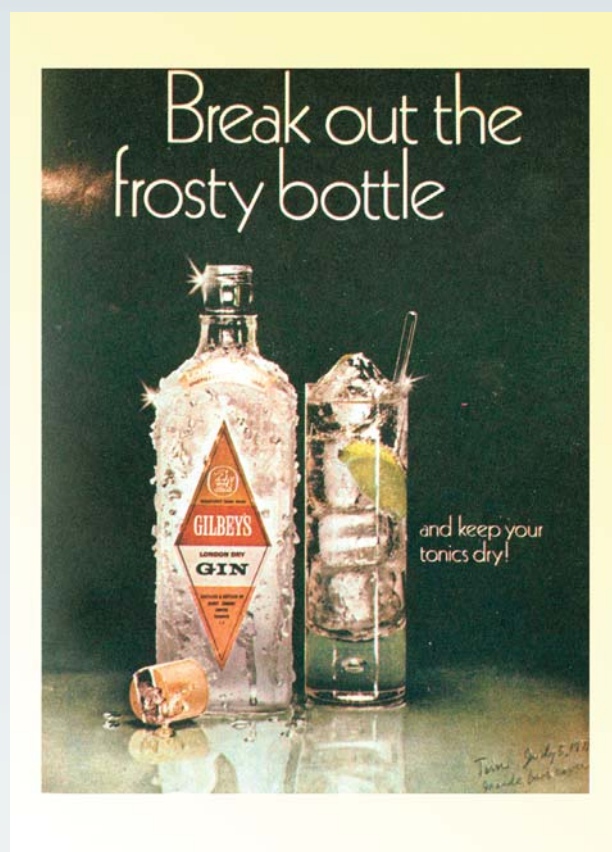
Before reading further, think of your phone number. If you are familiar enough with the number, you probably remembered it quickly. Yet you have no idea how your brain worked this magic. That is, you do not have direct access to the neural or cognitive processes that lead to your thoughts and behaviour. You thought about your phone number, and (if the magic worked) the number popped into your consciousness.

This brief exercise illustrates a central property of consciousness: We are aware of some mental processes and not aware of others. Over the last several decades, many researchers have explored different ways in which unconscious cues, or **subliminal perception**, can influence cognition. Subliminal perception refers to stimuli that get processed by sensory systems but, because of their short durations or subtle forms, do not reach consciousness. Advertisers have long been accused of using subliminal cues to persuade people to purchase products (FIGURE 4.11). The evidence suggests that subliminal messages have quite small effects on purchasing behaviour (Greenwald, 1992), but material presented subliminally can influence how people think even if it has little or no effect on complex actions. (Buying something you did not intend to buy would count as a complex

**subliminal perception** Information processed without conscious awareness.

**FIGURE 4.11 Try for Yourself: Subliminal Perception**

Try to pick out the subliminal message in the advertisement below.



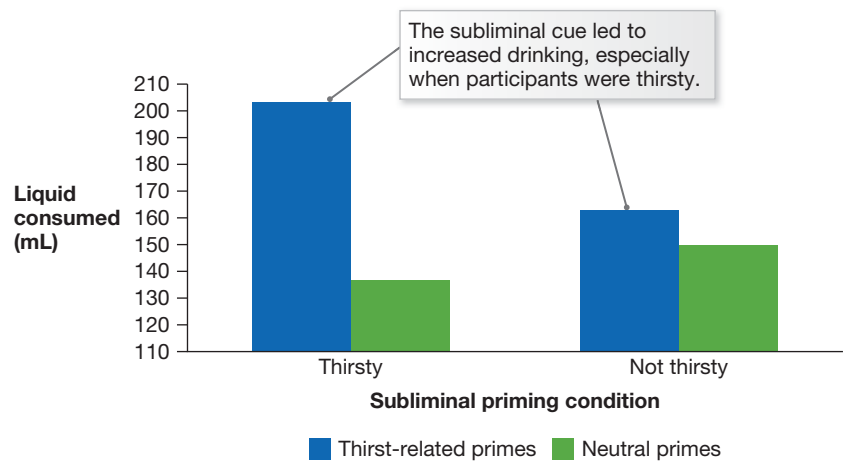
**Answer:** The ice cubes spell out S-E-X.



action.) That is, considerable evidence indicates that people are affected by events—stimuli—they are not aware of (Gladwell, 2005). In one recent study, participants exerted greater physical effort when large images of money were flashed at them, even though the flashes were so brief the participants did not report seeing the money (Pessiglione et al., 2007). The subliminal images of money also produced brain activity in areas of the limbic system, which is involved in emotion and motivation. Subliminal cues may be most powerful when they work on people’s motivational states. For example, flashing the word *thirst* may prove more effective than flashing the explicit directive *Buy Coke*. Indeed, researchers at the University of Waterloo found that subliminal presentations of the word *thirst* led participants to drink more Kool-Aid, especially when they were actually thirsty (FIGURE 4.12; Strahan, Spencer, & Zanna, 2002).

Other events can influence our thoughts without our awareness. In a classic experiment by the social psychologists Richard Nisbett and Timothy Wilson (1977), the participants were asked to examine word pairs, such as *ocean-moon*, that had obvious semantic associations between the words. They were then asked to free-associate on other, single words, such as *detergent*. Nisbett and Wilson wanted to find out the degree, if any, to which the word pairs would influence the free associations—and, if the influence occurred, whether the participants would be aware of it. When given the word *detergent* after the word pair *ocean-moon*, participants typically free-associated the word *tide*. However, when asked why they said “tide,” they usually gave reasons citing the detergent’s brand name, such as “My mom used Tide when I was a kid”; they were not aware that the word pair had influenced their thoughts. Here again, the left hemisphere interpreter was at work, making sense of a situation and providing a plausible explanation for cognitive events when complete information was not available. We are, of course, frequently unaware of the many different influences on our thoughts, feelings, and behaviour. Similar effects underlie the classic mistake called a *Freudian slip*, in which an unconscious thought is suddenly expressed at an inappropriate time and/or in an inappropriate social context.

Another example of unconscious influences’ power comes from the work of Yale University’s John Bargh and his colleagues (1996), who asked participants to make sentences out of groups of words. Some of these words were associated with the elderly, such as *old*, *Florida*, and *wrinkles*. After the participants had made up a number of sentences, they were told the experiment was over. But the researchers continued observing the participants, interested in whether the unconscious activation of beliefs about the elderly would influence the participants’ behaviour. Indeed, participants primed with stereotypes about old people walked much more slowly than did those who had been given words unrelated to the elderly. When questioned later, the slow-walking participants were not aware that the concept of “elderly” had been activated or that it had changed their behaviour. Other researchers have obtained similar findings. For instance, Ap Dijksterhuis and Ad van Knippenberg (1998) found that people at Nijmegen University, in the Netherlands, better answered trivia questions when they were subtly presented with information about “professors” than when they were subtly presented with information about “soccer hooligans,” although they were unaware that their behaviour was influenced by the information. Such findings indicate that much of our behaviour occurs without our awareness or intention (Bargh & Morsella, 2008; Dijksterhuis & Aarts, 2010).



**FIGURE 4.12 Subliminal Cues and Motivation** Participants were primed with subliminal presentations of words related to thirst (e.g., *dry* and *thirst*) and subliminal presentations of neutral words (e.g., *pirate* and *won*). The cues related to thirst led the participants to drink more liquid.

**THE SMART UNCONSCIOUS** Common sense tells us that consciously thinking about a problem or deliberating about the options is the best strategy for making a decision. Consider the possibility that *not* consciously thinking can produce an outcome superior to that of consciously thinking. In a study by Ap Dijksterhuis (2004), participants evaluated complex information regarding real-world choices—for example, selecting an apartment. In each case, the participants chose between alternatives that had negative features (e.g., high rent, bad location) and positive features (e.g., nice landlord, good view), but objectively, one apartment was the best choice. Some participants were required to make an immediate choice (no thought); some to think for three minutes and then choose (conscious thought); and some to work for three minutes on a difficult, distracting task and then choose (unconscious thought). Across three separate trials, those in the unconscious thought condition made the best decisions. According to Dijksterhuis and Nordgren (2006), unconscious processing is especially valuable for complex decisions in which it is difficult to weigh the pros and cons consciously. A similar phenomenon has also been reported in the creativity literature: Anecdotal reports suggest that allowing an idea to incubate over time helps in problem solving. Perhaps this is why, for very important decisions, people often choose to “sleep on it.” (Chapter 8, “Thinking and Intelligence,” will return to this idea in discussing problem solving strategies.)

Consider also the possibility that consciously thinking can undermine good decision making. The American social psychologist Tim Wilson and the American cognitive psychologist Jonathan Schooler (1991) asked research participants to rate jams. When the participants simply tasted the jams, their ratings were very similar to experts’ ratings. However, when the participants had to explain their ratings jam by jam, their ratings differed substantially from the experts’.

Unless the experts were wrong, the participants had made poorer judgments: Having to reflect consciously about their reasons apparently altered their perceptions of the jams. Schooler has introduced the concept of *verbal overshadowing* to describe the performance impairment that occurs when people try to explain verbally their perceptual experiences that are not easy to describe (Schooler & Engstler-Schooler, 1990; Schooler, 2002). For example, participants who had to describe the perpetrator they saw in a simulated bank robbery were less able to pick the person out of a lineup than were participants who did not have to provide a description. The descriptive labels used by the first group altered those participants’ memories of the robber. In another study, participants who had to describe a wine’s taste were later less able to detect that wine’s taste than were participants who simply tasted the wine and did not describe the taste (Melcher & Schooler, 1996). Consciously reflecting on the wine’s qualities impaired

**FIGURE 4.13 Try for Yourself: Verbal Overshadowing**

Pick the image below that is by a famous painter.



Now explain why you chose the image you did.

If you are like most people, you found it difficult to verbalize your perceptual experience.

**Answer:** *Untitled XX*, on the right, is by Willem de Kooning (1904–1997), considered a master of abstract expressionism. The painting on the left, *Lollipop House*, was painted by Marla Olmstead (b. 2000), the subject of the 2007 documentary *My Kid Could Paint That*.

performance. The take-home message of these studies is that we are not very good at describing perceptual experiences; when we are forced to do so, the act of verbally labelling alters our memories. Although it is unclear exactly why thinking too much can impair judgment and memory, some things appear to be best left unsaid (FIGURE 4.13).

## Brain Activity Produces Consciousness

Except in research situations, we can know that a particular person is aware of a certain something only when that person reports the awareness. Because a person cannot be aware of having perceived subliminal stimuli, for example, the person cannot report on them or their effects. As discussed above, though, subliminal information can influence behaviour, and brain imaging reveals that subliminal stimuli are processed in the brain despite their perceivers' lack of conscious awareness. Only research can reveal such processing, and during the past few decades, researchers have worked to identify the brain regions most important to different forms of awareness. By studying awareness in individuals with damage to specific regions of the brain, for example, researchers hope to link selective losses of awareness—that is, losses of awareness for specific forms of information—to the damaged brain areas.

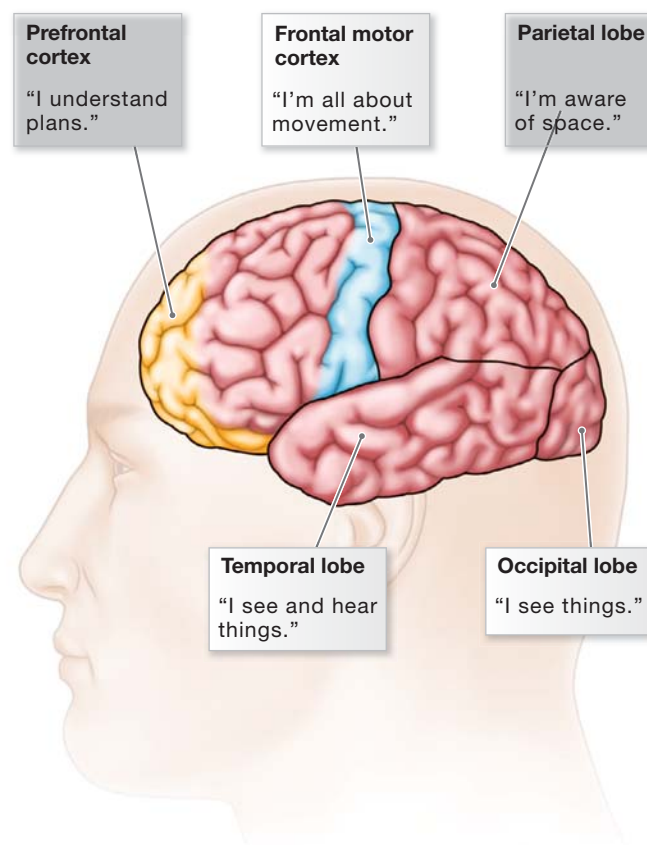
**BLINDSIGHT** Some research on visual awareness has examined **blindsight**, a condition in which a person who experiences some blindness because of damage to the visual system continues to show evidence of some sight, but is unaware of being able to see at all. Typically, a blindsighted patient loses vision in only a portion of the visual field. For example, when looking forward the person might not be able to see anything on his or her left. Researchers have discovered that when a stimulus is presented in this blind field, the patient can respond unconsciously to that stimulus. For example, a moving dot might be presented to the blind spot, and the patient must indicate in which direction the dot is moving. Typically, the patient reports having seen nothing. However, when pressed to guess the direction of motion, more often than by chance the patient will guess correctly.

One example of blindsight was recently found in a 52-year-old African physician living in Switzerland who had become blind following two consecutive strokes that destroyed the primary visual cortices in both brain hemispheres (Pegna, Khateb, Lazeyras, & Seghier, 2005). Nothing was wrong with his eyes, but the visual regions of his brain could not process any information they received from them. Although alert and aware of his surroundings, the patient reported being unable to see anything, not even the presence of intense light. Visual information also goes to other brain regions, such as the amygdala, however. As discussed in Chapter 9, one theory suggests that the amygdala processes visual information very crudely and quickly, to help identify potential threats. For example, the amygdala becomes activated in imaging studies when people observe subliminal presentations of faces expressing fear (Whalen et al., 2005). When the blind physician was shown a series of faces and was asked to guess their emotional expression, he had no sense of having seen anything but was able to identify the expression at a level much better than by chance. He did not respond to other stimuli (such as shapes, animal faces, or scary stimuli). A brain scanner showed that his amygdala became activated when he was presented with emotional faces but not with faces showing neutral expressions. Thus his amygdala might have processed the faces' emotional content despite his lack of awareness. This raises the intriguing question of whether the patient was “seeing” the faces; it also may help illuminate how visual information reaches the amygdala when primary visual areas are damaged.

**blindsight** A condition in which people who are blind have some spared visual capacities in the absence of any visual awareness.

**GLOBAL WORKSPACE** The *global workspace model* posits that consciousness arises as a function of which brain circuits are active (Baars, 1988; Dehaene et al., 2006). That is, you experience your brain regions' output as conscious awareness. Studying people with brain injuries, who are sometimes unaware of their deficits, supports this idea. For instance, a person who has vision problems caused by an eye injury will know about those problems because the brain's visual areas will notice something is wrong. But if that same person then suffers damage to the brain's visual areas so that they stop delivering output, the person may have no visual information to consider and thus will not be aware of vision problems. Of course, if the person suddenly becomes blind, as did the doctor described above, that person will know he or she cannot see. But a person who loses part of the visual field because of a brain injury tends not to notice the gap in visual experience. This tendency appears with hemineglect, for example (see Figure 3.27). A hemineglect patient is not aware of missing part of the visual world. In one patient's words, "I knew the word 'neglect' was a sort of medical term for whatever was wrong but the word bothered me because you only neglect something that is actually there, don't you? If it's not there, how can you neglect it?" (Halligan & Marshall, 1998). Jeffrey Cooney and Michael Gazzaniga (2003) explain this phenomenon by arguing that the left hemisphere interpreter can make sense only of available information, so even though normally sighted people might find the hemineglect patients' attitude bizarre, the hemineglect patients see their particular limited visual states as perfectly normal. The hemineglect patients' unawareness of their visual deficits supports the idea that consciousness arises through the brain processes active at any point in time.

**FIGURE 4.14 Areas of Awareness** A central theme emerging from cognitive neuroscience is that awareness of different aspects of the world is associated with functioning in different parts of the brain. This simplified diagram indicates major areas of awareness.



Most importantly, the global workspace model presents no single area of the brain as responsible for general “awareness.” Rather, different areas of the brain deal with different types of information, and each of these systems in turn is responsible for conscious awareness of its type of information (FIGURE 4.14). From this perspective, consciousness is the mechanism that is actively aware of information and that prioritizes what information we need or want to deal with at any moment.

## SUMMING UP

### How Is the Conscious Mind Experienced?

Although the relationship between the physical brain and consciousness has been debated at least since Descartes’ time, psychological scientists have developed methods of assessing both the contents and the variations of consciousness. Consciousness refers to a person’s experience of the world, including thoughts and feelings. The brain gives rise to consciousness by bringing multiple systems’ activities together in a global workspace. Most brain activities do not rise to the level of consciousness, but these unconscious processes influence behaviour.

## MEASURING UP

1. Which of the following statements are correct, according to our understanding of consciousness? Choose as many as apply.
  - a. The presence of consciousness is one of the main ways we can distinguish between humans’ thoughts and nonhuman animals’ thoughts.
  - b. Brain research shows that some people in comas have higher brain activity levels than others.
  - c. The contents of consciousness cannot be labelled.
  - d. Any biological process can be made conscious through effortful processing.
  - e. Our behaviours and thoughts are affected by some events about which we have no conscious knowledge.
  - f. Consciousness is subjective.
  - g. Without brain activity, there is no consciousness.
  - h. People in comas may differ in levels of consciousness.
  - i. People are either conscious or unconscious; there is no middle ground.
2. In a split-brain patient, the left hemisphere interpreter \_\_\_\_\_.
  - a. explains what to do when the patient does not understand instructions
  - b. translates from one language to another until the patient understands what is being said
  - c. makes sense of actions directed by the right hemisphere
  - d. uses language to direct the right hemisphere’s activities.

## What Is Sleep?

At regular intervals, the brain does a strange thing—it goes to sleep. A common misperception is that the brain shuts itself down during sleep and no longer processes information from the external world; nothing could be further from the truth. Many brain regions are more active during sleep than during wakefulness. It is even possible that some complex thinking, such as working on difficult problems,

### LEARNING OBJECTIVES

List and describe the stages of sleep.

Explain why we sleep and dream.

## Real World PSYCHOLOGY

occurs in the sleeping brain (Walker & Stickgold, 2006). In one study, people had to learn a task at which they would slowly get better with practice. Unbeknownst to the participants, a hidden rule existed that, once discovered, would lead to much better performance. The participants proved more likely to figure out the rule after sleep than after a comparable period of wakefulness, independent of the time of day (Wagner, Gals, Haider, Verleger, & Born, 2004).

During sleep, the brain is still active. The conscious experience of the outside world is largely turned off, but to some extent people remain aware of their surroundings, as when sleeping parents sense their baby rustling in the crib. Given that most animals sleep and that humans cannot go without sleep for more than a few days, most researchers believe sleep serves some important (but so far unknown) biological purpose.

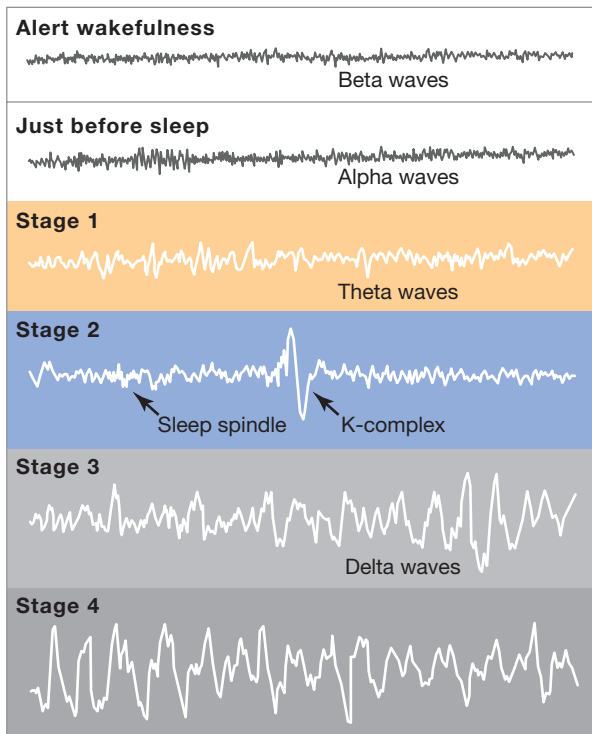
The average person sleeps around eight hours per night, but individuals differ tremendously in the number of hours they sleep. Infants sleep most of the day, and people tend to sleep less as they age. According to Statistics Canada (Hurst, 2008), those with higher incomes tend to sleep the least, perhaps because they sacrifice sleep for career. Canadian women sleep an average of 11 minutes longer than Canadian men. Throughout the world, some adults report needing 9 or 10 hours of sleep a night to feel rested, whereas others report needing only an hour or two a night. When a 70-year-old retired nurse, Miss M., reported sleeping only an hour a night, researchers were skeptical. On her first two nights in a research laboratory, Miss M. was unable to sleep, apparently because of the excitement. But on her third night, she slept for only 99 minutes, then awoke refreshed, cheerful, and full of energy (Meddis, 1977). You might like the idea of sleeping so little and having all those extra hours of spare time, but most of us do not function well on so little sleep. And as discussed in later chapters, sufficient sleep is important for memory and good health.

### Sleep Is an Altered State of Consciousness

The difference between being awake and being asleep has as much to do with conscious experience as with biological processes. When you sleep, you are not conscious, but your brain still processes information and, to some extent, remains aware of your environment. Your mind is at work, analyzing potential dangers, controlling bodily movements, and shifting body parts to maximize comfort. For this reason, people who sleep next to children or to pets tend not to roll over onto them. Nor do most people fall out of bed while sleeping—in this case, the brain is aware of at least the edges of the bed. (Because the ability to not fall out of bed when asleep is learned or perhaps develops with age, infant cribs have side rails and young children may need bed rails when they transition from crib to bed.)

Before the development of objective methods to assess brain activity, most people believed the brain went to sleep along with the rest of the body. Invented in the 1920s, the *electroencephalograph*, or *EEG*, a machine that measures the brain's electrical activity (see Chapter 2, "Research Methodology"), revealed that a lot goes on in the brain during sleep. When people are awake, their brains' neurons are extremely active, as evidenced by short, frequent, desynchronized brain signals known as *beta waves* (shown in **FIGURE 4.15**). When people close their eyes and relax, brain activity slows and becomes more synchronized, a pattern that produces *alpha waves*.

**STAGES OF SLEEP** Sleep occurs in stages, as evidenced by changes in EEG readings (see Figure 4.15). As you drift off to sleep, you enter stage 1, characterized by



**FIGURE 4.15 Brain Activity during Sleep** Using an EEG, researchers measured these examples of the patterns of electrical brain activity during different stages of normal sleep.

*theta waves*, from which you can be aroused easily. Indeed, if awakened you will probably deny that you were sleeping. In this light sleep, you might see fantastical images or geometric shapes; you might have the sensation that you are falling or that your limbs are jerking. As you progress to stage 2, your breathing becomes more regular, and you become less sensitive to external stimulation. You are now really asleep. Although the EEG would continue to show theta waves, it would also show occasional bursts of activity called *sleep spindles* and large waves called *k-complexes*. Some researchers believe that these are signals from brain mechanisms involved with shutting out the external world and keeping people asleep (Steriade, 1992). Two findings—that abrupt noise can trigger k-complexes; and that as people age and sleep lighter, their EEGs show fewer sleep spindles—indicate that the brain must work to maintain sleep.

The progression to deep sleep occurs through stages 3 and 4, which are marked by large, regular brain patterns called *delta waves*. This period is often referred to as *slow-wave sleep*. People in slow-wave sleep are very hard to wake and often very disoriented when they do wake up. However, people still process some information in stage 4, as the mind continues to evaluate the environment for potential danger. Parents in stage 4 can be aroused by their children’s cries, for example, but blissfully ignore sounds, such as sirens or traffic noise, louder than the crying children.

**REM SLEEP** After about 90 minutes of sleep, a peculiar thing happens. The sleep cycle reverses, returning to stage 3 and then to stage 2. At this point, the EEG suddenly shows a flurry of beta wave activity that usually indicates an awake, alert mind. The eyes dart back and forth rapidly beneath closed eyelids, and for these *rapid eye movements* this stage is called **REM sleep**. It is sometimes called *paradoxical sleep* because of the paradox of a sleeping body with an active brain. Indeed, some neurons in the brain, especially in the occipital cortex and brain stem regions, are more active during REM sleep than during waking hours. But while the brain is

**REM sleep** The stage of sleep marked by rapid eye movements, dreaming, and paralysis of motor systems.

active during REM episodes, most of the body's muscles are paralyzed. At the same time, the body shows signs of genital arousal: Most males of all ages develop erections, and most females of all ages experience clitoral engorgement.

REM sleep is psychologically significant because about 80 percent of the time when people are awakened during REM sleep, they report dreaming, compared with less than half of the time during non-REM sleep (Solms, 2000). As discussed further below, the dreams differ between these two types of sleep.

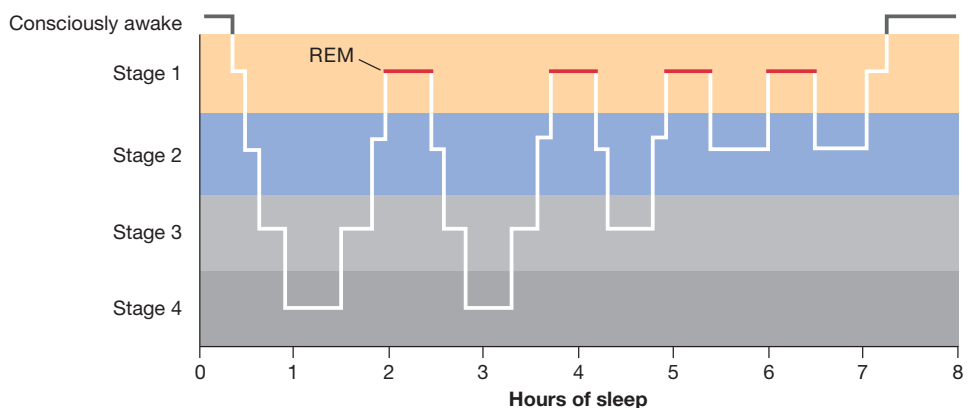
Over the course of a typical night's sleep, the cycle repeats, as the sleeper progresses from slow-wave sleep through to REM sleep, then back to slow-wave sleep and through to REM sleep (FIGURE 4.16). As morning approaches, the sleep cycle becomes shorter, and the sleeper spends relatively more time in REM sleep. People briefly awaken many times during the night but do not remember these awakenings in the morning. As people age, they sometimes have more difficulty going back to sleep after awakening.

**SLEEP DISORDERS** According to an old joke, when someone says, "I slept like a baby," it must mean waking up every few hours feeling miserable and unable to get back to sleep. Sleep problems are relatively common throughout life; about half the population reports difficulty getting to sleep or staying asleep. Even though nearly everyone has occasional sleep difficulties, for some people the inability to sleep causes significant problems in their daily lives. **Insomnia** is a sleep disorder in which people's mental health and ability to function are compromised by their inability to sleep. Indeed, chronic insomnia is associated with diminished psychological well-being, including feelings of depression (Hamilton et al., 2007). It is estimated that 3.3 million Canadians experience problems with insomnia (Tjepkema, 2005). In a large study that followed Quebec residents for one year, researchers found that just under one-third of people experienced occasional symptoms of insomnia whereas 7.4 percent met all diagnostic criteria for insomnia. Those who were most anxious and depressed at the beginning of the study were most likely to develop chronic insomnia (LeBlanc et al., 2009). In a three-year longitudinal study conducted in Quebec, nearly half of those with insomnia at the beginning of the study still had it after three years (Morin et al., 2009). One factor that complicates the estimation of how many people have insomnia is that many people who believe they are poor sleepers overestimate how long it takes them to fall asleep and often underestimate how much sleep they get on a typical night. For instance, some people experience *pseudoinsomnia*, in which they basically dream they are not sleeping. Their EEGs would indicate sleep, though if you roused them they would claim to have been awake.

**insomnia** A disorder characterized by an inability to sleep.

## Real World PSYCHOLOGY

**FIGURE 4.16 Stages of Sleep** This chart illustrates the normal stages of sleep over the course of the night.





In an odd twist, a major cause of insomnia is worrying about sleep. People may be tired, but when they lie down they worry about whether they will get to sleep and may even panic about how a lack of sleep will affect them the next day. This anxiety leads to heightened arousal, which interferes with normal sleep patterns. To overcome these effects, many people take sleeping pills, which may work in the short run but can cause significant problems down the road. People may come to depend on the pills to help them sleep. If so and if they do not take the pills, they may lie awake wondering whether they can get to sleep on their own. Recent research at Université Laval demonstrates that the preferred treatment for insomnia is *cognitive-behavioural therapy* (CBT, discussed in Chapter 15, “Treatment of Psychological Disorders”), which helps people overcome their worries about sleep. According to this research, the most successful approach is combined drug and CBT therapy, with the drugs discontinued before the end of therapy (Morin et al., 2009). Other factors that contribute to insomnia include poor sleeping habits (ways to improve sleeping habits are listed in **TABLE 4.1**).

Another fairly common sleeping problem is **sleep apnea**, a disorder in which a person stops breathing for temporary periods while asleep, resulting in a loss of oxygen and sleep disruption. Sleep apnea is most common among middle-aged men and is often associated with obesity (Spurr, Graven, & Gilbert, 2008). People with sleep apnea are often unaware of their condition since the main symptom is loud snoring and they do not remember their frequent awakenings during the night. Yet chronic apnea causes people to have poor sleep, which is associated with daytime fatigue and even problems such as inability to concentrate while driving. For serious cases, physicians often prescribe a breathing device that, during sleep, blows air into the person’s nose or nose and mouth (**FIGURE 4.17**).

A student who falls asleep during a lecture is likely sleep deprived, but a professor who falls asleep while lecturing is probably experiencing an episode of **narcolepsy**, a disorder in which excessive sleepiness occurs during normal waking hours. During

**sleep apnea** A disorder in which a person stops breathing while asleep.

**narcolepsy** A sleep disorder in which people fall asleep during normal waking hours.

**Table 4.1 How to Develop Good Sleeping Habits**

1. Establish a routine to help set your biological clock: Every day, including weekends, go to bed at the same time and wake up at the same time. Changing the time you go to bed or wake up each day can alter your regular nightly sleep cycle and/or disrupt other physiological systems.
2. Never consume alcohol or caffeine just before going to bed. Alcohol might help you get to sleep more quickly, but it will interfere with your sleep cycle and most likely cause you to wake up early the next day.
3. Regular exercise will help maintain your sleep cycle. However, exercising creates arousal that interferes with sleep, so do not exercise right before going to bed.
4. Do not spend time in your bed reading, eating, or watching television. Your mind needs to associate your bed with sleeping.
5. Relax. Do not worry about the future. Have a warm bath or listen to soothing music. Relaxation techniques—such as imagining you are on the beach, with the sun shining on your back and radiating down your hands—may help you deal with chronic stress.
6. When you cannot fall asleep, get up and do something else. Do not lie there trying to force sleep. One sleepless night will not affect you very much, and worrying about the effects of not sleeping will only make it more difficult to sleep.
7. When you have trouble falling asleep on a particular night, do not try to make up for the lost sleep by sleeping late the next morning or napping during the day. You want to be sleepy when you go to bed at night, and sleeping late and/or napping will disrupt your sleep cycle.





**FIGURE 4.17 Sleep Apnea** A continuous positive airway pressure (CPAP) device blows air to keep a sleep apnea patient's throat open.

an episode of narcolepsy, a person may experience the muscle paralysis that accompanies REM sleep, perhaps causing him or her to go limp and collapse. Obviously, people with narcolepsy—an estimated 1 in 2,000 people—have to be very careful about the activities they engage in during the day, as unexpectedly falling asleep can be dangerous or fatal depending on the surroundings. Evidence suggests that narcolepsy is a genetic condition that affects the neural transmission of a specific neurotransmitter in the hypothalamus (Chabas, Taheri, Renier, & Mignot, 2003; Nishino, 2007). The most widely used treatments for this condition are drugs such as the stimulant modafinil. However, Swiss researchers have found evidence that narcolepsy is an autoimmune disorder and that treating it as such (using immunoglobulin) produces excellent results (Cvetkovic-Lopes et al., 2010).

A sleep disorder that is roughly the opposite of narcolepsy is *REM behaviour disorder*, in which the normal paralysis that accompanies REM sleep is disabled so that people act out their dreams while sleeping, often striking their sleeping partners. This rare disorder is caused by a neurological deficit and is most often seen in elderly males.

Unlike REM behaviour disorder, sleepwalking is a relatively common behaviour that occurs during stage 4 sleep. Technically called *somnambulism*, sleepwalking is most common among young children and typically occurs within the first hour or two after falling asleep. During an episode, the person is glassy-eyed and seems disconnected from other people and/or the surroundings. No harm is done if the sleepwalker wakes up during the episode. Being gently walked back to bed is safer for the sleepwalker than being left to wander around and potentially get hurt.

## Sleep Is an Adaptive Behaviour

In terms of adaptiveness, sleep might seem illogical. Tuning out the external world during sleep can be dangerous and thus a threat to survival. Beyond that, humans might have advanced themselves in countless ways if they had used all their time productively rather than wasting it by sleeping. But people cannot override indefinitely the desire to sleep; the body shuts down whether we like it or not. Why do we sleep? Sleep must do something important, because many animals sleep, even if they have peculiar sleeping styles. (For example, some dolphin species have *uni-hemispherical sleep*, in which the cerebral hemispheres take turns sleeping. Although it used to be assumed that all animals sleep, evidence indicates that some animals, such as some frogs, never exhibit a state that can be considered sleep [Siegel, 2008].) Researchers have proposed three general explanations for sleep's adaptiveness: *restoration*, *circadian cycles*, and *facilitation of learning*.

**RESTORATION AND SLEEP DEPRIVATION** According to the *restorative theory*, sleep allows the brain and body to rest and to repair themselves. Various kinds of evidence support this theory: Released during deep sleep, growth hormone facilitates the repair of damaged tissue. After people engage in vigorous physical activity, such as running a marathon, they generally sleep longer than usual. Sleep apparently allows the brain to replenish glycogen stores and strengthen the immune system (Hobson, 1999).

Numerous laboratory studies have examined sleep deprivation's effects on physical and cognitive performance. Surprisingly, most studies find that two or three days of sleep deprivation have little effect on strength, athletic ability, or the performance of complex tasks. In a brain imaging study, sleep-deprived people showed increased activation of the prefrontal cortex, a finding that suggests some brain

regions may compensate for sleep deprivation's effects (Drummond et al., 2000). However, sleep-deprived people find it difficult to perform quiet tasks (such as reading) and nearly impossible to perform boring or mundane tasks.

Eventually, over a long period, sleep deprivation causes mood problems and decreases cognitive performance. People who suffer from chronic sleep deprivation—including many university students!—may experience attention lapses and reduced short-term memory. Studies using rats have found that extended sleep deprivation compromises the immune system and leads to death. Sleep deprivation is also dangerous and potentially disastrous because it makes people prone to **microsleeps**, in which they fall asleep during the day for periods ranging from a few seconds to a minute (Coren, 1996).

Sleep deprivation might serve one very useful purpose, however: helping people overcome depression. Consistent evidence has emerged over the past decade demonstrating that depriving depressed people of sleep sometimes alleviates their depression. This effect appears to occur because sleep deprivation leads to increased activation of serotonin receptors, as do drugs used to treat depression (Benedetti et al., 1999). For people who are not depressed, however, sleep deprivation is more likely to produce negative moods than positive ones.

**CIRCADIAN RHYTHMS** Brain and other physiological processes are regulated into patterns known as **circadian rhythms** (*circadian* roughly translates to “about a day”). For example, body temperature, hormone levels, and sleep/wake cycles operate according to circadian rhythms. A kind of biological clockwork, circadian rhythms are controlled by the cycles of light and dark, although human and nonhuman animals continue to show these rhythms when light cues are removed.

The *circadian rhythm theory* proposes that sleep has evolved to keep animals quiet and inactive during times of the day when there is greatest danger, usually when it is dark. According to this theory, animals need only a limited amount of time each day to accomplish the necessities of survival, and it is adaptive for them to spend the remainder of the time inactive, preferably hidden. Accordingly, an animal's typical amount of sleep depends on how much time that particular animal needs to obtain food, how easily it can hide, and how vulnerable it is to attack. Small animals tend to sleep a lot. Large animals vulnerable to attack, such as cows and deer, sleep little. Large predatory animals that are not vulnerable sleep a lot (**FIGURE 4.18**). Humans depend greatly on vision for survival, and they adapted to sleeping at night because the lack of light increased the dangers around them.

**FACILITATION OF LEARNING** Scientists have also proposed that sleep is important because it is involved in the strengthening of neural connections that serve as the basis of learning. The general idea is that circuits wired together during the waking period are consolidated, or strengthened, during sleep (Wilson & McNaughton, 1994). Robert Stickgold and colleagues (2000) conducted a study in which participants had to learn a complex task. After finding that participants improved at the task only if they had slept for at least six hours following training, the researchers argued that learning the task required neural changes that normally occur only during sleep. Both slow-wave sleep and REM sleep appear to be important for learning to take place, but evidence indicates that people are especially likely to perform better if they dream about the task while sleeping. In a study, participants learned how to run a complex maze. Those who then slept for 90 minutes went on to perform better on the maze. Those who dreamed about the maze, however, performed much better (Wamsley et al., 2010). Indeed, a study of Trent University students

**microsleeps** Brief, unintended sleep episodes, ranging from a few seconds to a minute, caused by chronic sleep deprivation.

**circadian rhythms** The regulation of biological cycles into regular patterns.



**FIGURE 4.18 Sleeping Predator** After a fresh kill, a lion may sleep for days.

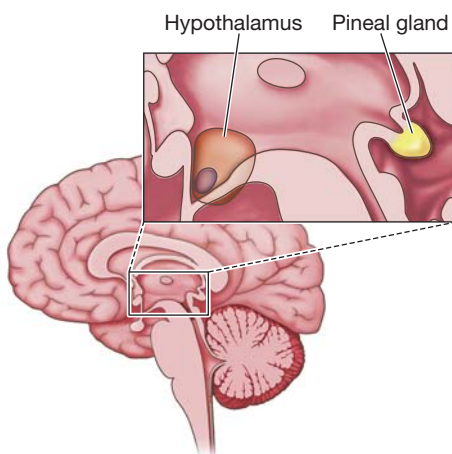
found they experienced more REM sleep during exam periods, when a greater mental consolidation of information might be expected to take place (Smith & Lapp, 1991). The argument that sleep, especially REM sleep, promotes development of brain circuits for learning is also supported by the changes in sleep patterns that occur over the life course. Infants and the very young, who learn an incredible amount in a few years, sleep the most and also spend the most time in REM sleep.

Findings linking sleep to learning should give caution to students whose main style of studying is the all-nighter. In one recent study, students who were sleep deprived for one night showed reduced activity the next day in the hippocampus, a brain area essential for memory (Yoo et al., 2007; see Figure 3.24). These sleep-deprived students also showed poorer memory at subsequent testing. According to the investigators, substantial evidence shows that sleep not only is essential for consolidating memories but also seems to prepare the brain for its memory needs for the next day. (For a further discussion of why the all-nighter is an inefficient way to learn, see Chapter 7, “Attention and Memory.”)

### Sleep and Wakefulness Are Regulated by Multiple Neural Mechanisms

Multiple neural mechanisms are involved in producing and maintaining circadian rhythms and sleep. A tiny structure in the brain called the *pineal gland* (FIGURE 4.19) secretes *melatonin*, a hormone that travels through the bloodstream and affects various receptors in both the body and the brain. Bright light suppresses the production of melatonin, whereas darkness triggers its release. Researchers recently have noted that taking melatonin can help people cope with jet lag and shift work, both of which interfere with circadian rhythms. Taking melatonin also appears to help people fall asleep, although it is unclear why this happens.

Researchers have identified a gene that influences sleep (Koh et al., 2008). Called SLEEPLESS, this gene regulates a protein that, like many anaesthetics, reduces action potentials in the brain. Loss of the protein leads to an 80 percent reduction in sleep.



**FIGURE 4.19 The Pineal Gland** The biological clock signals the pineal gland to secrete melatonin, which affects bodily states related to being tired.

**BRAIN STEM AND AROUSAL** Sleep is controlled by brain mechanisms that produce alterations in states of arousal. In 1949, Giuseppe Moruzzi of Italy and Horace Magoun of the United States found that stimulating the *reticular formation* in the brain stem leads to increased arousal in the cerebral cortex. If you cut the fibres from the reticular formation to the cortex, animals fall asleep and stay asleep until they die. Accordingly, Moruzzi and Magoun proposed that low levels of activity in the reticular formation produce sleep, and high levels lead to awakening.

If the reticular formation triggers arousal, what triggers sleep? Some evidence suggests that the *basal forebrain*, a small area just in front of the hypothalamus, is involved in inducing non-REM sleep. Neurons in this area become more active during non-REM sleep, and any lesion in the area will lead to insomnia. Once activated, the region sends inhibitory signals to the reticular formation, thereby reducing arousal and triggering sleep.

### People Dream while Sleeping

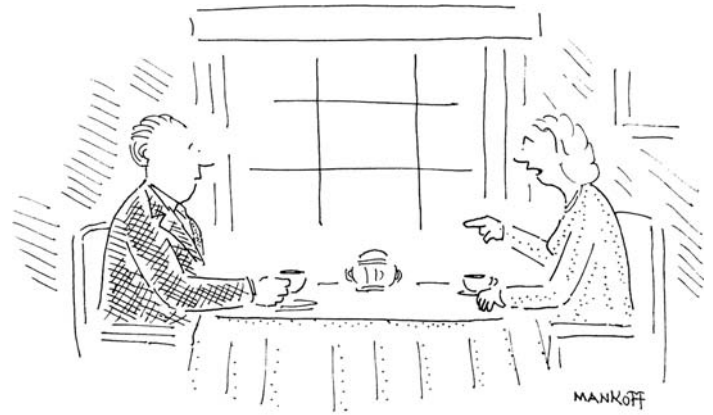
Because **dreams** are the products of an altered state of consciousness, dreaming is one of life’s great mysteries. Why does the sleeper’s mind conjure up images, fantasies, stories that make little sense, scenes that ignore physical laws and rules of

**dreams** The product of an altered state of consciousness in which images and fantasies are confused with reality.

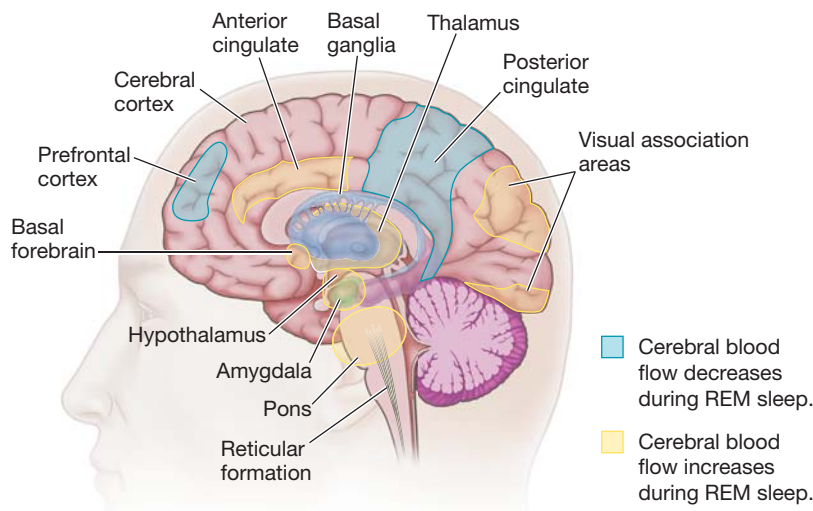
both time and space? Why does it confuse these conjurings with reality? Why does it sometimes allow them to scare the dreamer awake? Usually, only when people wake up do they realize they have been dreaming. Some people claim not to remember their dreams, but everyone dreams unless a particular kind of brain injury or a particular kind of medication gets in the way. Indeed, the average person spends six years of his or her life dreaming. If you want to remember your dreams better, you can teach yourself to do so: Keep a pen and paper or a voice recorder next to your bed so you can record your dreams as soon as you wake up. If you wait, you likely will forget most of them.

Dreams occur in REM and non-REM sleep, although the dreams' contents differ in the two types of sleep. Activation of different brain regions during REM and non-REM sleep may be responsible for the different types of dreams. REM dreams are more likely to be bizarre, involving intense emotions, visual and auditory hallucinations (but rarely taste, smell, or pain), illogical contents, and an uncritical acceptance of events. Non-REM dreams are often very dull, about mundane activities such as deciding what clothes to wear or taking notes in class (FIGURE 4.20).

When researchers first noticed rapid eye movements, in the 1950s, they believed dreams were mainly a product of REM sleep. Initially, they dismissed non-REM dreams as trivial or as based on faulty recollection. We now know that REM sleep



"Look, don't try to weasel out of this. It was my dream, but you had the affair in it."



**FIGURE 4.20** Brain Regions Stimulated during Dreams

REM dreams are often bizarre and full of intense emotion.



Non-REM dreams are often dull and about mundane activities.



can occur without dreaming and that dreams can occur without REM sleep. Moreover, REM and dreaming appear to be controlled by different neural signals (Solms, 2000), so REM might be linked with dreams' contents rather than producing the dream state. REM dreams' contents result from activation of brain structures associated with motivation, emotion, and reward along with activation of visual association areas. The brain's emotion centres and visual association areas interact without self-awareness, reflective thought, or conscious input from the external world. Of course, dreams sometimes incorporate external sounds or other sensory experiences, but this happens without the type of consciousness experienced during wakefulness.

**manifest content** The plot of a dream; the way a dream is remembered.

**latent content** What a dream symbolizes, or the material that is disguised in a dream to protect the dreamer.

**WHAT DO DREAMS MEAN?** Sigmund Freud, in one of the first major theories of dreams, argued that dreams contain hidden content that represents unconscious conflicts. According to Freud, the **manifest content** is the dream the way the dreamer remembers it, whereas the **latent content** is what the dream symbolizes, or the material disguised to protect the dreamer. Virtually no support exists for Freud's ideas that dreams represent hidden conflicts and that objects in dreams have special symbolic meanings. However, daily life experiences do influence dreams' contents. For example, you may be especially likely to have anxiety dreams while studying for exams.

Some dreams have thematic structures, in that they unfold as events or stories rather than as jumbles of disconnected images, but such structures apparently hold no secret meanings. Most people think their dreams are uniquely their own, but many common themes occur in dreams. Have you ever dreamed about showing up for an exam and being unprepared or finding that you are taking the wrong test? Many people in university have dreams like these. Even after you graduate and no longer take exams routinely, you likely will have similar dreams about being unprepared. Retired professors sometimes dream about being unprepared to teach classes!

**activation-synthesis hypothesis** A theory of dreaming that proposes that neural stimulation from the pons activates mechanisms that normally interpret visual input.

**ACTIVATION-SYNTHESIS HYPOTHESIS** In the 1980s, the sleep researcher Alan Hobson proposed a model that has dominated scientific thinking about dreaming. According to Hobson's **activation-synthesis hypothesis**, random neural stimulation can activate mechanisms that normally interpret visual input. The sleeping mind tries to make sense of the resulting activity in visual and motor neurons by synthesizing it with stored memories. From this perspective, dreams are *epiphenomenal*—the side effects of mental processes. In 2000, Hobson and his colleagues revised the activation-synthesis model to take into account recent findings in cognitive neuroscience. For instance, they included amygdala activation as the source of dreams' emotional content, and they proposed that deactivation of the frontal cortices contributes to dreams' delusional and illogical aspects. By its nature, the activation-synthesis hypothesis is concerned more with REM dreams than with non-REM ones. Critics of Hobson's theory argue that dreams are seldom as chaotic as might be expected if they were based on random eye movements (Domhoff, 2003). Indeed, most dreams are fairly similar to waking life, albeit with some strange features as described earlier.

**EVOLVED THREAT-REHEARSAL STRATEGIES** The Finnish neuroscientist Antti Revonsuo (2000) has proposed an evolutionary account wherein dreams sometimes simulate threatening events to allow people to rehearse coping strategies. In providing individuals with solutions to adaptive problems, dreaming would help the human species survive and reproduce and thus might be the result of evolution.

That the majority of dreams reported by people involve negative emotions, such as fear and anxiety, supports the evolved threat-rehearsal theory. In addition, people tend to dream about threats in their lives and to have nightmares about even long-past traumas. Moreover, dreaming is associated with the activation of limbic structures, such as the amygdala, that are activated by real dangers.

## SUMMING UP

### What Is Sleep?

Almost all animals experience sleep, an altered state of consciousness in which the sleeper loses most contact with the external world. Sleep's several stages can be identified through different patterns on EEG recordings. REM sleep and non-REM sleep differ, and different neural mechanisms produce each type, although the brain stem figures prominently in the regulation of sleep/wake cycles. Dreams occur in REM sleep and non-REM sleep, but the dreams' contents differ between the types. This variation may be due to differential activation of brain structures associated with both emotion and cognition. Theories have been proposed to explain why sleeping and dreaming happen, but the biological functions of both sleeping and dreaming are unknown.

## MEASURING UP

1. When people sleep, \_\_\_\_\_.
  - a. the brain shuts down so it can rest
  - b. brain activity goes through several cycles of different stages, and each stage has its own characteristic pattern of brain waves
  - c. the brain goes into a random pattern of firing that causes dreaming—dreaming is the left hemisphere interpreter making sense of brain activity
  - d. REM sleep occurs continuously throughout the sleep period as different types of brain waves determine how deeply we sleep
2. Select the hypothesized reasons why we dream. Select as many as apply.
  - a. Dreams get rid of excessive energy that accumulates throughout the day.
  - b. Dreams are a way of making sense of neural firing patterns.
  - c. Dreams allow us to rehearse coping strategies for anxiety-producing events.
  - d. Dreams help us forget information we no longer need to remember.
  - e. Dreams restore natural brain waves to their original state.

## What Is Altered Consciousness?

A person's consciousness varies naturally over the course of the day. Often this variation is due to the person's actions. Watching television might encourage the person's mind to zone out, whereas learning to play a piece on the piano might focus the person's attention. Unusual subjective experiences, diminished or enhanced levels of self-awareness, and disturbances in a person's sense of control over physical actions are associated with *altered states of consciousness*. Discussed below are altered states of consciousness such as *hypnosis*, *meditation*, and *immersion in an action*.

### LEARNING OBJECTIVE

Understand how different states of consciousness influence behaviour.

**hypnosis** A social interaction during which a person, responding to suggestions, experiences changes in memory, perception, and/or voluntary action.

## Hypnosis Is Induced through Suggestion

As part of an act, a stage performer or magician might hypnotize audience members and instruct them to perform silly behaviours, such as making animal noises. Has this hypnotist presented a real change in mental state or just good theatre? The essential question regarding hypnosis is: *What exactly is hypnosis?* **Hypnosis** involves a social interaction during which a person, responding to suggestions, experiences changes in memory, perception, and/or voluntary action (Kihlstrom, 1985; Kihlstrom & Eich, 1994). Psychological scientists generally agree that hypnosis affects some people, but they do not agree on whether it produces a genuinely altered state of consciousness. During a hypnotic induction, the hypnotist makes a series of suggestions to at least one person, such as “You are becoming sleepy,” “Your eyelids are drooping,” “Your arms and legs feel very heavy.” As the person falls more deeply into the hypnotic state, the hypnotist makes more suggestions, such as “You cannot move your right arm,” “You feel warm,” “You want to bark like a dog.” If everything goes according to plan, the person follows all the suggestions as though they are true (so the person really barks like a dog, for example).

Sometimes the hypnotist suggests that, after the hypnosis session, the person will experience a change in memory, perception, or voluntary action. Such a *post-hypnotic suggestion* is usually accompanied by the instruction to not remember the suggestion. For example, a stage performer or magician serving as a hypnotist might suggest, much to the delight of the audience, “When I say the word *dog*, you will stand up and bark like a dog. You will not remember this suggestion.” Therapists sometimes hypnotize patients and give them post-hypnotic suggestions to help them diet or quit smoking, but evidence suggests that hypnosis has quite modest effects on these behaviours. Evidence clearly indicates, however, that like unconscious stimuli, post-hypnotic suggestions can at least subtly influence behaviours.

Consider a study of moral judgment conducted by Americans Thalia Wheatley and Jonathan Haidt (2005), in which subjects received a post-hypnotic suggestion to feel a pang of disgust whenever they read a certain word, which itself was neutral (e.g., the word *often*). Subsequently, subjects made more-severe moral judgments when reading stories that contained the word, even when the story was innocuous. Like split-brain patients, the subjects were surprised by their reactions and sometimes made up justifications for their harsh ratings, such as saying that the lead character seemed “up to something.” This behaviour suggests that the left hemisphere interpreter might be involved in people’s understanding their own behaviour, when that behaviour results from post-hypnotic suggestion or other unconscious influence.

To the extent that hypnosis works, it relies mostly on the person being hypnotized rather than the hypnotist: Most of us could learn to hypnotize other people, but most of us cannot be hypnotized. Why not? Hypnosis works primarily for people who are highly suggestible; in fact, standardized tests exist for hypnotic suggestibility (Kallio & Revonsuo, 2003). What does it mean to be the approximately 1 in 5 people who is highly suggestible? Researchers have a hard time identifying the personality characteristics of people who can or cannot be hypnotized. Suggestibility seems related less to obvious traits such as intelligence and gullibility than to the tendencies to get absorbed in activities easily, to not be distracted easily, and to have a rich imagination (Balthazard & Woody, 1992; Crawford et al., 1996; Silva & Kirsch, 1992). Furthermore, a person who dislikes or finds frightening the idea of being hypnotized would likely not be hypnotized easily. To be hypnotized, a person must go along with the hypnotist’s suggestions willingly. No reliable evidence indicates that people will do things under hypnosis that they find immoral or otherwise objectionable.

### Real World PSYCHOLOGY

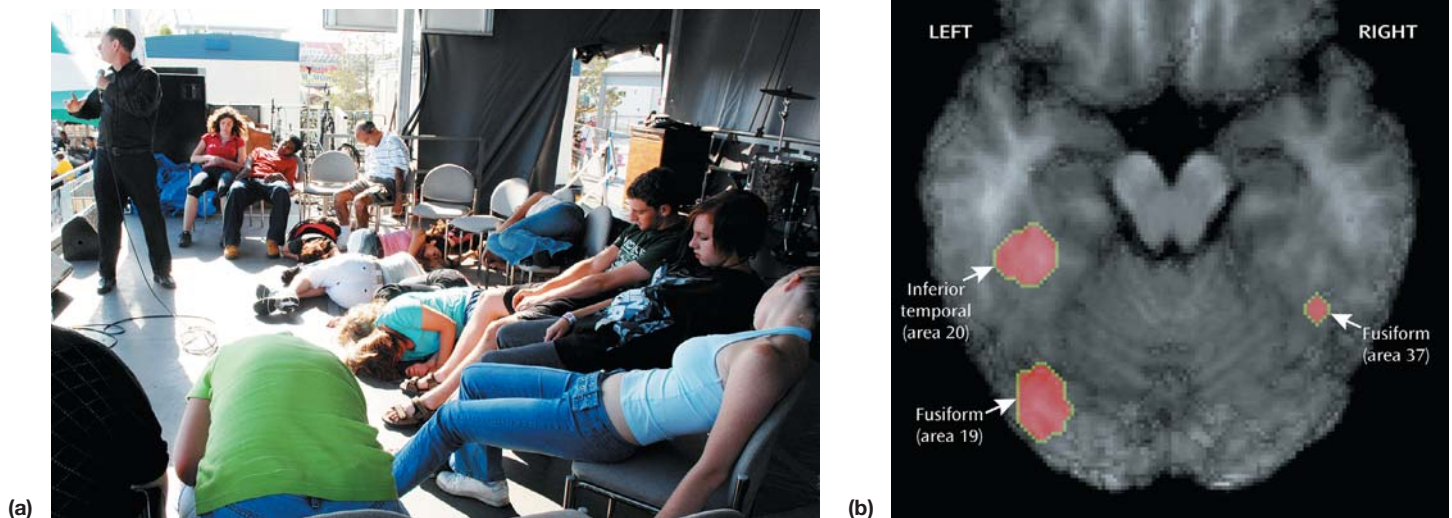


**THEORIES OF HYPNOSIS** As mentioned above, considerable controversy exists over whether hypnosis is an altered state of consciousness (Jamieson, 2007). Some psychological scientists believe that a person under hypnosis essentially plays the role of a hypnotized person. That person is not faking hypnosis; rather, he or she acts the part as if in a play—willing to perform actions called for by the “director,” the hypnotist. According to this *sociocognitive theory of hypnosis*, hypnotized people behave as they expect hypnotized people to behave, even if those expectations are faulty (Kirsch & Lynn, 1995; Spanos & Coe, 1992). Alternatively, although it acknowledges social context’s importance to hypnosis, the *dissociation theory of hypnosis* views the hypnotic state as an altered state, namely a trancelike one in which conscious awareness is separated, or dissociated, from other aspects of consciousness (Gruzelier, 2000).

It seems unlikely that a person could alter his or her brain activity to please a hypnotist, even if that hypnotist is a psychological researcher, and numerous brain imaging studies have supported the dissociation theory of hypnosis (Rainville et al., 2002). In one of the earliest such studies, Harvard University’s Stephen Kosslyn and colleagues (2000) demonstrated that when hypnotized participants were asked to imagine black-and-white objects as containing colour, they showed activity in visual cortex regions involved in colour perception, whereas subjects asked to drain colour from coloured images showed diminished activity in those same brain regions (FIGURE 4.21). This activity pattern did not occur when participants were not hypnotized.

Another study used the Stroop test, which involves naming the colour in which a colour’s name is printed; recall from Figure 2.18 that, for example, it takes longer to name the colour of the word *red* when that word is printed in blue ink than when it is printed in red ink. Participants took the test having received the post-hypnotic suggestion that they would be looking at meaningless symbols instead of words. The participants apparently followed that suggestion and therefore did not show the standard Stroop interference effect, which is believed to result from automatic cognitive processes that cannot be controlled (Raz et al., 2002). In a subsequent imaging study,

**FIGURE 4.21 The Brain Hypnotized** (a) Are hypnotized people merely playing the part? (b) This PET image from one of Stephen Kosslyn’s studies shows that areas in the visual cortex associated with colour perception are activated more when hypnotized participants are told to imagine colour—a finding that suggests the brain follows hypnotic suggestions.

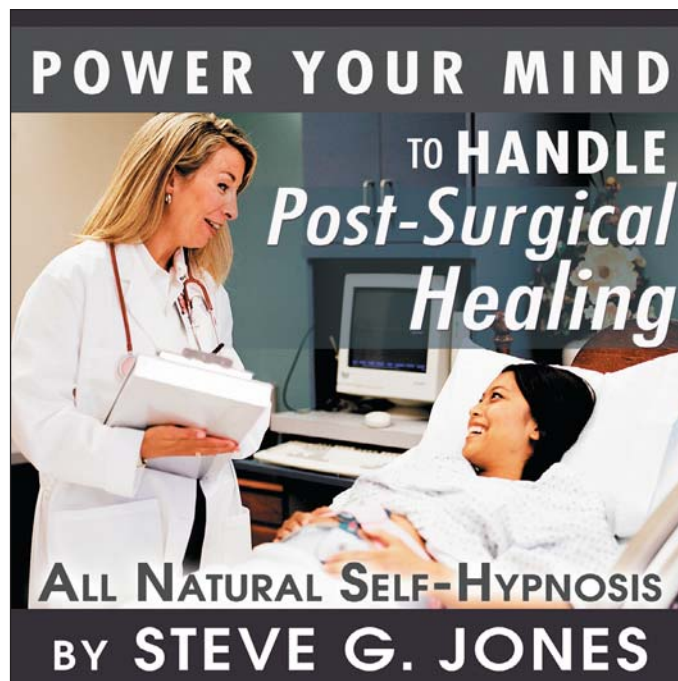


the same researchers found that their suggestion to view the words as meaningless was associated with less activity in brain regions typically activated when people read or perform the Stroop test. Thus these participants seem to have perceived the stimuli as nonwords, an alteration of brain activity that would be hard for people to accomplish just to please a hypnotist—or a researcher (Raz et al., 2005).

**HYPNOSIS FOR PAIN** One of the most powerful uses of hypnosis is *hypnotic analgesia*, a form of pain reduction. Laboratory research has demonstrated that this technique works reliably (Hilgard & Hilgard, 1975; Nash & Barnier, 2008). For instance, a person who plunges one of his or her arms into extremely cold water will feel great pain, and the pain will intensify over time. On average, a person can leave the arm in the water for only about 30 seconds, but a person given hypnotic analgesia can hold out longer. As you might expect, people high in suggestibility who are given hypnotic analgesia can tolerate the cold water the longest (Montgomery et al., 2000).

Overwhelming evidence indicates that, in clinical settings, hypnosis is effective in dealing with immediate pain (e.g., from surgery, dental work, burns) and chronic pain (e.g., from arthritis, cancer, diabetes; Patterson & Jensen, 2003). Patients can also be taught aspects of self-hypnosis to improve recovery from surgery (**FIGURE 4.22**). Hypnosis may work more by changing people's interpretations of pain than by diminishing pain; that is, people feel the sensations associated with pain, but they feel detached from those sensations (Price, Harkins, & Baker, 1987). An imaging study confirmed this pattern by showing that while hypnosis does not affect the sensory processing of pain, it reduces brain activity in regions that process the emotional aspects of pain (Rainville et al., 1997). Findings such as these provide considerable support for the dissociation theory of hypnosis. It seems implausible that either expectations about hypnosis or social pressure not to feel pain could explain, first, how people given hypnotic analgesia are able to undergo painful surgery and not feel it, and, second, why hypnosis leads to differential brain activation during the experience of pain.

**FIGURE 4.22 Self-Hypnosis** Advertisements promote the idea that people can use self-hypnosis to recover from surgery.



## Meditation Produces Relaxation

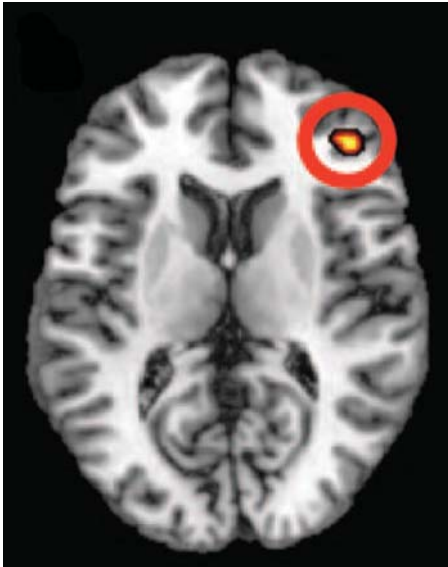
With a growing awareness of different cultural and religious practices and alternative approaches to medicine, people in the West have become more interested in examining Eastern techniques, including acupuncture and meditation. Different forms of meditation are popular in many Eastern religions, including Hinduism, Buddhism, and Sikhism. **Meditation** is a mental procedure that focuses attention on an external object or on a sense of awareness. Through intense contemplation, the meditator develops a deep sense of calm tranquility. Mark Leary (2004) of Duke University notes that one goal of meditation is to quiet the internal voices we experience as we go through the day or as we try to sleep. Do you ever find that while you are trying to concentrate on a lecture or carry on a conversation an inner voice keeps interrupting you, perhaps reminding you of things you need to do or wondering what the other person thinks of you? A common cause of sleeplessness is that this inner voice chatters about worries and concerns that the person would prefer to forget so that he or she can sleep. During meditation, people learn to calm this inner voice, sometimes by simply letting it continue without paying attention to it.

There are two general forms of meditation. In *concentrative meditation*, you focus attention on one thing, such as your breathing pattern, a mental image, or a specific phrase (sometimes called a *mantra*). In *mindfulness meditation*, you let your thoughts flow freely, paying attention to them but trying not to react to them. You hear the contents of your inner voice, but you allow them to flow from one topic to the next without examining their meaning or reacting to them in any way. Why not take a break from reading and try one of these methods?

Do you feel more relaxed? Meditation aims to help people achieve a deep state of relaxation so they can deal with the tensions and stresses in their lives. Although religious forms of meditation are meant to bring spiritual enlightenment, most forms of meditation popular in the West are meant to expand the mind and bring about feelings of inner peace. These methods include *Zen*, *yoga*, and *transcendental meditation*, or *TM*, the third of which is perhaps the best known meditation procedure. TM involves meditating with great concentration for 20 minutes twice a day. Many early studies found benefits from TM, such as reduced blood pressure, decreased reports of stress, and changes in the hormonal responses underlying stress. However, these studies have been criticized because they had small samples and lacked appropriate control groups. In a more rigorous recent study, a large number of heart patients were randomly assigned to TM or an educational program. After 16 weeks, the patients performing TM improved more than the control group on a number of health measures, such as blood pressure, blood lipids, and insulin resistance (Paul-Labrador et al., 2006). Unfortunately, this study does not show which aspects of TM produced the health benefits. Was it simply relaxing, or was it the altered state of consciousness? If you were a heart patient, of course, you would not care which aspect of TM helped you improve. (As discussed in Chapter 10, “Health and Well-Being,” reducing stress, no matter how it is done, yields substantial health benefits.)

Psychological scientists also study how meditation affects cognitive processing and brain function (Cahn & Polich, 2006). After only five days of intensive meditation training, randomly assigned subjects showed both significant improvements in attention and stress reductions, compared with a group completing relaxation training (Tang et al., 2007). Using fMRI, researchers scanned participants in an intensive eight-week meditation program at St. Joseph’s Hospital in Toronto and found that meditation changed brain activity associated with focusing on momentary subjective experiences (Farb et al., 2007). When participants in another study were made to

**meditation** A mental procedure that focuses attention on an external object or on a sense of awareness.



**FIGURE 4.23 The Brain on Meditation** In these fMRI scans, the circles indicate brain areas that typically show less activity when people are sad. After control subjects watched sad clips from movies, these areas of their brains were less active, as expected. In the brains of participants who had received eight weeks of meditation training, these areas remained active, indicating that these participants felt less sadness.

feel sad, those who had received meditation training felt less sad than those in a control group who did not receive meditation training (**FIGURE 4.23**; Farb et al., 2010). Long-term practitioners of Buddhist meditation show differential patterns of brain activity in the face of distracting sounds, a finding that supports the idea that such meditators are better at ignoring distractions (Brefczynski-Lewis, Lutz, Schaefer, Levinson & Davidson, 2007). Some researchers argue that long-term meditation brings about structural changes in the brain that help maintain brain function over the lifespan. Another study found that the volume of grey matter (the section of the brain containing neurons' cell bodies; see Chapter 3, "Biological Foundations") did not diminish in older adults who practiced Zen meditation as it typically does with age (Pagnoni & Cekic, 2007), a finding that suggests Zen meditation might help preserve cognitive functioning as people age. But people who meditate may differ substantially from people who do not, especially in terms of lifestyle choices such as diet and a willingness to take care of their health. As Chapter 2 notes, correlational data such as these do not prove causation. Careful empirical research using the methods of psychological science should contribute significantly to our understanding of meditation's effects.

### People Can Lose Themselves in Activities

Hypnosis and meditation involve doing something to alter consciousness. As noted throughout this chapter, however, a person's level of conscious awareness changes as a result of the time of day as well as the person's activities. For instance, when a person performs an automatic task, such as driving, that person's conscious thoughts might not include the driving experience. There can be a negative side to this lack of attention: In North America over the past decade, more than 300 children have died because they were left unattended in hot cars, often because a parent forgot to drop the child off at daycare on his or her way to work. It is easy to imagine forgetting your lunch in the car, but your child? Fortunately, such incidents are rare, but they seem to be especially likely when the parent's typical routine does not include daycare drop-off duty. While the parent is driving, his or her brain shifts to "autopilot" and automatically goes through the process of driving to the workplace instead of stopping at daycare first. During most of our daily activities, of course, we are consciously aware of only a small portion of both our thoughts and our behaviours.

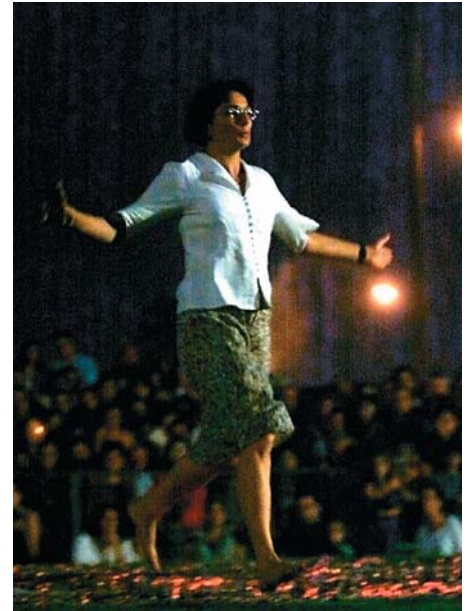
**EXERCISE, RELIGIOUS PRAYER, AND FLOW** Have you ever had the experience, during exercise, of one minute being in pain and feeling fatigued and the next minute being euphoric and feeling a glorious release of energy? Commonly known as *runner's high*, this state is partially mediated by physiological processes (especially endorphin release; see Chapter 3, "Biological Foundations"), but it also occurs in part because of a shift in consciousness. For example, many people cannot exercise without music, which offers a distraction from physical exertions and, in doing so, may energize an exerciser to keep going for another kilometre.

Shifts in consciousness that are similar to runner's high occur at other moments in our lives. Religious ceremonies often decrease awareness of the external world and create feelings of euphoria. Indeed, such rituals often involve chanting, dancing, and/or other behaviours as a way for people to lose themselves in *religious ecstasy*. Like meditation, religious ecstasy directs attention away from the self; in this way, it allows a person to focus on his or her spiritual awareness (**FIGURE 4.24**).

One psychological theory about such peak experiences is based on the concept of *flow*, "a particular kind of experience that is so engrossing and enjoyable

[that it is] worth doing for its own sake even though it may have no consequence outside itself” (Csikszentmihalyi, 1999, p. 824). That is, a person might perform a particular task out of fascination with it rather than out of a desire for a reward. Flow is an optimal experience, in that the activity is completely absorbing and completely satisfying. The person experiencing flow loses track of time, forgets about his or her problems, and fails to notice other things going on (Csikszentmihalyi, 1990). The person’s skills are well matched with the task’s demands; the situation is less like driving, where much of the work happens automatically, than like rock climbing, where every thought is on the next step and is concrete, not deep and abstract (Leary, 2004). Flow experiences have been reported during many activities, including playing music (O’Neil, 1999) or a moderately challenging version of the computer game *Tetris* (Keller & Bless, 2008), participating in sports (Jackson et al., 2001), and simply doing satisfying jobs (Demerouti, 2006). According to Csikszentmihalyi (1999), flow experiences bring personal fulfillment and make life worth living.

**ESCAPING THE SELF** Our conscious thoughts can be dominated by worries, frustrations, and feelings of personal failure. Sometimes people get tired of dealing with life’s problems and try to make themselves feel better through escapist pursuits. Potential flow activities such as sports or work may help people escape thinking about their problems, but people engage in such activities mainly to feel personally fulfilled. The difference is between escaping and engaging. Sometimes people choose to escape the self rather than engage with life: To forget their troubles, they drink alcohol, take drugs, play video games, watch television, and so on. The selective appeal of escapist entertainment is that it distracts people from reflecting on their problems or their failures, thereby helping them avoid feeling bad about themselves. Some escapist activities—such as running or reading—tend to have positive effects, some tend to be relatively harmless distractions, and some tend to come at great personal expense. For example, people obsessively playing online games such as *World of Warcraft* have lost their jobs and even their marriages (FIGURE 4.25). Moreover, evidence suggests that some ways of escaping the self can be associated with self-destructive behaviours such as binge eating, unsafe sex, and, at an extreme, suicide. According to the social



**FIGURE 4.24 Shifts of Consciousness** During certain religious festivals, such as this Christian Orthodox rite in Greece, people walk on smoldering embers as an act of faith. The embers’ top layer is not as hot as the bottom layer, so walking on the burning embers, while always risky, is not as difficult as it appears.



**FIGURE 4.25 Escapist Entertainment** Simple entertainment can veer toward obsession. Some have reported spending as many as 50 hours a week playing video games such as *World of Warcraft*.

According to a 2008 statement on end-of-life care released by the College of Physicians and Surgeons of Manitoba, if a physician and patient (or the patient's family) are at an impasse on end-of-life care, the physician shall prevail in every circumstance, regardless of the wishes of the patient or family. This policy puts life-or-death decisions in the hands of doctors, each of whom not only adheres to a personal belief system but also holds opinions—such as on matters of medical knowledge and medical technology—that may affect the practice of medicine. Some commentators have interpreted the 2008 statement and similar ones as reversing a trend toward patient autonomy. Patient autonomy has developed as a negative right, however: the right to deny unwanted treatment. It almost never has been construed as a right to receive treatment against the recommendation of a doctor (Pope, 2010).

On questions about end-of-life medical treatment, religious thinkers, philosophers, and scientists have tended to crash into one another. At issue are different definitions of human consciousness and self-awareness. In Manitoba, the criterion for maintaining life support is that the patient may be able to recover sufficiently to achieve awareness of self and of environment. As the bioethicist William Harvey notes, this criterion reflects the determinist viewpoint that the mind, arising from higher cortical activity, is the essence of a human being. In contrast, Harvey suggests, when the families of patients demand life-sustaining treatment that providers deem inappropriate, the basis of the family's thinking is usually religious. Such decisions reflect "a 'lower brain criterion.' Since [the patient's] brainstem is still functioning, he is not dead—he still has a soul" (Zier et al., 2009).

Even if the "consciousness" criterion for continuing life support is accepted, ascertaining a patient's brain state and ability to recover can be extremely difficult, but doing so is essential for making decisions about medical care. Patients who appear to be in a vegetative state (VS) may actually be in a minimally conscious state (MCS), or "locked-in," and a surefire way of distinguishing between the two remains elusive. The cognitive neuroscientist Maria Farah has discussed three promising approaches that use MRI technology (Farah, 2008). Each one is based on a different assumption about brain function, and skeptics have concerns about the validity of each.

The first approach is to demonstrate through MRI that the patient has preserved the high-level cognitive processing that

normally accompanies consciousness (Schiff et al., 2005). Farah argues that cognition is not consciousness and that dissociated cognition often accompanies awareness. The second approach is to use MRI to demonstrate the preservation of patterns of activity that have been shown to distinguish conscious from unconscious processing (Boly et al., 2004). However, few brain imaging studies have directly compared conscious and unconscious processing, and many more are needed before a "brain signature" of consciousness can be identified (Farah, 2008). The third approach is based on Owen and colleagues' (2006) fMRI findings discussed earlier in this chapter. A VS patient, commanded to imagine engaging in certain motor activities, showed brain activity characteristic of those activities. Thus the differences between the MCS and the VS may not be as distinct as previously thought. This conclusion is based, however, on the assumption that such commands cannot be carried out without conscious awareness, an idea that needs further investigation (Farah, 2008). Still other neurologists, pointing to the limitations of fMRI as a measure of neuronal activity, suggest that a technique such as EEG or *magnetoencephalography* (MEG) may be more appropriate (Knight, 2008).

The case of Samuel Golubchuk, who died in June 2008 after seven months on life support in a Manitoba ICU, brought many of these issues to the forefront of public awareness, sparking emotional debates. Dr. Joel Zivot, who ultimately provided Golubchuk's end-of-life care after other doctors refused to provide further treatment, asks whether such patients have a "right to understand that critical care practice among the doctors varies to such an extent that it could mean life or death? . . . What right does a patient have to choose a critical care physician in Manitoba, when, in end-of-life care, the final decision always is with the doctor?" (Zivot, 2010).

What should the criteria be for continuing life support for gravely ill patients? Is any level of brain activity sufficient to justify treatment, or, as in Manitoba, should evidence of higher-level cortical activity be required? More important, should these decisions be made by the state or federal government? By individual hospitals or doctors? By each patient and his or her family? And if the criteria involve the patient's level of consciousness of self and surroundings, what technologies should be used to evaluate consciousness—and again, who gets to decide?

psychologist Roy Baumeister (1991), people engage in such behaviours because they have low self-awareness when they escape the self. Chapter 12 further discusses the connections between behaviour and self-awareness; the next section of this chapter looks at a common way people try to escape their problems, namely using drugs or alcohol to alter consciousness.

## SUMMING UP

### What Is Altered Consciousness?

An altered state of consciousness is a change in subjective experience, such as through hypnosis or meditation. Some people are susceptible to hypnosis, such that a post-hypnotic suggestion can alter how they think, feel, or behave, though they are not conscious that a suggestion was given. Hypnosis can also be used to control pain. Patterns of brain activation show neural correlates of hypnosis that suggest that it is not a faked performance or some other theatrical trick. People can experience altered states of consciousness during profound religious experiences, during extreme physical exertion, or when they are deeply absorbed in tasks matched to both their interests and their abilities.

## MEASURING UP

Mark each statement below with an “S” if it supports the conclusion that hypnosis is a real phenomenon. Put an “F” next to any false statement.

- a. Participants under hypnosis who were told that they would not see real words did not show the Stroop effect. (For a reminder on the Stroop effect, see Figure 2.18.)
- b. Brain imaging showed that hypnotized subjects really were asleep.
- c. Brain imaging showed that hypnosis changes brain activity in ways inconsistent with the idea that people are simply role-playing.
- d. Some people cannot be hypnotized.
- e. People who are hypnotized will do anything the hypnotist tells them to.
- f. Hypnosis is not useful in reducing pain.
- g. Hypnotized people are aware of the hypnotist's suggestions, so they just go along with what they are asked to do.

## How Do Drugs Affect Consciousness?

Throughout history, people have discovered that ingesting certain substances can alter their mental states in various ways. Some of those altered states, however momentary, can be pleasant. Some, especially over the long term, can have negative consequences including injury or death. According to the United Nations (2009), 200 million people around the globe use illicit drugs each year. Societal problems stemming from drug abuse are well known. Most people probably know and care about someone addicted to a commonly abused drug, such as alcohol, an illegal substance, or a prescription medication. If we include nicotine and caffeine on that list, most people probably *are* drug addicts. To investigate drug addiction, psychological science asks various questions across multiple levels, from the biological to the individual to the social: Why do people use drugs? Why do some people become addicted to drugs? Why do drug addicts continue to abuse drugs when doing so causes turmoil and suffering?

### LEARNING OBJECTIVE

Describe the effects of marijuana, of stimulants, of MDMA, and of opiates.

## People Use—and Abuse—Many Psychoactive Drugs

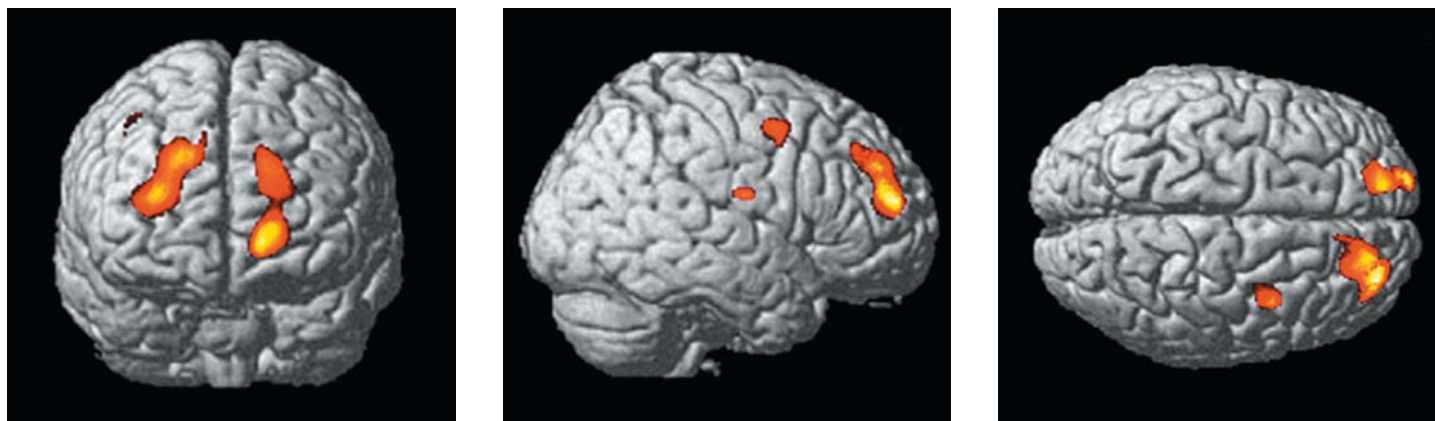
Drugs are a mixed blessing. The right ones can provide soothing relief—from severe pain or a moderate headache. Other right ones can lift depressed people’s moods and help them lead more satisfying lives. Still others can help children who have attention deficits or hyperactivity disorders settle down and learn better. But many of these same drugs can be used for “recreational” purposes—to alter physical sensations, levels of consciousness, thoughts, moods, and behaviours in ways that users believe are desirable—and this recreational use sometimes can have negative consequences.

*Psychoactive drugs* are mind-altering substances that change the brain’s neurochemistry by activating neurotransmitter systems. The effects of a particular psychoactive drug depend on which systems it activates (**FIGURE 4.26**). Common psychoactive drugs include *stimulants*, *depressants*, *narcotics*, and *hallucinogens*. This section considers drugs that often have legitimate medical uses but sometimes are abused outside of treatment.

### Real World PSYCHOLOGY

**MARIJUANA** The most widely used illegal drug in North America is marijuana, the dried leaves and flower buds of the hemp plant. According to Health Canada (2008), 44 percent of Canadians report having used marijuana, with the highest rates in British Columbia (49.6 percent) and the lowest in Prince Edward Island (39.1 percent). The psychoactive ingredient in marijuana is the chemical *THC*, or *tetrahydrocannabinol*, which produces a relaxed mental state, uplifted or contented mood, and some perceptual and cognitive distortions. Marijuana users report that THC also makes perceptions more vivid, and some say it especially affects taste. Most first-time users do not experience the “high” obtained by more experienced users. Novice smokers might use inefficient techniques and/or might have trouble inhaling, but users apparently must learn how to *appreciate* the drug’s effects (Kuhn, Swartzwelder, & Wilson, 2003). In this way, marijuana differs from most other drugs, whose first-time uses have stronger effects and subsequent uses lead to tolerance in which a person has to use more of the drug to get the same effect.

Although the brain mechanisms that marijuana affects remain somewhat mysterious, investigators have recently discovered a class of receptors that are activated by naturally occurring THC-like substances. Activation of these cannabinoid receptors appears to adjust and enhance mental activity and perhaps alter pain perception. The large concentration of these receptors in the hippocampus may partly explain why marijuana impairs memory (Ilan, Smith, & Gevins, 2004). Marijuana is also used for its medicinal properties and has been legal for that use



**FIGURE 4.26** **Drugs’ Effects on the Brain** Brain scans from three views show the areas in this brain that have been affected by methamphetamine use. Specifically, the yellow and red areas show reduced grey matter density in the frontal cortexes (Kim et al., 2006).



in Canada since 2001. For instance, cancer patients undergoing chemotherapy report that marijuana is effective for overcoming nausea. Nearly 1 in 4 AIDS patients reports using marijuana to relieve both nausea and pain (Prentiss et al., 2004). The medical use of marijuana is controversial because of the possibility that chronic use can cause health problems or lead to abuse of the drug.

**STIMULANTS** *Stimulants* are drugs that increase behavioural and mental activity. They include caffeine and nicotine as well as cocaine and amphetamines. These substances activate the sympathetic nervous system (increasing heart rate and blood pressure), improve mood, cause people to become restless, and disrupt sleep. Stimulants generally work by interfering with the normal reuptake of dopamine by the releasing neuron, allowing dopamine to remain in the synapse and thus prolonging its effects, although sometimes stimulants also increase the release of dopamine (Fibiger, 1993). Drugs that block dopamine's action reduce stimulants' rewarding properties.

*Cocaine* is derived from the leaves of the coca bush, which grows primarily in South America. After inhaling (snorting) cocaine as a powder or smoking it in the form of *crack cocaine*, users experience a wave of confidence. They feel good, alert, energetic, sociable, and wide awake. These short-term effects are especially intense for crack cocaine users. In contrast, habitual use of cocaine in large quantities can lead to paranoia, psychotic behaviour, and violence (Ottieger, Tressell, Inciardi, & Rosales, 1992).

Cocaine has a long history of use in North America. John Pemberton, a pharmacist in the United States, was so impressed with cocaine's effects that in 1886 he added the drug to soda water for easy ingestion, thus creating Coca-Cola (Figure 4.28a). In the early twentieth century, cocaine was removed from the drink. To this day, however, coca leaves from which the cocaine has been removed are used in the making of Coke.

*Amphetamines* are synthesized using simple lab methods. They go by street names such as *speed*, *meth* (for *methamphetamine*), *ice*, and *crystal*. Amphetamines have a long history of use for weight loss and staying awake. However, their numerous negative side effects include insomnia, anxiety, and heart problems; people quickly become addicted to them; and they are seldom used for legitimate medical purposes.

Methamphetamine is the world's second most commonly used illicit drug, after marijuana (Barr et al., 2006). Although it was first developed in the early twentieth century as a nasal decongestant, its recreational use became popular in the 1980s. According to Health Canada, 8.7 percent of men and 4.1 percent of women have tried methamphetamine during their lifetimes, compared with 14.1 percent of men and 7.3 percent of women who have tried cocaine (Adlaf, Begin, & Sawka, 2005). If asked about the past year, only 1.1 percent report methamphetamine use and 1.6 percent report cocaine use (Health Canada, 2008). One factor that encourages its use, and may explain its surge in popularity over the past decade, is that methamphetamine is easy to make from common over-the-counter drugs.

Methamphetamine not only blocks reuptake of dopamine, it also increases the release of dopamine and thus yields much higher levels of dopamine in the synapse. In addition, methamphetamine stays in the body and brain much longer than, say, cocaine, so its effects are prolonged. Methamphetamine abuse damages various brain structures and ultimately depletes dopamine levels. Its damage to the temporal lobe and the limbic system, for example, may explain its effects on memory and emotion in long-term users (Kim et al., 2006; Thompson et al., 2004). It also causes considerable physical damage (**FIGURE 4.27**).





(a)



(b)

**FIGURE 4.28** Drugs through History (a) This early advertisement's claim that Coca-Cola is "a valuable Brain Tonic" may have been inspired by the initial incorporation of cocaine into the drink. (b) Before 1904, Bayer advertised heroin as "the sedative for coughs."



**FIGURE 4.27** Methamphetamine's Effects These before-and-after photos dramatically illustrate how the physical damage from methamphetamine can affect appearance.

**MDMA** One drug that has become popular since the 1990s is *MDMA*, or *ecstasy*, which produces an energizing effect similar to that of stimulants but also causes slight hallucinations. According to Health Canada, 3 percent of women and 5.2 percent of men report using ecstasy during their lifetimes, with the average age of first use reported as 19 years old (Adlaf et al., 2005). The drug first became popular among young adults in nightclubs and at all-night parties known as raves. Compared with amphetamines, MDMA is associated with less dopamine release and more serotonin release. The serotonin release may explain ecstasy's hallucinogenic properties. Although many users believe it to be relatively safe, researchers have documented a number of impairments from long-term ecstasy use, especially memory problems and a diminished ability to perform complex tasks (Kalechstein et al., 2007). Because ecstasy also depletes serotonin, users often feel depressed when the drug's rewarding properties wear off.

**OPIATES** Heroin, morphine, and codeine belong to the family of drugs known as *opiates*. These drugs provide enormous reward value by increasing dopamine activation in the nucleus accumbens and binding with opiate receptors, producing feelings of relaxation, analgesia, and euphoria. Heroin provides a rush of intense pleasure that most addicts describe as similar to orgasm, which then evolves into a pleasant, relaxed stupor. The dual activation of opiate receptors and dopamine receptors may explain why heroin and morphine are so highly addictive (Kuhn et al., 2003).

Opiates have been used to relieve pain and suffering for hundreds of years. Indeed, before the twentieth century, heroin was widely available without prescription and was marketed by the Bayer aspirin company (FIGURE 4.28). The benefits of short-term opiate use to relieve severe pain seem clear, but long-term opiate use to relieve chronic pain will much more likely lead to abuse or addiction than will short-term use (Ballantyne & LaForge, 2007). Moreover, long-term use of opiates is associated with a number of neurological and cognitive deficits, such as attention and memory problems (Gruber, Silveri, & Yurgelin-Todd, 2007). Therefore, clinicians need to be cautious in prescribing opiates, especially when the drugs will be used over extended periods.

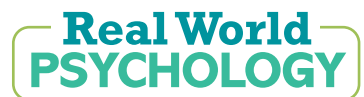
## Providing Examples of Slippery Slope Thinking

What happens when you slip while walking down a slope? Might you fall to the bottom? A person making a *slippery slope argument* reasons that some first slippery step must lead down to a larger, more slippery step or even a large fall. For example, a slippery slope argument against all “recreational” drug use proposes that if you start using a drug that is not likely to have lasting or harmful effects (say, marijuana), this behaviour will lead you to take “harder” drugs (say, cocaine), and soon you will be robbing to support your heroin habit. The “starter,” less powerful drug is referred to as a *gateway drug*, because it supposedly opens the gate to more regular and more dangerous drug use. The data on whether using something like marijuana is associated with later use of drugs like heroin is mixed, but even if it were a strong relationship, what might be wrong with these data? The conclusion that taking marijuana *causes* people to take harder drugs cannot be inferred from these data. There are many other possible explanations for this relationship, including the more likely one that people apt to get addicted could start with any drug and generally do start with the cheapest and most available one, marijuana. It might or might not be true that a minor action will lead to a more serious one, but there is no reason to assume that it is always or even usually true.

## Alcohol Is the Most Widely Abused Drug

Like many around the world, Canadians have a love/hate relationship with alcohol. On the one hand, moderate drinking is an accepted aspect of normal social interaction and may even be good for health. On the other hand, alcohol is a major contributor to many of our societal problems, such as spousal abuse and other forms of violence. Although the percentage of traffic fatalities due to alcohol is dropping, alcohol is a factor in more than one-third of fatal accidents (Mayhew, Brown, & Simpson, 2002), killing nearly a thousand Canadians each year (Traffic Injury Research Foundation, 2009). Moreover, one-quarter of suicide victims and one-third of homicide victims have blood alcohol levels that meet legal criteria for impairment. One study found that approximately one-third of university students reported having had sex during a drinking binge, and the heaviest drinkers were likely to have had sex with a new or casual partner (Leigh & Schafer, 1993), thus increasing their risk for exposure to AIDS and other sexually transmitted diseases.

**GENDER DIFFERENCES IN ALCOHOL CONSUMPTION ACROSS CULTURES** The World Health Organization is conducting a massive international study of gender-related and culture-related differences in alcohol consumption (Obot & Room, 2005). This study is expected to continue over the coming decade; however, many findings are already available. The study’s main premise is that to understand alcohol consumption worldwide, we need to study the various ways alcohol is used, by men and by women, across cultural and social contexts. The authors call the gender gap in alcohol consumption “one of the few universal gender differences in human social behaviour” (Wilsnack, Wilsnack, & Obot, 2005, p. 1). Can you guess whether men or women consume more alcohol? In every region of the world, across a wide





**FIGURE 4.29 Theo Fleury** For many years, the hockey great Theo Fleury battled drug and alcohol problems, which he attributes to having been sexually abused by a former coach.

variety of measures (e.g., drinking versus abstinence, heavy drinking versus occasional drinking, alcohol-related disorders), men drink a lot more. Men are twice as likely to report binge drinking (drinking five or more servings in one evening), chronic drinking, and recent alcohol intoxication. However, gender gaps in binge drinking may be smaller among university students.

Several factors may explain this large and universal gender difference. One is that women do not metabolize alcohol as quickly as men and generally have smaller body volumes, so they consume less alcohol than men to achieve the same effects. Another explanation is that women's drinking may be more hidden because it is less socially accepted than men's drinking. According to this theory, women's alcohol consumption may be under-reported, especially in cultures where it is frowned upon or forbidden. In some cultures, "real men" are expected to drink a lot and prove they can "hold" their liquor, whereas women who do the same are seen as abnormal (**FIGURE 4.29**).

Psychosocial researchers have studied four factors that might affect the gender-related differences in a specific culture's alcohol consumption: (1) *Power*. Drinking alcohol in large quantities is a symbol of male power (i.e., privilege). As women gain more power through paid employment in jobs that traditionally were held by men, will they increase their alcohol consumption? So far, the answer is no. In Europe and North America, where this hypothesis was tested, the increased autonomy that women now have has not increased the amount of alcohol they drink. (2) *Sex*. Men and women may drink because they expect doing so to enhance their sexual performance or enjoyment of sex, though in fact alcohol, especially in large quantities, is more likely to lead to impotence for men. It can also increase women's vulnerability to men's sexual aggression; knowing this, some women may limit their own drinking. (3) *Risks*. Men enjoy taking risks more than women do, so men may be more likely to engage in heavy drinking, which is known to be hazardous. (4) *Responsibilities*. Men may drink more than women because drinking allows them to ignore their social responsibilities. In some social contexts, "domestic role obligations"—for men, usually, supporting a family and having responsibilities around the house—may magnify the gender gap in drinking.

**EXPECTATIONS** One reason people consume alcohol is that they anticipate alcohol will have certain effects on their emotions and behaviour. Light and heavy drinkers believe alcohol reduces anxiety, so many people have a drink or two after a difficult day. The available evidence does not support this belief: Although moderate doses of alcohol are associated with a more positive mood, larger doses are associated with a more negative mood. Also, although alcohol can interfere with the cognitive processing of threat cues, such that anxiety-provoking events are less troubling when people are intoxicated, this effect occurs only if people drink *before* the anxiety-provoking events. According to this research, drinking after a hard day can increase people's focus on and obsession with their problems (Sayette, 1993).

Alan Marlatt (1999), a leading substance abuse researcher, has noted that people view alcohol as the "magic elixir," capable of increasing social skills, sexual pleasure, confidence, and power. Expectations about alcohol's effects are learned very early in life, through observation; children may see that people who drink have a lot of fun and that drinking is an important aspect of many celebrations. Teenagers may view drinkers as sociable and grown up, two things they desperately want to be. Studies have shown that children who have very positive expectations about alcohol are more likely to start drinking and to be heavy drinkers than children who do not share those expectations (Leigh & Stacy, 2004).

According to the social psychologists Jay Hull and Charles Bond (1986), expectations about alcohol profoundly affect behaviour. To study alcohol's true effects on behaviour, these researchers gave participants tonic water with or without alcohol and, regardless of the drinks' actual contents, told some participants they were getting just tonic water and some they were getting tonic water with alcohol. This balanced-placebo design allowed for a comparison of those who thought they were drinking tonic water but were actually drinking alcohol with those who thought they were drinking alcohol but were actually drinking tonic water. In thus separating drug effects from beliefs, the researchers demonstrated that alcohol impairs motor processes, information processing, and mood, independent of whether the person thinks he or she has consumed it. In contrast, the belief that one has consumed alcohol leads to disinhibition regarding various social behaviours, such as sexual arousal and aggression, whether or not the person has consumed alcohol. Thus some behaviours generally associated with drunkenness are accounted for by learned beliefs about intoxication rather than by alcohol's pharmacological properties. Sometimes the learned expectations and the pharmacology work in opposite ways. As mentioned above, for instance, alcohol tends to increase sexual arousal, but it interferes with sexual performance.

**PHYSICAL EFFECTS** Alcohol triggers a number of neurotransmitter systems and activates receptors for GABA, opiates, and dopamine (for all these terms, see Chapter 3, "Biological Foundations"). Evidence suggests that alcohol's rewarding aspects stem from its activation of dopamine receptors, as is the case with other addictive drugs. Alcohol also interferes with the neurochemical processes involved in memory; for this reason, memory loss can follow excessive alcohol intake. Heavy long-term alcohol intake can cause extensive brain damage. *Korsakoff's syndrome* is an alcohol-related disorder characterized by both severe memory loss and intellectual deterioration.

#### CRITICAL THINKING SKILL

### Showing How Circular Reasoning Is a Misuse of Operational Definitions

Have you ever seen a cat chase its tail? It can be a pretty funny sight, as the cat never gets closer to its "prey." Similarly, in a circular argument, the reason for believing the conclusion is just a restatement of the conclusion, so the argument ends up where it started. Here is an example: "We need to raise the legal drinking age from 19 to 21 because 19-year-olds are too young to drink." Can you see what is wrong with this argument? Saying that 19-year-olds are too young to drink is just another way of saying "We need to raise the legal drinking age from 19." The argument does not explain *why* 19 is too young. If the speaker had said, "We need to raise the legal drinking age from 19 to 21 because research shows that 21-year-olds have half the number of traffic accidents that 19-year-olds do" or ". . . because the frontal areas of the brain continue to mature after age 19" or ". . . because 21-year-olds are more responsible," he or she would have provided a reason to support the conclusion.



(a)



(b)

**FIGURE 4.30 Physical Dependence versus Psychological Dependence** Both types of dependence can force people to go to extremes. **(a)** A savvy restaurant owner in Germany figured out how to accommodate his patrons who are physically addicted to smoking but do not want to step outside—he made padded holes in the wall. **(b)** With their enclosed spaces, bright lights, and stimulating sounds, casinos, such as this one in the United States, encourage patrons' psychological addiction to gambling.

## Addiction Has Psychological and Physical Aspects

The term *physical dependence* is synonymous with *addiction*, a physiological state in which failing to ingest a substance leads to symptoms of *withdrawal*, a state characterized by anxiety, tension, and craving. Physical dependence is associated with *tolerance*, so that a person needs to consume more of the substance to achieve the same subjective effect. Addiction researchers now widely accept that dopamine activity in the limbic system underlies the rewarding properties of taking drugs and is central to addiction (Baler & Volkow, 2006; Chapter 9, “Motivation and Emotion,” further discusses dopamine’s role in reward). A brain region called the *insula* seems to be important for craving and addiction, since this region becomes active when addicts view images of drug use. A recent study compared the experience of quitting smoking for patients with insula damage to the experiences for patients with other types of brain damage. The patients with insula damage reported that immediately after being injured they quit smoking easily and that they no longer experienced conscious urges to smoke. One patient who had a stroke to his left insula commented that he quit smoking because his “body forgot the urge to smoke” (Naqvi et al., 2007).

In contrast to physical dependence, *psychological dependence* refers to habitual and compulsive substance use despite the consequences. People can be psychologically dependent without showing tolerance or withdrawal. This section focuses on addiction to substances that alter consciousness, but people can also become psychologically dependent on behaviours, such as gambling or shopping (**FIGURE 4.30**).

How do people become addicted? Many theories related to the initiation of drug or alcohol use among either children or adolescents focus on the social level of analysis. They explore social learning processes that emphasize the roles of parents, peers, and mass media. Social learning theories also emphasize self-identification with high-risk groups (e.g., “stoners” or “druggies”) as central to the initiation of drug or alcohol use. Teenagers want to fit in somewhere, even with groups that society perceives as deviant. And as discussed further in Chapter 6, children imitate the behaviour of role models, especially those they admire or with whom they identify. For children whose parents smoke, the modelling of the behaviour may be continuous through early childhood and elementary school. Unsurprisingly, then, multiple studies show that when parents smoke, their children tend to have positive attitudes about smoking and to begin smoking early (Rowe, Chassin, Presson, & Sherman, 1996).

As individuals, some adolescents are especially likely to experiment with illegal drugs and to abuse alcohol. Children high in sensation seeking (a personality trait that involves attraction to novelty and risk taking) are more likely to associate with deviant peer groups and to use alcohol, tobacco, and drugs (Wills, DuHamel, & Vaccaro, 1995). These children and their parents tend to have poor relationships, which in turn promote the children’s association with deviant peer groups. Does the family environment determine alcohol and drug use, then? Some theorists, operating at the biological level of analysis, suggest that an inherited predisposition to sensation seeking may predict behaviours, such as affiliating with drug users, that increase the possibility of substance abuse. Indeed, some evidence points to genetic components of addiction, especially for alcoholism, but little direct evidence points to a *single* “alcoholism” or “addiction” gene. Rather, what might be inherited is a cluster of characteristics, including certain personality traits, a reduced concern about personal harm, a nervous system chronically low in arousal, or a predisposition to finding chemical substances pleasurable. In turn, such factors may make some people more likely to explore drugs and enjoy them.

One of the most fascinating aspects of addiction is that only about 5 percent to 10 percent of those who use drugs become addicted. Indeed, more than 50 percent of Canadian men and 40 percent of Canadian women have experimented with illicit drugs, yet most of them use drugs only occasionally or try them for a while and then give them up. In a longitudinal study, Jonathan Shedler and Jack Block (1990) found that those who had experimented with drugs as adolescents were better adjusted in adulthood than those who had never tried them. Complete abstainers and heavy drug users had adjustment problems compared with those who had experimented. However, this finding does not suggest that everyone should try drugs or that parents should encourage drug experimentation. After all, no one can predict just who will become addicted or know who is prepared to handle drugs' effects on behaviour.

**ADDICTION'S CONTEXT** Some evidence suggests that context is important for understanding addiction. For example, in the late 1960s, estimates suggested that drug abuse among American soldiers, including the use of narcotics such as heroin and opium, had become epidemic. The widespread drug use was not surprising—it was a time of youthful drug experimentation, soldiers in Vietnam had easy access to various drugs, and drugs helped the soldiers cope temporarily with fear, depression, homesickness, boredom, and the repressiveness of army regulations. The military commanders mostly ignored drug use among soldiers, viewing it as “blowing off steam.”

Beginning in 1971, the military began mandatory drug testing of soldiers to identify and detoxify drug users before they returned to the United States. Amid speculation that a flood of addicted soldiers returning from Vietnam would swamp treatment facilities back home, the White House asked a team of behavioural scientists to study a group of returning soldiers and assess the extent of the addiction problem. Led by the behavioural epidemiologist Lee Robins, the research team examined a random sample of 898 soldiers who were leaving Vietnam in September 1971. Robins and her colleagues found extremely high levels of drug use among them (Robins, Helzer, & Davis, 1975). Over 90 percent reported drinking alcohol, nearly three-quarters smoked marijuana, and nearly half used narcotics such as heroin, morphine, and opium. About half the soldiers who used narcotics either had symptoms of addiction or reported believing they would be unable to give up their drug habits. The team's findings suggested that approximately 1 soldier in 5 returning from Vietnam was a drug addict. Given the prevailing view that addiction was a biological disorder with a low rate of recovery, these results indicated that tens of thousands of heroin addicts would soon be inundating the United States. But this did not happen.

Robins and her colleagues examined drug use among the soldiers after they returned to the United States. Of those who were apparently addicted to narcotics in Vietnam, only half sought out drugs when they returned to the States, and fewer still maintained their narcotic addictions. Approximately 95 percent of the addicts no longer used drugs within months of their return—an astonishing quit rate considering that the success rate of the best treatments is typically only 20 percent to 30 percent. A long-term follow-up study conducted in the early 1990s confirmed that only a handful of those who were addicts in Vietnam remained addicts.

Why did coming home help the addicts recover? In the United States, they likely did not have the same motivations for taking the drugs as they did in Vietnam. No longer needing the drugs to escape combat's horrors, they focused on other needs and goals, such as careers and family obligations. An important lesson from this case

study is that we cannot ignore environment when we try to understand addiction. Knowing drugs' physical actions in the brain may give us insights into addiction's biology, but that information fails to account for how these biological impulses can be overcome by other motivations.

## SUMMING UP

### How Do Drugs Affect Consciousness?

People have long ingested drugs that alter the way they think, feel, and act. The use and abuse of drugs has enormous societal costs, including impaired driving, illness, and crime. Although moderate use of drugs such as alcohol and caffeine may have few consequences, excessive use can lead to physical or psychological dependence. The term *addiction* refers to physical dependence, in which not using the drug produces withdrawal and more of the drug is needed to obtain its effects. Psychoactive drugs affect a variety of neurotransmitter systems, but the user's beliefs about a particular drug also affect the experience and behaviour of that user.

## MEASURING UP

1. All drugs work by \_\_\_\_\_.
  - a. increasing neural firing in the cerebellum
  - b. decreasing the amount of neurotransmitter affected by reuptake
  - c. creating dizziness, which the interpreter translates as a drug state
  - d. activating neurotransmitter systems
2. Match each of the following drugs or drug categories with as many true statements as apply: stimulants, MDMA, opiates, marijuana, alcohol.
  - a. involved in over half of all fatal car accidents
  - b. the only drug that does not have its strongest effect on first-time users
  - c. include heroin, morphine, and codeine
  - d. increase(s) dopamine action in a brain structure called the nucleus accumbens
  - e. include cocaine, nicotine, caffeine, and amphetamines
  - f. known as ecstasy
  - g. according to their reports, one-third of university students had sex while under its influence
  - h. include a drug used in Coca-Cola's original recipe
  - i. has negative long-term effects on memory

## CONCLUSION

Try to imagine human life without consciousness. How could you live without experiencing the world around you? Conscious experience is an essential aspect of the human condition, one that psychologists and philosophers have long wanted to understand the nature of. Over the past century, the topic has largely been philosophers' domain, because psychologists' increasing emphasis on empiricism has cast doubt on the scientific study of subjective states, such as consciousness. The qualia of consciousness are inaccessible to direct observation, but psychologists have



not ignored consciousness. They have examined the ways that people alter levels of consciousness, such as by creating subjectively pleasant or spiritually meaningful mental states. Mind-altering substances play prominent roles in many religious ceremonies, and some religious practices purposely alter conscious states through prayer and meditation.

What has eluded the scientific world is how our thoughts and behaviours alter the conscious experience. Brain imaging has allowed researchers to examine consciousness objectively, and we now know that conscious experience reflects the brain's ongoing activity. For instance, emotional dreams are experienced as such because emotional brain regions are active at that time and brain regions involved in rational thought and self-awareness are not. Although many philosophical questions remain, psychological scientists are making considerable progress in understanding the biological foundations of consciousness. Perhaps more so than in any other area of inquiry, brain imaging and other physiological methods have opened up the subjective world to scientific examination, allowing for a much better appreciation and understanding of the human experience.

## CHAPTER SUMMARY

### How Is the Conscious Mind Experienced?

- **Consciousness Is a Subjective Experience:** Consciousness is difficult to study because of the subjective nature of our experience of the world. Brain imaging research has shown that particular brain regions are activated by particular types of sensory information.
- **There Are Variations in Conscious Experience:** Consciousness is each person's unified and coherent experience of the world around him or her. At any one time, each person can be conscious of a limited number of things. A person's level of consciousness varies throughout the day and depends on the task at hand. Whereas some people in comas show no brain activity (a persistent vegetative state), people in minimally conscious states show brain activity indicating some awareness of external stimuli.
- **Splitting the Brain Splits the Conscious Mind:** The corpus callosum connects the brain's two sides; cutting it in half results in two independently functioning hemispheres. The left hemisphere is responsible primarily for language, and the right hemisphere is responsible primarily for images and spatial relations. The left hemisphere strives to make sense of experiences, and its interpretations influence the way a person views and remembers the world.
- **Unconscious Processing Influences Behaviour:** Research findings indicate that much of a person's behaviour occurs automatically, without that person's constant awareness. Thought and behaviour can be influenced by stimuli that are not experienced consciously.
- **Brain Activity Produces Consciousness:** Blindsight demonstrates visual ability without awareness. The global workspace model of consciousness demonstrates how awareness depends on activity in various different cortical areas.

### What Is Sleep?

- **Sleep Is an Altered State of Consciousness:** Sleep occurs in stages, which vary according to levels of brain activity and of respiration. REM sleep activates the brain and produces both body paralysis and genital stimulation. Sleep disorders include insomnia, sleep apnea, and narcolepsy.
- **Sleep Is an Adaptive Behaviour:** Sleep restores the body, and circadian rhythms control changes in body function and in sleep. Learning is consolidated during sleep.

- **Sleep and Wakefulness Are Regulated by Multiple Neural Mechanisms:** Brain stem structures are involved in arousal and REM sleep.
- **People Dream while Sleeping:** REM dreams activate different brain areas than do non-REM dreams. Sigmund Freud thought dreams revealed unconscious conflicts. The activation-synthesis hypothesis posits that dreams are side effects of brain activity. Antti Revonsuo has theorized that dreaming is adaptive.

### What Is Altered Consciousness?

- **Hypnosis Is Induced through Suggestion:** Scientists debate whether hypnosis is an altered state of consciousness or whether hypnotized people merely play the role they expect (and are expected) to play. Brain imaging research suggests that hypnotized subjects undergo changes in their brain activity.
- **Meditation Produces Relaxation:** The goal of meditation, especially as practiced in the West, is to bring about a state of deep relaxation. Studies have shown that meditation can have multiple benefits for people's physical and mental health.
- **People Can Lose Themselves in Activities:** Exercise, certain religious practices, and other engaging activities can produce a state of altered consciousness called flow, in which people become completely absorbed in what they are doing. Flow is a positive experience, but escapist activities can be harmful if people use them for avoidance rather than for fulfillment.

### How Do Drugs Affect Consciousness?

- **People Use—and Abuse—Many Psychoactive Drugs:** Stimulants increase behavioural and mental activity. MDMA (ecstasy) produces energizing and hallucinogenic effects. THC (the active ingredient in marijuana) alters perception. All drugs, including opiates, provide high reward value by increasing dopamine activation.
- **Alcohol Is the Most Widely Abused Drug:** Though believed to reduce anxiety, alcohol consumption can increase anxiety and negative mood. A drinker's expectation can significantly affect his or her behaviour while under the influence of alcohol.
- **Addiction Has Psychological and Physical Aspects:** Physical addiction involves the body's responses to and tolerance toward a substance. Psychological dependence involves both habitual use and compulsion to use, despite consequences.

## KEY TERMS

activation-synthesis hypothesis, p. 164	consciousness, p. 141	interpreter, p. 149	microsleeps, p. 161	split brain, p. 146
blindsight, p. 153	dreams, p. 162	latent content, p. 164	narcolepsy, p. 159	subliminal perception, p. 150
circadian rhythms, p. 161	hypnosis, p. 166	manifest content, p. 164	REM sleep, p. 157	
	insomnia, p. 158	meditation, p. 169	sleep apnea, p. 159	

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.

## PRACTICE TEST

- What is a key distinction between a person in a persistent vegetative state and a person in a minimally conscious state?
  - The person in the minimally conscious state is less responsive to her or his surroundings.
  - The person in the persistent vegetative state is more likely to regain full consciousness at some point in the future.
  - The person in the minimally conscious state shows some degree of brain activity, whereas the person in the persistent vegetative state shows no brain activity.
  - The person in the minimally conscious state is dreaming, whereas the person in the persistent vegetative state is in a coma.
- A researcher asks study participants to play a word game in which they unscramble letters to form words. In Condition A, the unscrambled words are *outgoing*, *talkative*, and *smile*. In Condition B, the unscrambled words are *standoffish*, *silent*, and *frown*. After participants complete the word game, they meet and interact with a stranger. What do you predict participants' behaviour during that interaction will reveal?
  - Participants in Conditions A and B will behave nearly identically.
  - Participants in Condition A will be more friendly toward the stranger than will participants in Condition B.
  - Participants in Condition B will be more friendly toward the stranger than will participants in Condition A.
- A study participant who has a severed corpus callosum is asked to focus on a dot in the middle of a computer screen. After a few seconds, a car appears on the left half of the screen while an automobile tire appears on the right half of the screen. How will the participant most likely respond if asked to describe the objects in the pictures?
  - The participant will say he saw a tire and will draw a car.
  - The participant will say he saw a car and will draw a tire.
  - The participant will say he saw a car and a tire, but he will not be able to draw either object.
  - The participant will draw a car and a tire, but he will not be able to name either object.
- For each description below, name the sleep disorder: insomnia, apnea, narcolepsy, or somnambulism.
  - Despite feeling well-rested, Marcus falls asleep suddenly while practicing piano.
  - Emma walks through the living room in the middle of the night, seemingly oblivious to those around her.
  - Sophia spends most of the night trying to fall asleep.
  - Ivan's roommate regularly complains that Ivan's snoring wakes him multiple times throughout the night.
- Which of the following pieces of evidence suggest sleep is an adaptive behaviour? Check all that apply.
  - A few days of sleep deprivation do not impair physical strength.
  - All animals sleep.
  - It is impossible to resist indefinitely the urge to sleep.
  - Sleep deprivation helps people feel less depressed.
  - Animals die when deprived of sleep for extended periods.
- Four students discuss a hypnotist's performance on campus. Which student's claim about hypnotism is most consistent with current evidence?
  - "We just witnessed a bunch of people acting goofy solely because they thought they were supposed to act goofy."
  - "I can't believe the hypnotist was able to make those people do things they would usually be so opposed to!"
  - "What worries me is that someone could hypnotize me without my even knowing about it."
  - "It's pretty cool that a hypnotist could help those people enter an altered state of consciousness."
- Which of the following instruction sets would a yoga teacher trained in concentrative meditation be most likely to give?
  - "Close your eyes while sitting in a comfortable position. Let your thoughts move freely through your mind, like clouds passing through the sky. Acknowledge them, but do not react to them."
  - "Lying on your back, rest your hands gently on your abdomen. As you breathe in and out, focus attention on your breath. Notice the rhythmic rise and fall of your abdomen and the slow, deep movement of your chest."
- Match each of the following drugs with the appropriate description of a user's typical response: alcohol, marijuana, MDMA, opiates, stimulants.
  - increased heart rate, elevated mood, restlessness
  - relaxation, contentment, vivid perceptual experiences
  - impaired motor skills, decreased sexual performance
  - energy, slight hallucinations
  - lack of pain, euphoria, intense pleasure
- A group of people are talking about their weekend plans. Which of the following statements suggest the most understanding regarding alcohol's effects? Multiple responses may be correct.
  - "I've been in a crummy mood all week. I'm heading to the bar tonight to chase my blues away with beer."
  - "I've been really stressed out all week. I just need a few beers to help me unwind and get my mind off all this work."
  - "I won't drink tonight because I really need a good night's sleep and I always wake up insanely early after I drink."
  - "I think a beer or two will give me the liquid courage I need to ask Jordan out on a date."
- Which of the following phenomena are best described as symptoms of physical dependence?
  - strong cravings for the substance
  - elevated tolerance for the substance
  - habitually reaching for the substance when in certain environments (e.g., lighting a cigarette each time you get into your car)
  - using the substance as prescribed by a physician

## PSYCHOLOGY AND SOCIETY

- Consider the critical thinking skills highlighted in this chapter: circular reasoning and slippery slope thinking. To find examples of lapses in either or both of these critical thinking skills, search through newspapers, blogs, and other sources for articles related to the use of medical devices to maintain the lives of people in a coma, the medical use of marijuana, and the mental and physical health benefits of practicing meditation. Write a paragraph explaining the lapses you find and how the writers (or thinkers being written about) might have avoided them.
- Many Canadians experiment with illicit drugs, especially before adulthood. Only some of those who try drugs will develop substance use problems. Using what you have learned from this chapter and previous chapters, provide at least three explanations for why some people might be more likely to become addicted.





# Sensation and Perception

WHEN HELEN KELLER WAS 19 MONTHS OLD, she completely lost the senses of sight and hearing. Her life became dark and silent, and for her the world existed only through touch, smell, and taste. She recognized her parents, and determined her location, by touch and by smell. But otherwise she was completely isolated in a mental prison. Realizing that others could communicate but she could not, she became so enraged and frustrated that she threw daily tantrums. She later wrote, “Sometimes, I stood between two persons who were conversing and touched their lips. I could not understand, and was vexed. I moved my lips and gesticulated frantically without result. This made me so angry at times that I kicked and screamed until I was exhausted” (quoted by Diane Schuur in *Time* magazine, June 14, 1999, para. 1).

When Keller was six years old, her parents sought assistance from Alexander Graham Bell, who invented devices such as the telephone while living in Canada. Bell also taught a system called “Visible Speech” to deaf children, and he put the Kellers in touch with the Perkins School for the Blind.

## How Do We Sense Our Worlds?

- Stimuli Must Be Coded to Be Understood by the Brain
- Psychophysics Relates Stimulus to Response
- Critical Thinking Skill: Recognizing the Effects of Context on Judgments

## What Are the Basic Sensory Processes?

- In Taste, Taste Buds Detect Chemicals
- In Smell, the Nasal Cavity Gathers Odorants

- In Touch, Sensors in the Skin Detect Pressure, Temperature, and Pain
- In Hearing, the Ear Detects Sound Waves
- In Vision, the Eye Detects Light Waves
- Humans and Animals Have Other Sensory Systems
- The Evidence for Extrasensory Perception (ESP) Is Weak or Nonexistent
- Critical Thinking Skill: Understanding That Perception Can Be Deceiving

## What Are the Basic Perceptual Processes?

- Perception Occurs in the Brain
- Object Perception Requires Construction
- Depth Perception Is Important for Locating Objects
- Culture Influences Perception
- Size Perception Depends on Distance Perception
- Motion Perception Has Internal and External Cues
- Perceptual Constancies Are Based on Ratio Relationships



**FIGURE 5.1 Keller and Sullivan** Eight-year-old Helen Keller (**left**) sits with her teacher, Anne Sullivan, in 1888.

Through the school, the Kellers hired a teacher, Anne Sullivan, to teach Helen to communicate with signs. At first, Helen simply mimicked Sullivan's strange hand motions, making no sense. One day, Sullivan ran water over one of Helen's hands while spelling *w-a-t-e-r* in the other, and Helen made the connection. She grabbed some dirt and asked Sullivan to spell its name. By evening, Helen had memorized her first 30 words in sign language and had begun a life of both passionate learning and social activism (FIGURE 5.1).

Try to imagine what it would be like to go through most of your life, as Helen Keller did, without being able to see or hear. Further, try to imagine what it would be like to be not only blind and deaf but also unable to smell, unable to taste, and unable to feel pain or temperature. You would still feel hunger and other bodily sensations, such as fatigue, but you would know no world beyond your body's boundaries. You would have no way of knowing about other people or an environment outside your body. You would be completely alone: No one could communicate with you, and you could communicate with no one. What would you do without sensation, your windows to the world, and perception, your ability to make sense of your sensory experiences?

**LEARNING OBJECTIVES**

Explain how we sense and perceive things (objects and events).

Explain how scientists study our sensory systems.

## How Do We Sense Our Worlds?

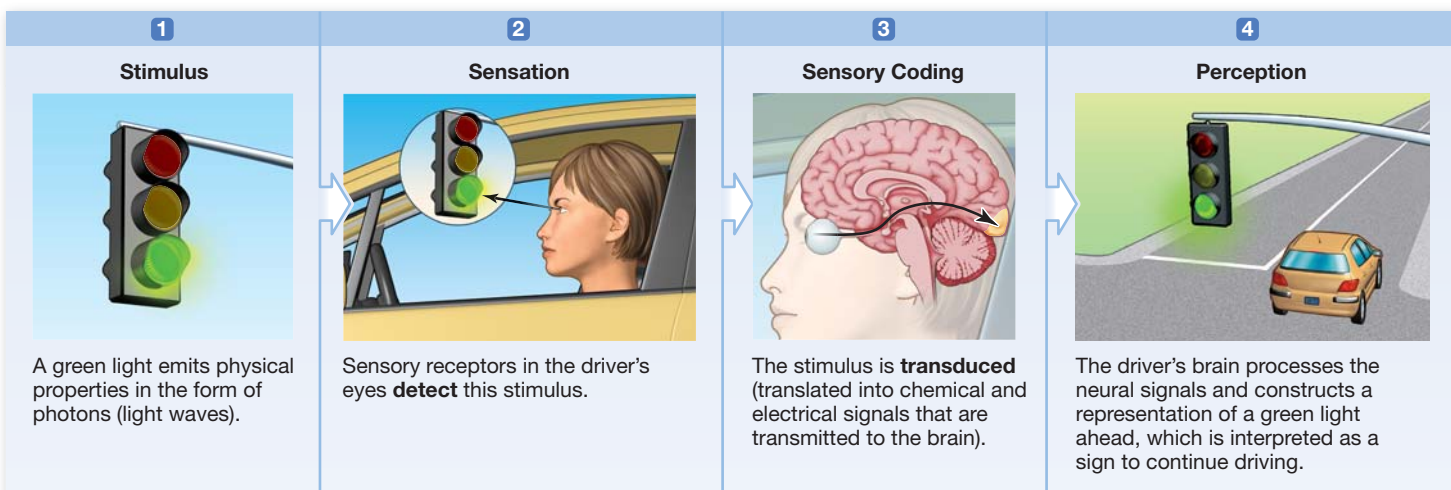
Psychological scientists often divide the way we experience the world into two distinct phases: *sensation* and *perception*. **Sensation** is our sense organs' detection of and responses to external stimulus energy (light, air vibrations, odours, and so on) and how those responses are transmitted to the brain. It is an elementary experience such as colour or motion without the more complex perceptual experience of what is being seen or what is moving. **Perception** is the brain's further processing of these detected signals that results in internal representations of the stimuli—representations that form a conscious experience of the world. Whereas the essence of sensation is detection, the essence of perception is construction of useful and meaningful information about a particular environment. For example, a green light emits photons that are detected by specialized neurons in the eyes, which transmit signals to the brain (sensation). The brain processes those neural signals, and the observer experiences a green light (perception; FIGURE 5.2).

The study of sensation and perception is the study of the bodily systems that convert stimulus energy into useful information. This chapter will discuss how the sense organs detect various types of stimulus energy, how the brain constructs

**sensation** The sense organs' responses to external stimuli and the transmission of these responses to the brain.

**perception** The processing, organization, and interpretation of sensory signals; it results in an internal representation of the stimulus.

**FIGURE 5.2 From Sensation to Perception**



information about the world on the basis of what has been detected, and how we use this constructed information to guide ourselves through the world around us. Perception is often based on our prior experiences, which shape our expectations about new sensory experiences. You are unlikely to see a blue, apple-shaped object as a real apple, for example, because you know from past experience that apples are not blue. An important lesson in this chapter is that our perception of the world does not work like a camera or tape recorder, faithfully and passively capturing the physical properties of stimuli we encounter. Rather, what we *sense* (what we see, hear, taste, touch, or smell) is the result of brain processes that actively construct perceptual experiences and, as a result, allow us to adapt to our environments' details. This system can get the details wrong, sometimes by filling in information that has not been provided, but it does so in an intelligent and efficient way that still produces a meaningful understanding of what is and what happens. Because of the different adaptive challenges that humans and the various nonhuman animals have faced, humans are sensitive to different types of physical energy than nonhuman animals are, and so this chapter focuses on sensation and perception as they operate in humans.

### Stimuli Must Be Coded to Be Understood by the Brain

Our sensory organs' translations of stimuli's physical properties into neural impulses is called *sensory coding*. The different features of the physical environment are coded by different neural impulse patterns. Thus a green stoplight will be coded by a particular neural response pattern in the eye's retina before being read by the brain; when the hand touches a hot skillet, other neurons, in the hand and in the brain, will signal pain. The brain cannot process raw stimuli, so the stimuli must be translated into chemical and electrical signals the brain can interpret. Sensory coding therefore begins with **transduction**, in which sensory *receptors*, specialized neurons in the sense organs, pass impulses to connecting neurons when the receptors receive physical or chemical stimulation. Connecting neurons then transmit information to the brain in the form of neural impulses. Most sensory information first goes to the thalamus, a structure in the middle of the brain. Neurons in the thalamus then send information to the cortex, where incoming neural impulses are interpreted as sight, smell, sound, touch, or taste. (For the brain regions, see Figure 3.24. **TABLE 5.1** lists the stimuli and receptors for each major sensory system. The brain's interpretation of these impulses—perception—is discussed later in this chapter.)

**transduction** A process by which sensory receptors produce neural impulses when they receive physical or chemical stimulation.

**Table 5.1 The Stimuli, Receptors, and Pathways for Each Sense**

Sense	Stimuli	Receptors	Pathways to the Brain
Taste	Molecules dissolved in fluid on the tongue	Taste cells in taste buds on the tongue	Portions of facial, glossopharyngeal, and vagus nerves
Smell	Molecules dissolved in fluid on mucous membranes in the nose	Sensitive ends of olfactory neurons in the mucous membranes	Olfactory nerve
Touch	Pressure on the skin	Sensitive ends of touch neurons in skin	Trigeminal nerve for touch above the neck, spinal nerves for touch elsewhere
Hearing	Sound waves	Pressure-sensitive hair cells in cochlea of inner ear	Auditory nerve
Vision	Light waves	Light-sensitive rods and cones in retina of eye	Optic nerve

To function effectively, our brains need *qualitative* and *quantitative* information about a stimulus. If you were waiting to cross a city street, qualitative information would include knowing whether the nearby traffic light is red or green. The difference between sounds—say, a tuba’s honk versus a flute’s toot—is qualitative. The difference between a salty taste and a sweet one is qualitative. We can identify qualitative differences because different sensory receptors respond to qualitatively different stimuli. In contrast, quantitative differences in stimuli are coded by the speed of a particular neuron’s firing—a more rapidly firing neuron is responding at a higher frequency to, for example, a brighter light, a louder sound, or a heavier weight (FIGURE 5.3).

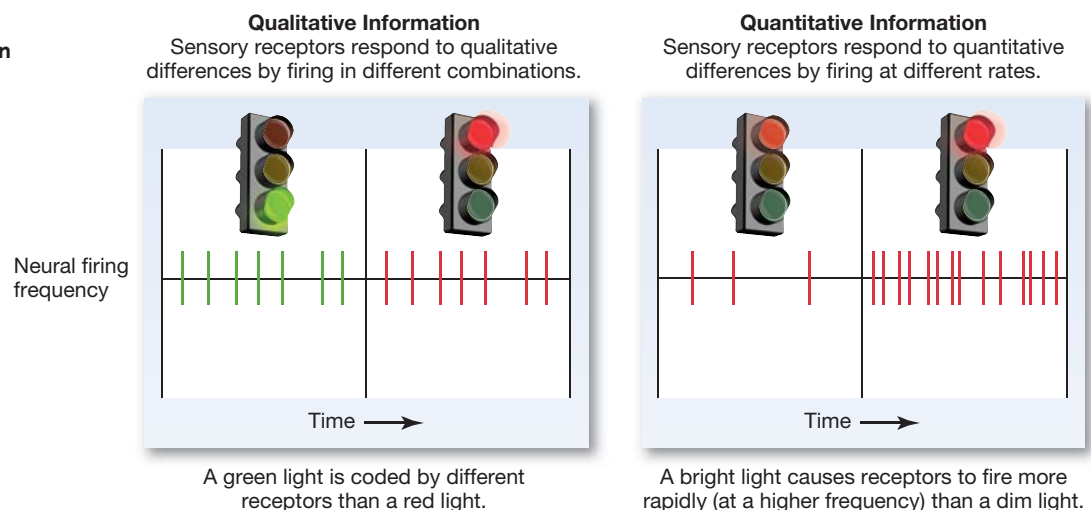
In most sensory systems, receptors provide *coarse coding*, in which sensory qualities are coded by only a few different types of receptors, each of which responds to a broad range of stimuli. The combined responses by different receptors firing at different rates allow us to tell the difference between, for example, lime green and forest green or between a pinch on the arm and a shove. Sensation and perception are a symphony of sensory receptors and the neurons those receptors communicate with, each firing in different combinations and at different rates; as discussed in Chapter 4, the sum of this activity is consciousness, the huge range of perceptions that make up our experience of the world.

### Psychophysics Relates Stimulus to Response

Humans have long understood that perceptual experience is constructed from information detected by the sense organs. For more than a century, psychological scientists have tried to understand the relationship between the world’s physical properties and how we sense and perceive them. *Psychophysics*, a subfield developed during the nineteenth century by the German researchers Ernst Weber and Gustav Fechner, examines our psychological experiences of physical stimuli. It assesses how much physical energy is required for our sense organs to detect a stimulus, for example, and how much change is required before we notice that change. To test such things, researchers present very subtle changes in stimuli and observe how participants respond. They study the limits of humans’ sensory systems, which are remarkably sensitive.

**SENSORY THRESHOLDS** As noted throughout Chapter 4, your sensory organs constantly acquire information from your environment, much of which you do not notice. The *absolute threshold* is the minimum intensity of stimulation that must occur before you experience a sensation, or the stimulus intensity detected above

**FIGURE 5.3** Qualitative versus Quantitative Sensory Information



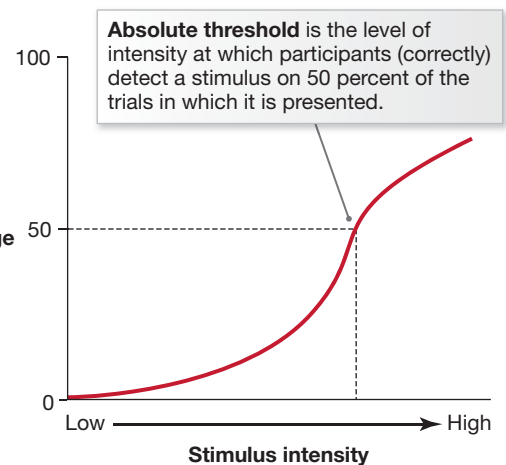


**Table 5.2 Approximate Absolute Sensory Threshold (Minimum Stimulus) for Each Sense**

Sense	Minimum Stimulus
Taste	One teaspoon of sugar in 7.5 litres of water
Smell	One drop of perfume diffused into the entire volume of six rooms
Touch	A fly's wing falling on your cheek from a distance of 1 centimetre
Hearing	The tick of a clock at 6 metres under quiet conditions
Vision	A candle flame seen at 50 kilometres on a dark, clear night

chance. The absolute threshold for hearing is the faintest sound a person can detect 50 percent of the time (FIGURE 5.4). For instance, how loudly must someone in the next room whisper for you to hear it? In this case, the absolute threshold for auditory stimuli would be the quietest whisper you could hear half the time. (TABLE 5.2 lists some approximate minimum stimuli for each sense.)

A *difference threshold* is the just noticeable difference between two stimuli—the minimum amount of change required for a person to detect a difference. If your friend is watching a television show while you are reading and a commercial comes on that is louder than the show, you might look up, noticing that something has changed. The difference threshold is the minimum change in volume required for you to detect a difference. The difference threshold increases as the stimulus becomes more intense. Pick up a 30-gram letter and a 60-gram letter, and you will easily detect the difference. But pick up a two-kilogram package and a package weighing 30 grams more, and the difference will be harder, maybe impossible, to discern. This principle, *Weber's law*, states that the just noticeable difference between two stimuli is based on a proportion of the original stimulus rather than on a fixed amount of difference. The formula for Weber's law is  $\Delta I/I = a \text{ constant}$ , so if you can detect a single candle when you have 10 candles ( $1/10 = .1$ ), you will need 10 candles to detect a difference in brightness when you have 100 candles ( $10/100 = .1$ ). This key psychological principle about difference applies in many different contexts and not just to perception.



**FIGURE 5.4 Absolute Threshold**

**CRITICAL THINKING SKILL**

## Recognizing the Effects of Context on Judgments

Are you smart? Are you beautiful? Are you good in math? Any judgment you make about yourself will be affected to a large extent by the context in which you make it. For example, to what or whom are you comparing yourself? In fact, context affects any judgment (Is that person trustworthy? Is that sunburn painful? Who is rich?), although we often make comparisons automatically and usually without being conscious that we are relying on some comparator.



**FIGURE 5.5 Think Critically: Context Matters** If you had seen just the detail, would you have guessed the bigger picture? The girl turns out to be crying because she is at a Justin Bieber performance at MuchMusic headquarters in Toronto.

Imagine sitting in a windowless room illuminated with one small candle. If you light a second candle, the room will appear much brighter. Now imagine sitting in a room lit brightly by several 200-watt lightbulbs. If you light a small candle here, the room's brightness might not differ perceptually. In other words, the subtle effects of context within a situation can become obvious when that situation is viewed from afar or later or in the abstract (FIGURE 5.5).

Context effects also extend beyond immediate perceptions, across a wide range of events. For example, people generally define their own social and physical characteristics by comparing themselves with others (Alicke, LoSchiavo, Zerbst, & Zhang, 1997). Often without realizing they are doing it, many women compare themselves with the highly attractive and ultra-thin models in advertising. Since the viewers cannot match the perfect, air-brushed images they encounter, they experience negative feelings (e.g., Bower, 2001). If the viewers are prone to making immediate comparisons, their moods become more negative, and they feel more dissatisfied with their own bodies (Tiggemann & McGill, 2004). One study found that when male and female university students viewed beautiful models, they rated photos of more-average-looking people as less attractive than did a similar group of university students who did not see the models' photos (Kenrick, Montello, Gutierrez, & Trost, 1993).

Research has shown that we do not completely control comparisons we make unconsciously. However, Gilbert, Giesler, and Morris (1995) have found that we can control comparisons by either avoiding some encounters or rejecting conclusions we have come to in the past. Thus women prone to feeling bad about themselves after seeing advertisements with seemingly perfect models could stop reading magazines that carry such advertisements, or they could continue to read the magazines but remind themselves that these models set unattainable standards that do not apply to real people. Women can define themselves as students, writers, scientists, mothers, and so on, and reject fashion models as their standards for comparison. Understanding the basis for any comparison is the key to making a sound judgment related—positively or negatively—to that comparison.

**signal detection theory (SDT)** A theory of perception based on the idea that the detection of a faint stimulus requires a judgment—it is not an all-or-none process.

**SIGNAL DETECTION THEORY** Classical psychophysics was based on the idea of a sensory *threshold*; either you saw something or you did not, depending on whether the intensity of the stimulus was above or below the sensory threshold. As research progressed, however, it became clear that early psychophysicists had ignored an important variable: human judgment. Imagine you are a participant in a study of sensory thresholds. You are sitting in a dark room, and an experimenter asks if you detect a faint light, hear a faint sound, or feel a very light touch on your arm. Even if you do not detect this stimulus, you might ask yourself if you do—or if you should, since someone has asked about it. You might convince yourself you had sensed a weak stimulus that had not been presented, or you might fail to detect a weak stimulus that had been presented. After realizing that their methods of testing absolute thresholds were flawed, researchers formulated **signal detection theory (SDT)**, which states that detecting a stimulus requires making a judgment about its presence or absence, based on a subjective interpretation of ambiguous information.

SDT applies, for example, to the work of radiologists, who scan medical images to detect early signs of disease. A radiologist might be looking for the kind of faint

shadow that signals an early-stage cancer and, even after years of training and experience, have difficulty judging whether an abnormality in the image is likely cancerous. The radiologist's knowledge of the patient (e.g., age, sex, family medical history) will likely affect this judgment; so, of course, will factors such as the radiologist's levels of both motivation and attention. Moreover, the knowledge of the consequences can influence a radiologist's judgment: Being wrong could mean missing a fatal cancer or, conversely, causing unnecessary and potentially dangerous treatment. Because stimulus-based judgment is critical in radiologists' work and so many other areas, signal detection is a central topic in psychology.

Research on signal detection involves a series of trials in which a stimulus is presented in only some trials. In each trial, participants must state whether they sensed the stimulus. Any trial in which participants judge whether an event occurs can have one of four outcomes (FIGURE 5.6). If the signal is presented and the observer detects it, the outcome is a *hit*. If the participant fails to detect the signal, the outcome is a *miss*. If the participant "detects" a signal that was not presented, the outcome is a *false alarm*. If the signal is not presented and the observer does not detect it, the outcome is a *correct rejection*. The participant's sensitivity to the signal is usually computed by comparing the hit rate with the false-alarm rate—thus correcting for any bias the participant might bring to the testing situation.

*Response bias* refers to a participant's tendency to report detecting the signal in an ambiguous trial. The participant might be strongly biased against responding and need a great deal of evidence that the signal is present. Under other conditions, that same participant might need only a small amount of evidence. For example, a radiologist checking a CAT scan for signs of a brain tumour might be extra cautious about accepting any abnormality as a signal (i.e., a tumour), since a positive response could lead to drastic and dangerous neurosurgery. A doctor checking an X-ray for signs of a broken bone might be more willing to make a positive diagnosis, since treatment, although uncomfortable, will most likely not endanger the life of the patient. People's expectations often influence the extent to which they are biased. For instance, a soldier expecting an imminent attack will likely err on the side of responding, such as by mistaking a dim shape as an enemy when in fact no one is there. Higher-level processes in the brain, such as beliefs and expectancies, influence how sensations from the environment are perceived.

**SENSORY ADAPTATION** Sensory systems are tuned to detect environmental changes: It is important for us to be able to detect such changes, because they might require responses, while it is less critical to keep responding to unchanging stimuli. **Sensory adaptation** is a decrease in sensitivity to a constant level of stimulation (FIGURE 5.7). As such, it exemplifies this book's theme that the mind is adaptive. Imagine, for example, you are studying in the library when work begins at a nearby construction site. When the equipment starts up, the sound seems particularly loud and disturbing. After a few minutes, however, you hardly notice the noise; it seems to have faded into the background. Researchers have often noticed that if a stimulus is presented continuously, the responses of the sensory systems that detect it tend to diminish over time. Similarly, when a continuous stimulus stops, the sensory systems usually respond strongly as well. If the construction noise suddenly halted, you would likely notice the silence. As discussed later in this chapter, focusing on such adaptations helps researchers explore the nature of sensory systems.

There are four possible outcomes when a subject is asked whether something occurred during a trial.

		Response given	
		Yes	No
Stimulus signal	On	Hit	Miss
	Off	False alarm	Correct rejection

Those who are biased toward reporting a signal tend to be "yea-sayers."

		Response given	
		Yes	No
Stimulus signal	On	89%	11%
	Off	41%	59%

Those who are biased toward denying that a signal occurred tend to be "nay-sayers."

		Response given	
		Yes	No
Stimulus signal	On	45%	55%
	Off	26%	74%

**FIGURE 5.6** Payoff Matrices for Signal Detection Theory



**FIGURE 5.7** Sensory Adaptation Because of sensory adaptation, people who live near constant noise, such as those (pictured here) who live near London's Heathrow Airport, eventually become less aware of the noise.

## SUMMING UP

### How Do We Sense Our Worlds?

The study of sensation focuses on the way our sense organs respond to and detect external stimulus energy. Stimuli need to be transduced for the brain to use their information. Qualitative aspects of stimuli, such as colour and bitterness, are coded by the combination of the specific receptors each activates. Sensory coding for quantitative factors, such as intensity and loudness, depends on the number of neurons firing and how frequently they fire. The development of psychophysical methods has allowed scientists to study psychological reactions to physical events. Psychophysical methods can be used to determine thresholds for detecting events and for noticing change. These thresholds can be influenced by situational factors and by biases in human judgment.

## MEASURING UP

1. Suppose you are designing an experiment to determine the absolute threshold for detecting a salty taste. You plan to give participants plain water that \_\_\_\_\_.
  - a. always has a small amount of salt in it
  - b. sometimes has a small amount of salt in it and sometimes has no salt

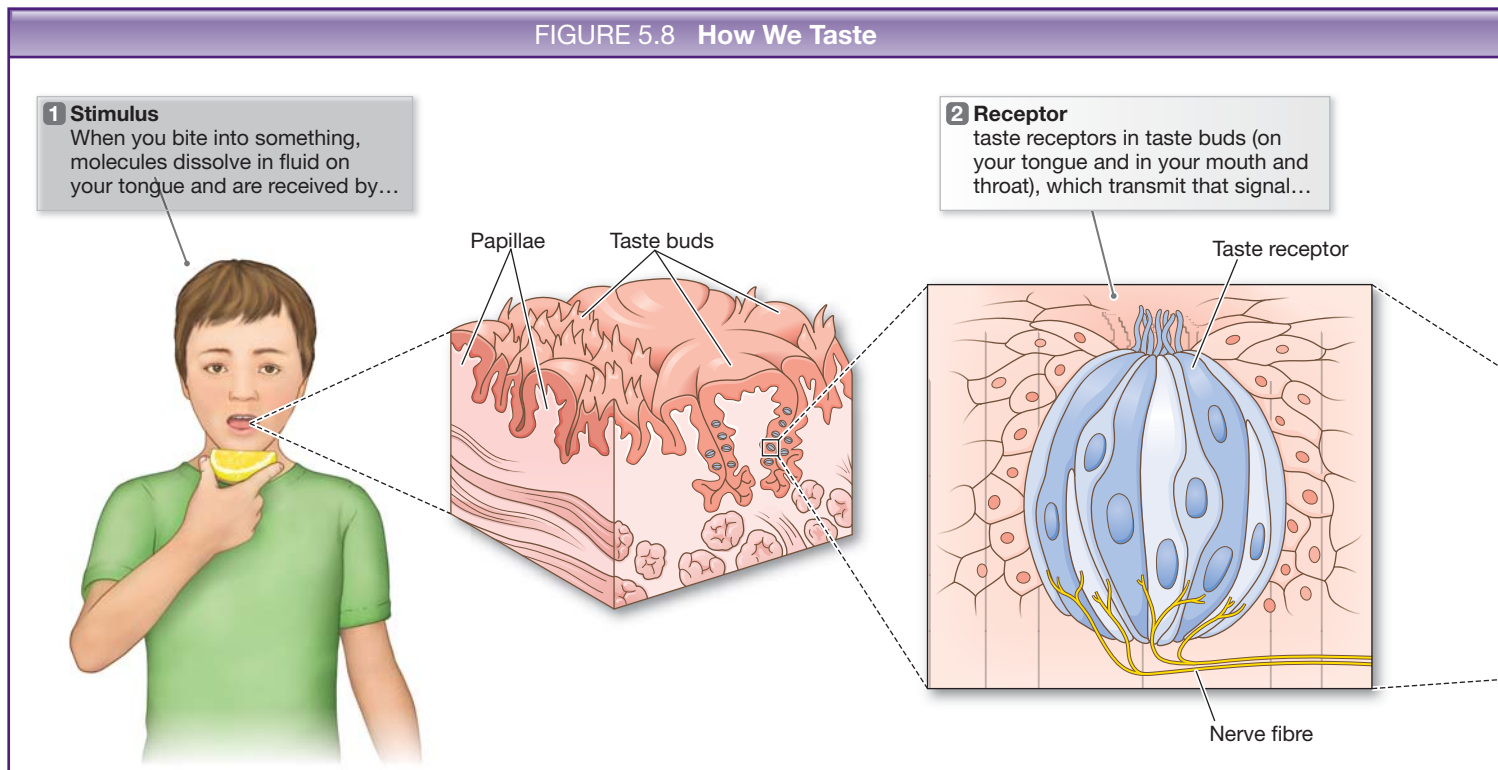
You plan to have them sip a small amount of water and tell you \_\_\_\_\_.

- a. whether they taste salt or no salt
- b. how much salt is in each sip from different glasses of water

You will use the participants' responses to calculate an absolute threshold for tasting salt by \_\_\_\_\_.

- a. comparing hits and false alarms
- b. calculating the amount of salt used in each sip of water

FIGURE 5.8 How We Taste



2. What is Weber's law?
  - a. When participants are unsure whether they can detect a stimulus, they will guess about it.
  - b. Some people are biased toward saying they detected something, and others are biased toward saying they detected nothing.
  - c. We are especially tuned to detect changes in stimulation.
  - d. The amount of physical energy needed to detect a change in sensation depends on the proportional change from the original stimulus.

## What Are the Basic Sensory Processes?

As discussed above, Helen Keller was blind and deaf. In scientific terms, her perceptual experience was restricted because her visual and auditory systems were damaged so that the neurons in her brain that constructed visual and auditory perceptions did not receive any sensory signals. Keller's situation helps illustrate how information about the world gets into the brain: Only the neurons in the sensory organs respond directly to events in the world. The neurons in the brain do not respond to events in the world; they respond only to input from other neurons. This section discusses how each sense organ detects stimuli and how the resulting information is then sent to the brain.

### In Taste, Taste Buds Detect Chemicals

The job of **gustation**, our sense of taste, is to keep poisons out of our digestive systems while allowing good food in. The stimuli for taste are chemical substances from food that dissolve in saliva, though how these stimuli work is still largely a mystery. The taste receptors are part of the **taste buds**, which are mostly on the tongue (in the tiny, mushroom-shaped structures called *papillae*) but are also spread throughout the mouth and throat. An individual has anywhere from 500 to 10,000 taste buds. When food stimulates them, the taste buds send signals to the brain, which then produces the experience of taste (**FIGURE 5.8**).

#### LEARNING OBJECTIVES

Trace the neural processes from the receptor to the brain for taste, smell, touch, hearing, and vision.

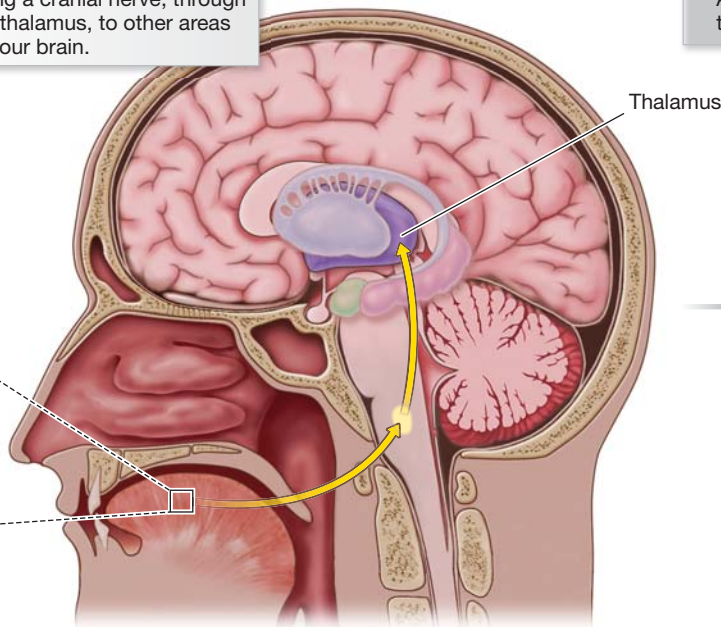
Describe the process of pain perception and how the perception of pain can be reduced.

**gustation** The sense of taste.

**taste buds** Sensory receptors that transduce taste information.

**3 Pathway to the brain**  
along a cranial nerve, through the thalamus, to other areas of your brain.

**4 Resulting perception**  
As a result, you know the taste is good or bad.



In all the senses, a near-infinite variety of perceptual experiences arises from the activation of unique combinations of receptors. Scientists once believed that different regions of the tongue are more sensitive to certain tastes, but they now know that the different taste buds are spread relatively uniformly throughout the tongue and mouth (Lindemann, 2001). Every taste experience is composed of a mixture of five basic qualities: sweet, sour, salty, bitter, and umami. *Umami* (Japanese for “savory” or “yummy”) has only recently, within the last decade, been recognized by scientists as a fifth taste sensation (Krulwich, 2007). This delicious taste was perhaps first created intentionally in the late 1800s, when the famous French chef Auguste Escoffier invented a veal stock that did not taste sweet, sour, salty, or bitter. Independently of Escoffier, in 1908, the Japanese cook and chemist Kikunae Ikeda identified it as arising from the detection of glutamate, an excitatory neurotransmitter that occurs naturally in foods such as meat, some cheese, and mushrooms. Glutamate is the sodium salt in glutamic acid, and as *monosodium glutamate*, or *MSG*, which is commercially available under the brand name Accent, it can be added to various foods as a “flavour enhancer.” To identify the flavor of umami, you might taste a food that does not include Accent, add Accent to it, and then taste it again. But beware: Some people experience odd sensory effects and/or headaches after consuming MSG.

Taste alone does not affect how much you like a certain type of food. As you might know from having had colds, food seems tasteless if your nasal passages are blocked—taste relies heavily on the sense of smell. A food’s texture also matters: Whether a food is soft or crunchy, creamy or granular, tender or tough affects the sensory experience, as does the extent to which the food causes discomfort, as can happen with spicy chilies. The entire taste experience occurs not in your mouth but in your brain, which integrates these various sensory signals.

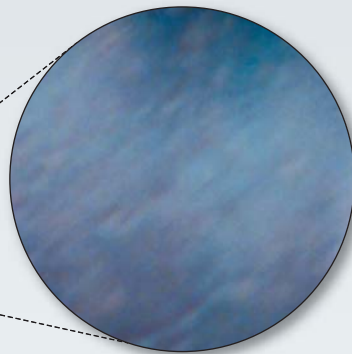
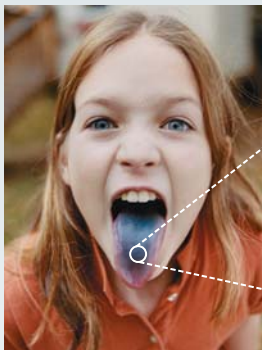
Some people experience especially intense taste sensations, a trait largely determined by genetics. These individuals, known as *supertasters*, are highly aware of flavours and textures and are more likely than others to feel pain when eating very spicy foods (Bartoshuk, 2000). First identified by their extreme dislike of bitter substances, supertasters have nearly six times as many taste buds as normal tasters. Although it might sound enjoyable to experience intense tastes, many supertasters are especially picky eaters because particular tastes can overwhelm them. When it comes to sensation, more is not necessarily better (FIGURE 5.9).

Our individual taste preferences—for example, that some people hate anchovies and others love them, that some people prefer spicy foods and others prefer bland ones—come partly from our different numbers of taste receptors. The same food can actually

### FIGURE 5.9 Try for Yourself: Are You a Supertaster?

Do you wonder if you are a supertaster? Supertasters tend to be thin and to dislike vegetables that can be bitter, such as broccoli. Women are more likely to be supertasters than men are. Supertasters are born with more taste buds and are more likely to become professional chefs or wine tasters. To determine if you are a supertaster, the psychologist Linda Bartoshuk suggests the following test:

- 1 Punch a small hole (about 7 mm) into a small square of wax paper.
- 2 Swab some blue food colouring on the front of your tongue, then place the wax paper over it.



- 3 Use a magnifying glass to view the part of your tongue that shows through the small hole.
- 4 You will see pink dots, which are the papillae. They remain pink because they do not take up the blue dye. Count the number of pink dots you can see in the small hole.

**Result:** In general, fewer than 15 papillae means you have fewer taste buds than average, 15–35 is average, and above 35 means you are probably among the 25 percent of the population who are supertasters.

taste different, because the sensation associated with that food differs in different people’s mouths. But cultural factors influence taste preferences as well.

Cultural influences on food preferences—for example, whether people eat croissants or bagels for breakfast—begin in the womb. In a study of infant food preferences, pregnant women were assigned to four groups: Some drank carrot juice every day during the last two months of pregnancy, then drank carrot juice again every day during the first two months *after* childbirth; some drank a comparable amount of water every day during both of those periods; some drank carrot juice during the first period, then drank water during the second period; and some drank water during the first period, then drank carrot juice during the second period (Mennella, Jagnow, & Beauchamp, 2006). All the mothers breast-fed their babies, so the taste of what each mother ate was in the breast milk that constituted each newborn’s sole food source during the first few months of life. When the babies were several months old, they were all fed carrot juice (either alone or mixed with their cereal). The infants whose mothers drank carrot juice either during the two months before childbirth, the first two months after childbirth, or both periods showed a preference for carrot juice compared with the infants whose mothers drank water during those same months. Thus, through their own eating behaviours before and immediately following birth, mothers apparently pass their eating preferences on to their offspring. Once again, as noted throughout this book, nature and nurture are inextricably entwined.

### In Smell, the Nasal Cavity Gathers Odorants

Lacking vision and hearing, Helen Keller relied on her other senses. She called her sense of smell a “potent wizard” that guided her through life. In general, however, humans’ sense of smell is vastly inferior to that of many animals (FIGURE 5.10), such as dogs, in part because we rely mainly on vision. Dogs have 40 times more olfactory receptors than humans do, and thus they are 100,000 to 1,000,000 times more sensitive to odours than humans are. Yet smell’s importance to us in our daily lives is evidenced by the vast sums of money we spend on both deodorants and mouthwash, at least in Western cultures.

#### FIGURE 5.10 Try for Yourself: How Is Your Sense of Smell?

You might be surprised to learn that most people have difficulty naming even common odours, but there is an easy way to test people’s ability.

Ask friends or family members to smell foods from the fridge or cupboard with their eyes closed and then to name what they smell. For the most convincing results, choose foods that almost everyone is familiar with, such as peanut butter or orange juice. You can also try common spices, such as cloves.

**Result:** Your participants will probably not identify the smells of food items at least 50 percent of the time (de Wijk, Schab, & Cain, 1995).

**Explanation:** Although people generally can tell whether something smells good or bad, and even young children are good at describing whether a smell belongs to something edible or something dangerous, most people are surprisingly bad at identifying common food odours. People may do better if you name possibilities, such as that the smell is from either a banana or licorice. Moreover, practice sometimes leads to better identification: Some people can develop enhanced abilities to identify odours.



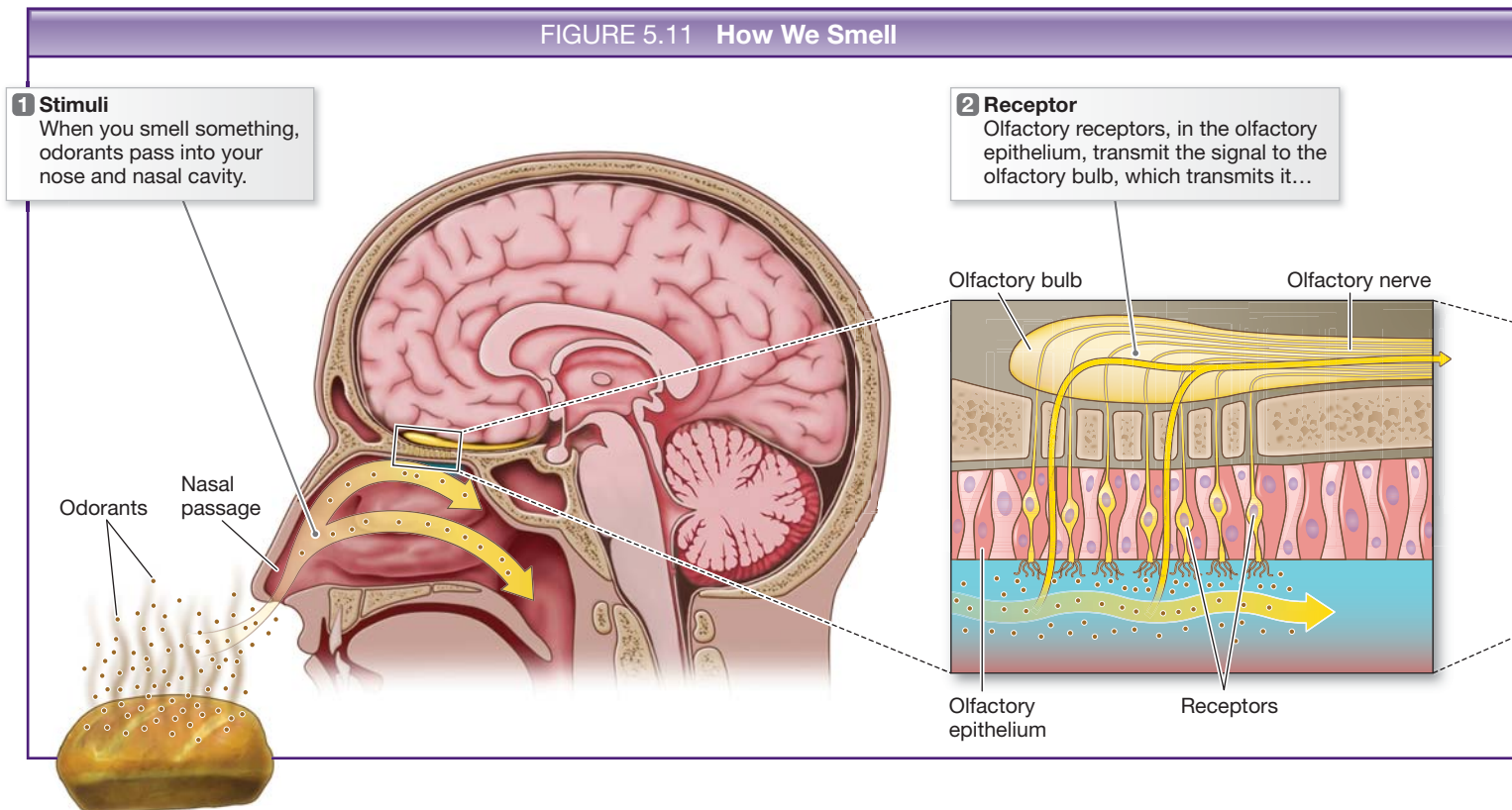
**olfaction** The sense of smell, which occurs when receptors in the nose respond to chemicals.

**olfactory epithelium** The thin layer of tissue, within the nasal cavity, that is embedded with smell receptors.

**olfactory bulb** The brain centre for smell, located below the frontal lobes.

Of all the senses, smell, or **olfaction**, has the most direct route to the brain, but it may be the least understood. Like taste, it involves the sensing of chemicals that come from outside the body. We smell something when chemical particles, or *odorants*, pass into the nose and, when we sniff, into the nasal cavity's upper and back portions. In the nose and the nasal cavity, the odorants come into contact with the **olfactory epithelium**, a thin layer of tissue embedded with smell receptors; these receptors transmit information to the **olfactory bulb**, the brain centre for smell, just below the frontal lobes. From here, smell information goes direct to other brain areas. Unlike other sensory information, smell signals bypass the thalamus, the early relay station. One imaging study found that areas in the brain's prefrontal cortex process information about whether a smell is pleasant or aversive, whereas the smell's intensity is processed in another brain region, the amygdala (Anderson et al., 2003). The prefrontal cortex is also involved in emotion and memory, so it is not surprising that olfactory stimuli can evoke feelings and memories (**FIGURE 5.11**). For example, many people find that the aromas of certain holiday foods cooking, the smell of bread baking, and/or the fragrance of particular perfumes generate fond childhood memories. When a perfume commercial on television claimed that the object of your desire would not be able to forget you if you wore the advertised perfume, the advertisers were linking scent with memory—and counting on the object of your desire finding the scent (and thus the memory of you) pleasant!

Researchers have identified thousands of receptors in the olfactory epithelium, each responsive to a different chemical group. It remains unclear exactly how these receptors encode distinct smells. One possibility is that each receptor type is uniquely associated with a specific odour (one type would encode,

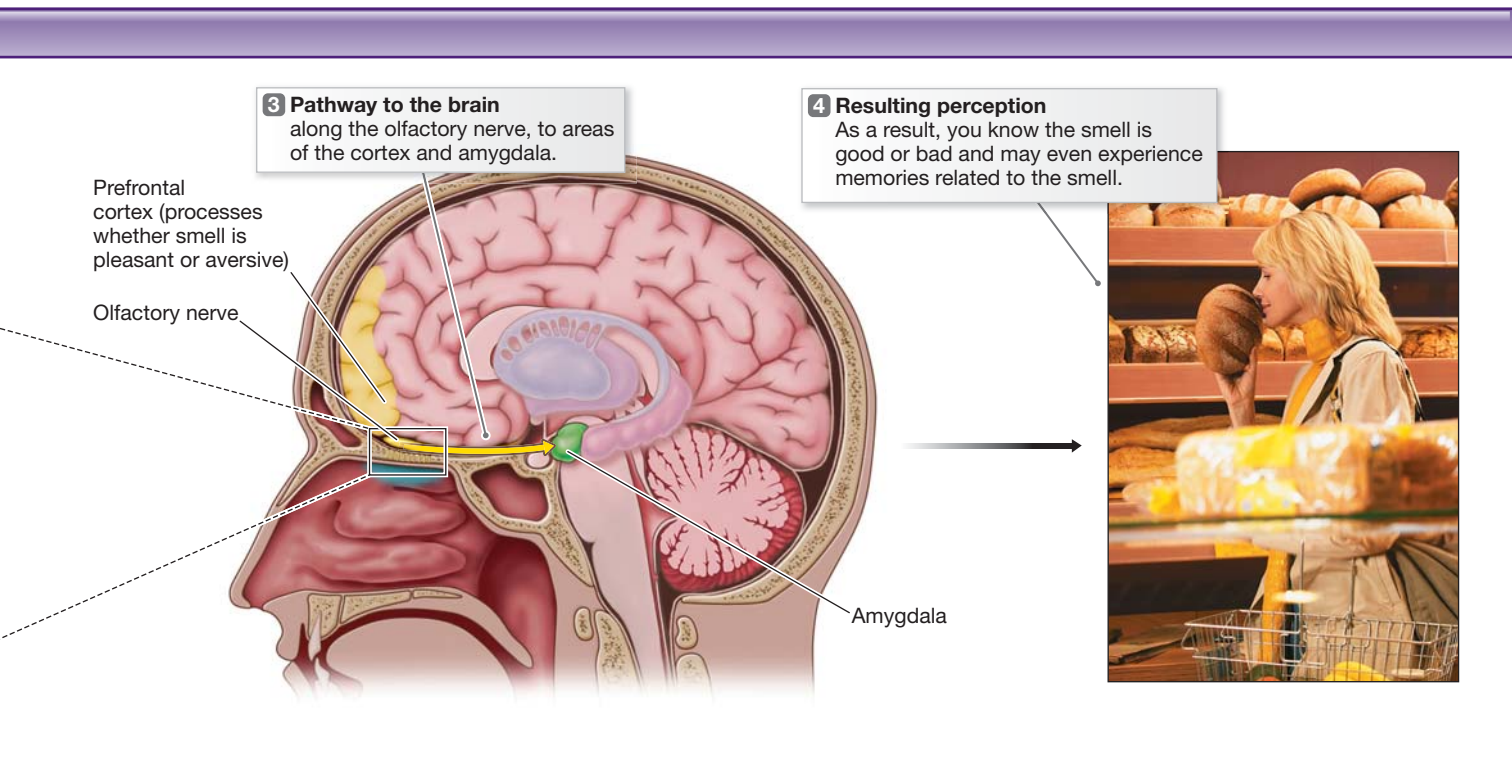




for example, only the scent of roses); this explanation is unlikely, however, given the huge number of scents we can detect. Another possibility, more likely to be correct, is that each odour stimulates several receptors and that the activation pattern across several receptor types determines the olfactory perception (Lledo, Gheusi, & Vincent, 2005).

According to the Israeli researchers Yaara Yeshurun and Noam Sobel (2010), although humans can discriminate among thousands of different odours, most people are pretty bad at identifying odours by name. What humans can readily do is say whether an odour is pleasant or unpleasant. Many are often surprised to find out that people have difficulty naming odours, but you can test this by asking your friends or family to name familiar food items from the fridge. You will probably find that they are unable to name the smell of odorous household items at least 50 percent of the time (de Wijk, Schab, & Cain, 1995; see Figure 5.10). At the same time, the available evidence indicates that women are generally better than men at identifying odours (Bromley & Doty, 1995; Lehrner, 1993; Schab, 1991).

As we age, our sensory and perceptual systems become less acute. But a deteriorating sense of smell can signal problems beyond the normal changes that occur with aging. A series of recent studies has found that an impaired sense of smell is associated with an increased risk of mental decline and of Alzheimer's disease, a devastating condition more prevalent in older adults. Alzheimer's disease causes a rapid decline in cognition, such that in its most advanced states, people with this disease are unable to recognize family members or care for themselves. In one study, older adults with an average age of 80, who were well enough to be living in the community, were given a smell identification test (Wilson et al., 2007). These older

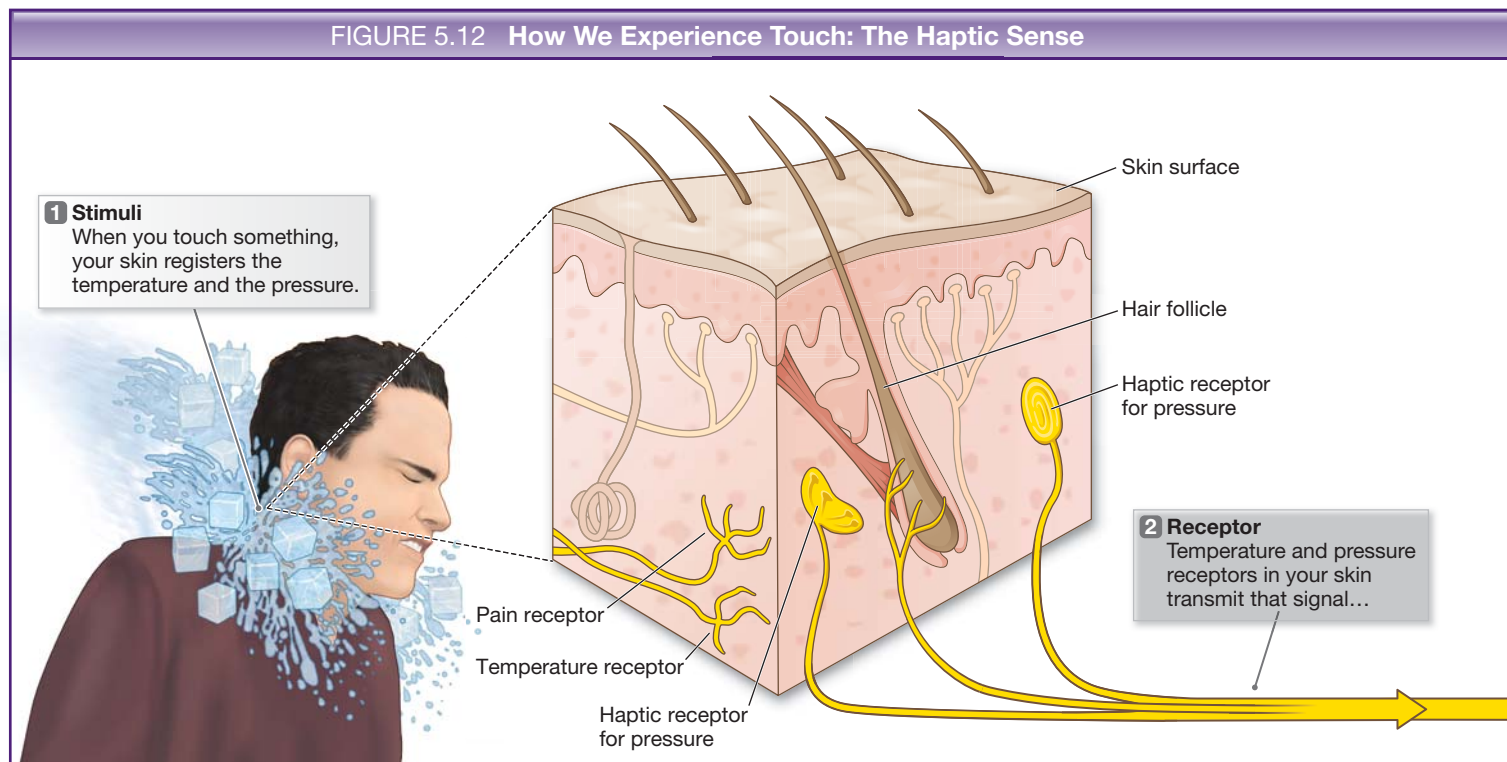


adults were followed for five years after the testing. Participants who scored in the lowest 25th percentile on the smell identification test had a 50 percent higher incidence of cognitive impairment five years later than those who scored in the top 25th percentile.

## In Touch, Sensors in the Skin Detect Pressure, Temperature, and Pain

**haptic sense** The sense of touch.

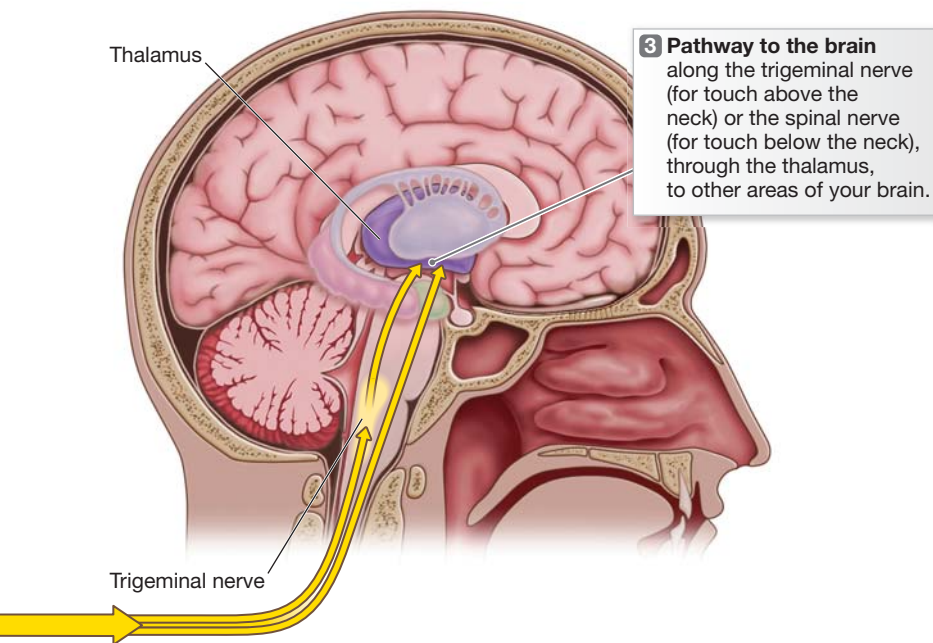
Touch, the **haptic sense**, conveys sensations of temperature, of pressure, and of pain and a sense of where our limbs are in space. Anything that makes contact with our skin provides *tactile stimulation*, which gives rise to an integrated experience of touch. The haptic receptors for both temperature and pressure are sensory neurons that terminate in the skin's outer layer. Their long axons enter the central nervous system by way of spinal or cranial nerves. For sensing temperature, there appear to be separate hot receptors and cold ones, although both can be triggered at the same time by intense stimuli (**FIGURE 5.12**). The simultaneous activation of hot and cold receptors can produce strange sensory experiences, such as a false feeling of wetness. Some receptors for pressure are nerve fibres at the bases of hair follicles that respond to movement in the hair. Other pressure receptors are capsules in the skin that respond to continued vibration, to sudden movements, and to steady pressure. Pain receptors, discussed in greater detail below, are found throughout the body, not just in the skin. The integration of various signals and higher-level mental processes produces haptic experiences. For instance, stroking multiple pressure points can produce a tickling sensation, which can be pleasant or unpleasant depending on the mental state of the person being tickled. An age-old question asks why you cannot tickle yourself, and imaging research has found that the brain areas involved in touch sensation respond less to self-produced tactile stimulation than to external tactile stimulation (Blakemore, Wolpert, & Frith, 1998;



the relationship between the brain and touch is discussed further in Chapter 3, “Biological Foundations”).

**TWO TYPES OF PAIN** Pain is part of a warning system that stops you from continuing activities that may harm you. Whether the message is to remove your hand from a hot burner or to stop running when you have damaged a tendon, pain signals that you should quit doing whatever you are doing. Children born with a rare genetic disorder that leaves them insensitive to pain usually die young, no matter how carefully they are supervised. They simply do not know how to avoid activities that harm them or to report when they are feeling ill (Melzack & Wall, 1982). Like other sensory experiences, the actual experience of pain is created by the brain. For instance, as discussed in Chapter 3, a person whose limb has been amputated may sometimes feel phantom pain in the nonexistent limb. The person really feels pain, but the pain occurs because the brain misinterprets neural activity.

Most experiences of pain result when damage to the skin activates haptic receptors. The nerve fibres that convey pain information are thinner than those for temperature and for pressure and are found in all body tissues that sense pain: skin, muscles, membranes around both bones and joints, organs, and so on. Two kinds of nerve fibres have been identified for pain: fast fibres for sharp, immediate pain and slow fibres for chronic, dull, steady pain. An important distinction between these fibres is the myelination or nonmyelination of their axons, which travel from the pain receptors to the spinal cord. Recall from Chapter 3 that myelination speeds up neural signals. Myelinated axons, like heavily insulated wire, can respond quickly; nonmyelinated axons respond more slowly. Think of a time when you touched a hot pan. You probably can recall feeling two kinds of pain: a sharp, fast, localized pain at the moment your skin touched the pan, followed by a slow, dull, more diffuse burning pain. The fast-acting receptors are activated by strong



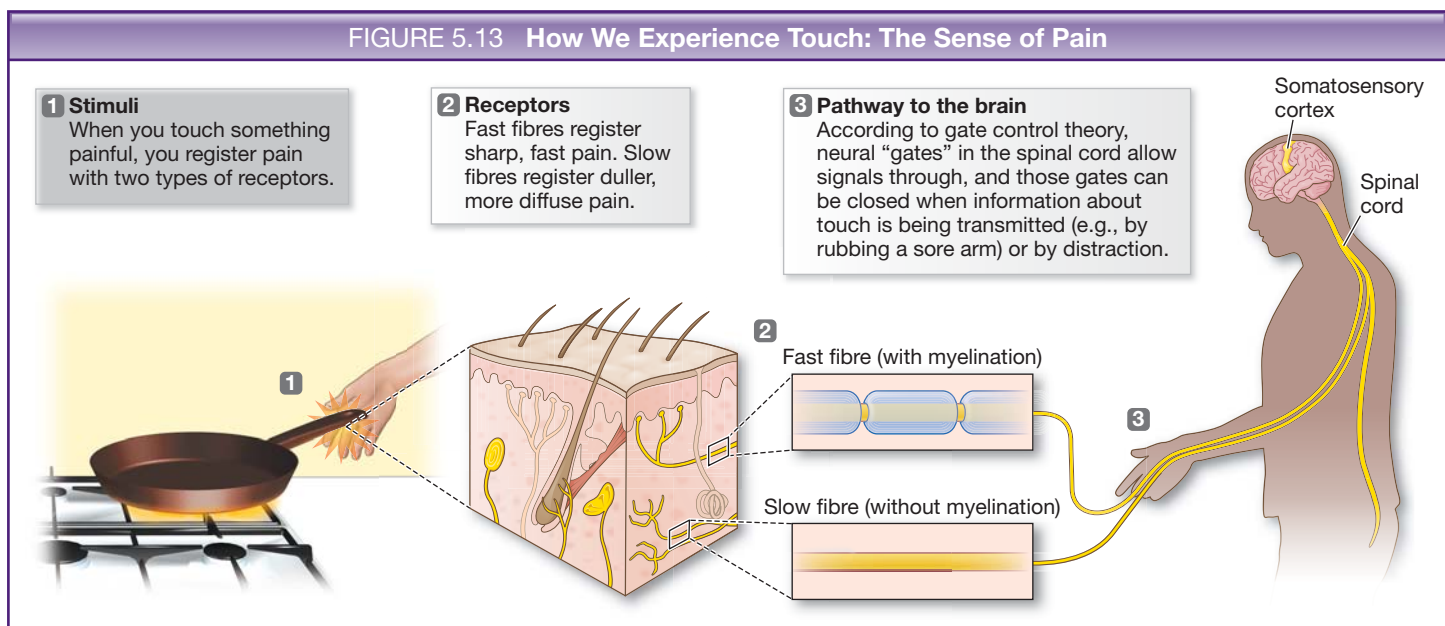
**4 Resulting perception**  
As a result, you know how the touch feels.



physical pressure and temperature extremes, whereas the slow-acting receptors are activated by chemical changes in tissue when skin is damaged. From an adaptive perspective, fast pain leads us to recoil from harmful objects and therefore is protective, whereas slow pain keeps us from using the affected body parts and therefore helps in recuperation (FIGURE 5.13).

**GATE CONTROL THEORY** The brain regulates the experience of pain, sometimes producing it, sometimes suppressing it. Ronald Melzack, a Montreal native, pioneered much of what we know about how the brain creates the experience of pain. Melzack spent most of his career at McGill University, where he demonstrated that psychological factors, such as past experiences, are extremely important in determining how much pain a person feels. Along with his British collaborator Patrick Wall (1965), Melzack formulated the *gate control theory of pain*, which states that for us to experience pain, pain receptors must be activated and a neural “gate” in the spinal cord must allow the signals through to the brain. This theory was radical in that it conceptualized pain as a perceptual experience within the brain rather than simply a response to nerve stimulation. According to this theory, pain signals are transmitted by small-diameter nerve fibres, which can be blocked at the level of the spinal cord (prevented from reaching the brain) by the firing of larger sensory nerve fibres. Thus sensory nerve fibres can “close a gate” and prevent or reduce the perception of pain. This is why scratching an itch is so satisfying, why rubbing an aching muscle helps reduce the ache, and why vigorously rubbing the skin where an injection is about to be given reduces the needle’s sting. A number of cognitive states, such as distraction, can also close the gate. Athletes sometimes play through pain because of their intense focus on the game; wounded soldiers sometimes continue to fight during combat, often failing to recognize a level of pain that would render them inactive at other times. An insect bite bothers us more when we are trying to sleep and have few distractions than when we are wide awake and active.

Conversely, some mental processes, such as worrying about or focusing on the painful stimulus, seem to open the pain gates wider. Research participants who are



well rested rate the same level of a painful stimulus as less painful than do participants who are fearful, anxious, or depressed (Loggia, Mogil, & Bushnell, 2008; Sullivan et al., 2001). Because pain is processed in the same areas of the brain as stress, fear, and anxiety, it is a sensory experience and an emotional response. Indeed, positive moods help people cope with pain. In a systematic review of the literature, Swedish researchers found that listening to music was an extremely effective means of reducing post-operative pain, perhaps because it helps patients relax (Engwall & Dupplis, 2009).

Pain perception is complex, depending on biological, psychological, and cultural factors. Numerous studies have found that females generally are more sensitive to pain than males are (Fillingim, 2003). That females have lower pain thresholds has been shown both in controlled laboratory studies and in clinical studies. According to the theory of men's "macho" responses to pain, both sexes may feel the same amount of pain, but men will not admit they are in pain because to do so is not consistent with the male sex role. Evidence against this explanation comes from studies of autonomic responses—that is, responses not under voluntary control. For example, women exhibit greater pupil dilation in response to pain than men do (Ellermeir & Westphal, 1995). Females also have more complex pain management systems. For example, women are able to experience pregnancy-induced analgesia, which reduces the perception of pain during childbirth (Gintzler & Liu, 2000). For women who menstruate, normal monthly fluctuations in hormones alter pain perception, so that pain thresholds are lowest during the high-estrogen stages of the menstrual cycle. Estrogen replacement therapy, which increases estrogen levels in menopausal women, is also associated with increased risk of pain (Musgrave, Vogt, Nevitt, & Cauley, 2001). These findings have important implications for the clinical treatment of pain and may lead to pain treatments tailored to take sex differences into account.

One new method for treating pain takes advantage of advances in brain imaging that allow us to see which parts of the brain are active when we feel pain. Pain researchers divide the perception of pain into two large areas in the brain. One area responds to the sensory input from the part of the body that is in pain—the dull pain of a chronic backache, the stabbing pain of a cut on the arm, and so on. The other part of the brain that is involved when we feel pain registers the emotional aspect of pain, which includes how unpleasant it is. When we feel pain, both brain areas are active. Researchers have studied whether, by engaging in activities that reduce the activity in brain areas that underlie pain perception, people can learn to reduce pain perception. DeCharms and colleagues (2005) have pioneered techniques that offer great hope for people who suffer from painful conditions. The researchers sought to teach people in pain, many of these people in chronic pain, to visualize their pain more positively. For example, participants were taught to think about a burning sensation as soothing, like the feeling of being in a sauna. As they tried to learn such techniques, they viewed fMRI images that showed which regions of their brains were active as they performed the tasks. (On fMRI, see Chapter 2, "Research Methodology.") Many participants learned techniques that altered their brain activity and reduced their pain.

Of course, more-traditional ways exist to control pain. Most of us have taken legal drugs, usually ibuprofen or acetaminophen, to reduce pain perception. If you have ever suffered from a severe toothache or needed surgery, you have probably experienced the benefits of pain medication. When a dentist administers Novocain to sensory neurons in the mouth, pain messages are not transmitted

## Real World PSYCHOLOGY

to the brain, so the mouth feels numb. General anaesthesia slows down the firing of neurons throughout the nervous system, and the patient becomes unresponsive to stimulation (Perkins, 2007).

You can use your knowledge of pain perception anytime you need to reduce your own pain or to help others in pain. Distraction is usually the easiest way to reduce pain, so if you are preparing for a painful procedure or suffering after one, watching an entertaining movie can help, especially if it is funny enough to elevate your mood. As noted earlier, music helps you relax to deal with pain. Rapid rubbing can benefit a stubbed toe, for example, or a finger that was caught in a closing drawer. You will also feel less pain if you are rested, not fearful, and not anxious. Finally, try to visualize your pain as something more pleasant. Of course, severe pain is a warning system and should be treated by a medical professional.

### In Hearing, the Ear Detects Sound Waves

**audition** The sense of sound perception.

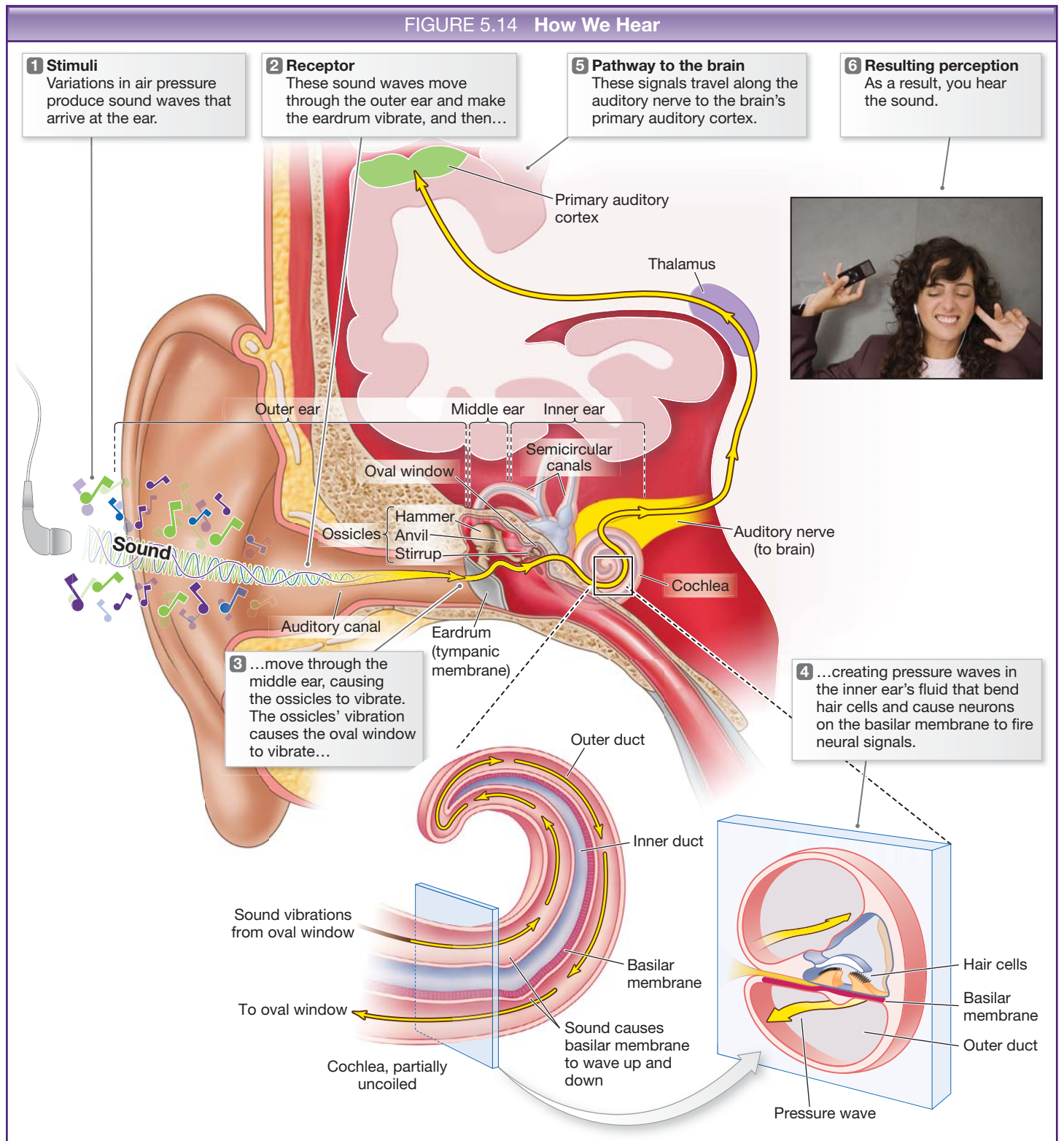
**sound wave** The pattern of the changes in air pressure through time that results in the percept of a sound.

**eardrum (tympanic membrane)** A thin membrane, which sound waves vibrate, that marks the beginning of the middle ear.

For humans, hearing, or **audition**, is second only to vision as a source of information about the world. It not only is a mechanism for determining what is happening in an environment but also provides a medium for spoken language. Hearing results when the movements and vibrations of objects cause the displacement of air molecules. Displaced air molecules produce a change in air pressure, and that change travels through the air. The pattern of the changes in air pressure through time is called a **sound wave**. The wave's *amplitude* determines its loudness; higher amplitude is perceived as louder. The wave's *frequency* determines its pitch; higher frequencies are perceived as higher in pitch. Sound's frequency is measured in vibrations per second, called *hertz* (abbreviated *Hz*). Most humans can detect sound waves with frequencies from about 20 Hz to about 20,000 Hz. Like (again) all other sensory experiences, the sensory experience of hearing occurs within the brain, as the brain integrates the different signals provided by various sound waves. Therefore, we finally have an answer to an age-old question: If a tree falls and no one hears it, air pressure will change, but there will be no sound unless that change is registered in a brain.

Our ability to hear is based on the intricate interactions of various regions of the ear, which convert sound waves into brain activity, producing the sensation of meaningful sound. Changes in air pressure produce sound waves that arrive at the *outer ear* and travel down the auditory canal to the **eardrum**, a membrane stretched tightly across the canal and marking the beginning of the *middle ear*. The sound waves make the eardrum vibrate. These vibrations are transferred to *ossicles*, three tiny bones commonly called the hammer, anvil, and stirrup. The ossicles transfer the eardrum's vibrations to the *oval window*, a membrane of the *cochlea*, or *inner ear*, a fluid-filled tube that curls into a snail-like shape. Running through the centre of the cochlea is the thin *basilar membrane*. The oval window's vibrations create pressure waves in the inner ear's fluid; these waves prompt the *hair cells* to bend and cause neurons on the basilar membrane to fire. These hair cells are the primary auditory receptors. Thus the mechanical signal of a sound wave hitting the eardrum is converted into a neural signal that travels to the brain via the auditory nerve (**FIGURE 5.14**). As noted by Daniel Levitin, a psychology professor at McGill University and a former professional musician, in his best-selling *This Is Your Brain on Music* (2006), music provides an excellent example of the wonders of the auditory system. Hearing music results from differences in brain activity, not from differentiated sound waves. For instance, when you listen to your favorite MP3 and you hear guitars, drumming, and singing,

nothing in the sound waves themselves tells you which part of the music is which. Yet it is rather easy for most people to pick out the separate features in a piece of music. Through activity in different brain regions, the features all come together to create the experience of music.



To get an estimate of whether your hearing is in the normal range, try the *Hearing Screening Inventory* (FIGURE 5.15). Although this inventory correlates well with hearing tests, it is not a medical diagnosis, so if you score in the range of hearing loss, you should have your hearing checked by an audiologist or other hearing professional.

**LOCATING SOUNDS** Locating a sound's origin is an important part of auditory perception. In audition, the sensory receptors do not code where events occur. Instead, the brain integrates the different sensory information coming from each of our two ears. Much of researchers' understanding of auditory localization has come from examining barn owls, nocturnal birds whose finely tuned hearing helps them locate their prey. In fact, in a dark laboratory a barn owl can locate a mouse through hearing alone. A barn owl uses two cues to locate a sound: the time the sound arrives in each ear, and the sound's intensity in each ear. Unless the sound comes from exactly in front or in back of the owl, it will reach one ear first. Whichever side it comes from, it will sound softer on

### FIGURE 5.15 Try for Yourself: Hearing Screening Inventory (HSI)

Developed by the University of British Columbia's Stanley Coren and A. Ralph Hakstian (1992), this questionnaire deals with some common hearing situations. For each question, select the response that best describes you and your behaviours.

For 1–8, you can select from among the following response alternatives: **Never** (or almost never), **Seldom**, **Occasionally**, **Frequently**, **Always** (or almost always). For 9–12: **Good**, **Average**, **So-So**, **Poor**, **Very poor**.

Circle the letter corresponding to the first letter of your choice.

1	Are you ever bothered by feelings that your hearing is poor?	N S O F A
2	Is your reading or studying easily interrupted by noises in nearby rooms?	N S O F A
3	Can you hear the telephone ring when you are in the same room in which it is located?	N S O F A
4	Can you hear the telephone ring when you are in the room next door?	N S O F A
5	Do you find it difficult to make out the words in recordings of popular songs?	N S O F A
6	When several people are talking in a room, do you have difficulty hearing an individual conversation?	N S O F A
7	Can you hear the water boiling in a pot when you are in the kitchen?	N S O F A
8	Can you follow the conversation when you are at a large dinner table?	N S O F A
9	Overall I would judge my hearing in my RIGHT ear to be	G A S P V
10	Overall I would judge my hearing in my LEFT ear to be	G A S P V
11	Overall I would judge my ability to make out speech or conversations to be	G A S P V
12	Overall I would judge my ability to judge the location of things by the sound they are making alone to be	G A S P V

**Result:** For questions 1, 5, and 6, score 1 for "Never," 2 for "Seldom," 3 for "Occasionally," 4 for "Frequently," and 5 for "Always."

For questions 2, 3, 4, 7, and 8, reverse the scoring, from 1 for "Always" up to 5 for "Never."

For questions 9 through 12, score from 1 for "Good" to 5 for "Very Poor."

Your hearing score is the sum of these 12 items.

Now check the following table for your predicted best-ear hearing sensitivity (this prediction is 92 percent accurate).

<b>HSI Scale Total</b>	<b>Predicted Best-Ear Sensitivity</b>
12 to 27	Hearing is normal
28 to 37	Hearing loss 25 dB or more (some conversational hearing loss)
38 or more	Hearing loss 55 dB or more

The *Hearing Screening Inventory* is copyrighted by SC Psychological Enterprises Ltd. and is reprinted here with permission.



The cochlear implant was the first neural implant used successfully in humans; in Canada, several thousand of these devices have been implanted since they were first approved for use in 1987.

The cochlear implant has helped people with severe hearing problems due to the loss of hair cells in the inner ear, which are responsible for transmitting auditory stimuli. Unlike a hearing aid, the implant does not amplify sound; rather, it directly stimulates the auditory nerve. The downside is that after the implant is put in place, the person who received it loses all residual normal hearing in that ear, because sound no longer travels via the ear canal and middle ear. Instead, sound is picked up by a tiny microphone behind the ear, sent through a computer processor, and then transmitted to the implant's electrodes inside the cochlea. If the devices are implanted at a young enough age (younger than two years being optimal) in a child born deaf, the child's hearing will be quite functional, and he or she will learn to speak reasonably normally (FIGURE 5.16).

Although the benefits of cochlear implants might seem indisputable to many people with normal hearing, in the 1990s, deaf people who do not consider deafness a disability voiced concerns that the implants might adversely affect deaf culture. In fact, some deaf people believe that cochlear implants are a weapon being wielded by the medical community to wipe out deaf culture. They see this effort as being an extreme result of prejudice and discrimination against them, commonly known as *audism*. They argue that the cochlear implants disrupt the deaf community's cohesiveness. While deaf people with cochlear implants can still use sign language, apparently they are not always welcome in the signing community (Chase, 2006). This attitude has slowly been changing, but is still held by many deaf signers.

There are specific ethical concerns about implanting the devices in deaf children, a procedure first approved by Health Canada in 2000. Under normal circumstances, an adult can decide whether to get the implants, but the decision is made for a child by the parents. Ninety percent of deaf children are born to hearing parents who consider deafness a disability. Is it ethical for hearing parents, who have never experienced being deaf, to decide that a baby or very young child should receive cochlear implants? Conversely, is it ethical for deaf parents who have never been able to hear to decide against implanting the devices? Some deaf people believe the decision should be informed by their experiences of living deaf, not the experiences of hearing parents who know nothing of the deaf world. But of course other arguments can be made:



**FIGURE 5.16 Cochlear Implants and Deaf Culture** Cochlear implants, such as the one fitted on the side of this 10-year-old girl's head, consist of a microphone around the ear and a transmitter fitted to the scalp, linked to electrodes that directly stimulate the auditory nerve. When implanted at a young age, these devices can enable people with hearing loss to learn to speak and hear.

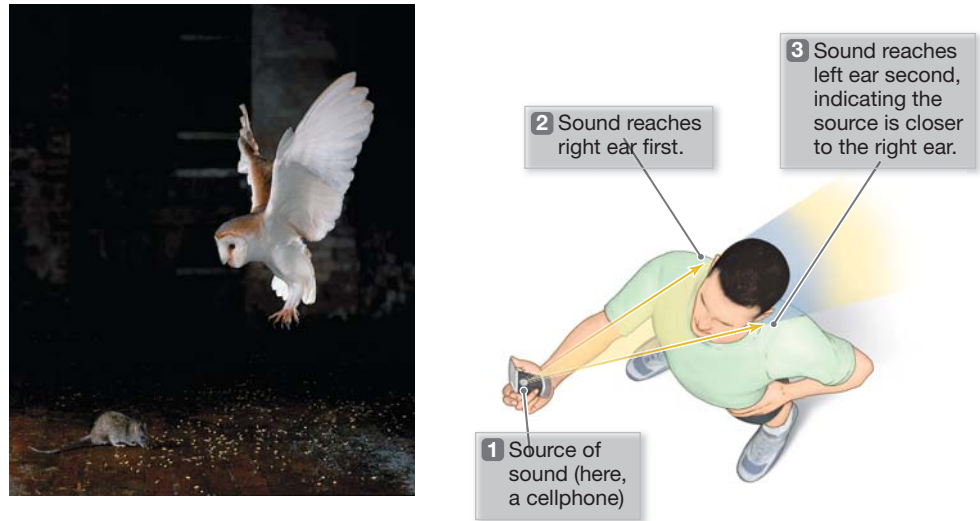
Perhaps deaf parents should not deny hearing to their children. The official position of the Canadian Association for the Deaf (2007) is that empirical research has not conclusively shown the efficacy of cochlear implants for young children. As a result, the Association strongly asserts the right of all deaf children to learn sign language early in childhood.

Some people believe the decision should be made by the child when he or she is mature enough. However, postponing the decision denies the child the language benefits of an early implant. In fact, by adolescence the brain loses the ability to use auditory information in the building of spoken-language skills. If a child is to benefit fully from implants, the parents must decide before the child is capable of making a decision, and if the goal is for the deaf child to use spoken language at the same level as his or her hearing peers, the device should be implanted before the child is two years old (Nicholas & Geers, 2006).

According to medical ethics and the legal system, medical decisions for children are made by their parents or guardians, so in regard to cochlear implants, neither the medical profession nor the law is concerned with whether deafness is considered a disability. However, society's attitude toward deafness will help determine how the implants are paid for. Is it ethical for the deaf community to deny that deafness is a disability if that denial results in cochlear implants not being covered by medical insurance or funded by government programs? If it is ethical for parents to refuse on cultural grounds to obtain implants for deaf children, is it ethical to refuse on cultural or religious grounds to treat children for any other condition, handicap, injury, or disease?

### FIGURE 5.17 Auditory Localization

Like barn owls, humans draw on the intensity and timing of sounds to locate where the sounds are coming from.



the other side because the owl's head acts as a barrier. These differences in timing and magnitude are minute—but not too small for the owl's brain to detect and act on. Although humans' ears are not as finely tuned to the location of sounds as owls' are, human brains use information from the two ears similarly (FIGURE 5.17).

### In Vision, the Eye Detects Light Waves

If we acquire knowledge through our senses, then vision is by far our most important source of knowledge. Does a place look safe or dangerous? Does a person look friendly or hostile? Even our metaphors for knowledge and for understanding are often visual: “I see,” “The answer is clear,” “I’m fuzzy on that point.” Unsurprisingly, then, most scientific study of sensation and of perception is concerned with vision.

Sight seems so effortless, so automatic, that we take it for granted. Every time a person opens his or her eyes, though, nearly half of that person's brain springs into action to make sense of the energy arriving in the eyes. Of course, the brain can do so only based on sensory signals from the eyes. If the eyes are damaged, the sensory system fails to process new information. This section focuses on how energy is transduced in the visual system, but what we commonly call *seeing* is much more than transducing energy. As James Enns, a psychologist at the University of British Columbia, notes in his book *The Thinking Eye, the Seeing Brain* (2005), very little of what we call seeing takes place in the eyes; rather, what we see results from constructive processes that occur throughout much of the brain to produce our visual experiences. Seeing is therefore an intelligent process that produces useful information about our environments.

Although some people have suggested that the human eye works like a crude camera, focusing light to form an image on the retina, this analogy does not do justice to the intricate processes that take place in the eye. Light first passes through the **cornea**, the eye's thick, transparent outer layer. The cornea focuses incoming light in a process called *refraction*. Light rays then enter and are bent farther inward by the *lens*, which focuses the light to form an image on the **retina**, the inner surface of the back of the eyeball.

Although more refraction (bending of light) happens at the cornea than at the lens, the lens is adjustable, whereas the cornea is not. The **pupil**, the dark circle at

**cornea** The clear outer covering of the eye.

**retina** The thin inner surface of the back of the eyeball. The retina contains the photoreceptors that transduce light into neural signals.

**pupil** The small opening in the eye; it lets in light waves.

the centre of the eye, is a small opening in the front of the lens, and to determine how much light enters the eye it either contracts or dilates (opens). The **iris**, an opaque, circular muscle, determines the eye's colour and controls the pupil's size. The pupil enlarges in dim light but also when we see something we like, such as an attractive person or a cute baby (Tombs & Silverman, 2004).

Behind the iris, muscles change the shape of the lens—flattening it to focus on distant objects and thickening it to focus on closer objects. This process is called *accommodation*. The lens and cornea work together to collect and focus light rays reflected from an object, to form on the retina an upside-down image of the object. The world looks right-side up to us even though the image of the world projected on the retina is upside down; the information that travels from our eyes to the brain is very different from how we “see” the world. The eye sends visual images to the brain not as a complete “picture” but in bits of information transmitted through neural signals. Just as the dots and dashes of Morse code transmit information that does not physically resemble the letters represented, so the visual system uses patterns of neurons that fire at different rates and in different combinations to represent the external world (Ramachandran, 2003; **FIGURE 5.18**).

**RODS AND CONES** The retina has two types of receptor cells: **rods** and **cones**, each type so called because of its distinctive shape. Rods respond at extremely low levels of illumination and are responsible primarily for night vision; they do not support colour vision, and they resolve fine detail poorly. Many people do not realize that humans cannot see colours in dim illumination, but go outside on the next moonless night and you will see grey colours instead of any bright ones you would have seen during the day. In contrast to rods, cones are less sensitive to low levels of light; they are responsible primarily for vision under high illumination and for seeing both colour and detail. Within the rods and cones, light-sensitive chemicals called *photopigments* initiate the transduction of light waves into electrical neural impulses.

Each retina holds approximately 120 million rods and 6 million cones. Near the retina's centre, cones are densely packed in a small region called the **fovea**. Although cones are spread throughout the remainder of the retina (except in the blind spot, as you will see shortly), they become increasingly scarce near the outside edge. Rods are all located at the retina's edges; none are in the fovea. If you look directly at a very dim star on a moonless night, the star will appear to vanish, because its light will fall on the fovea, where there are no rods. However, if you look just to the side of the star, the star will be visible, because its light will fall just outside the fovea, where there are rods.

**TRANSMISSION FROM THE EYE TO THE BRAIN** The generation of electrical signals by the photoreceptors in the retina begins the visual process. Immediately after light is transduced into neural impulses by the rods and cones, other cells in the retina—*bipolar*, *amacrine*, and *horizontal cells* (see Figure 5.18)—perform on those impulses a series of sophisticated computations that help the visual system process the incoming information. The outputs from these cells converge on about one million retinal *ganglion cells*, the first cells in the visual pathway to generate action potentials.

The ganglion cells send their signals along their axons from inside the eye to the thalamus. These axons are gathered into a bundle, the *optic nerve*, which exits the eye at the back of the retina. The point at which the optic nerve exits the retina has no rods or cones, resulting in a blind spot in each eye: If you look at one of your fists as you hold it out at arm's length, the size it appears to you is

**iris** The coloured muscular circle on the surface of the eye; it changes shape to let in more or less light.

**rods** Retinal cells that respond to low levels of illumination and result in black-and-white perception.

**cones** Retinal cells that respond to higher levels of illumination and result in colour perception.

**fovea** The centre of the retina, where cones are densely packed.

FIGURE 5.18 How We See

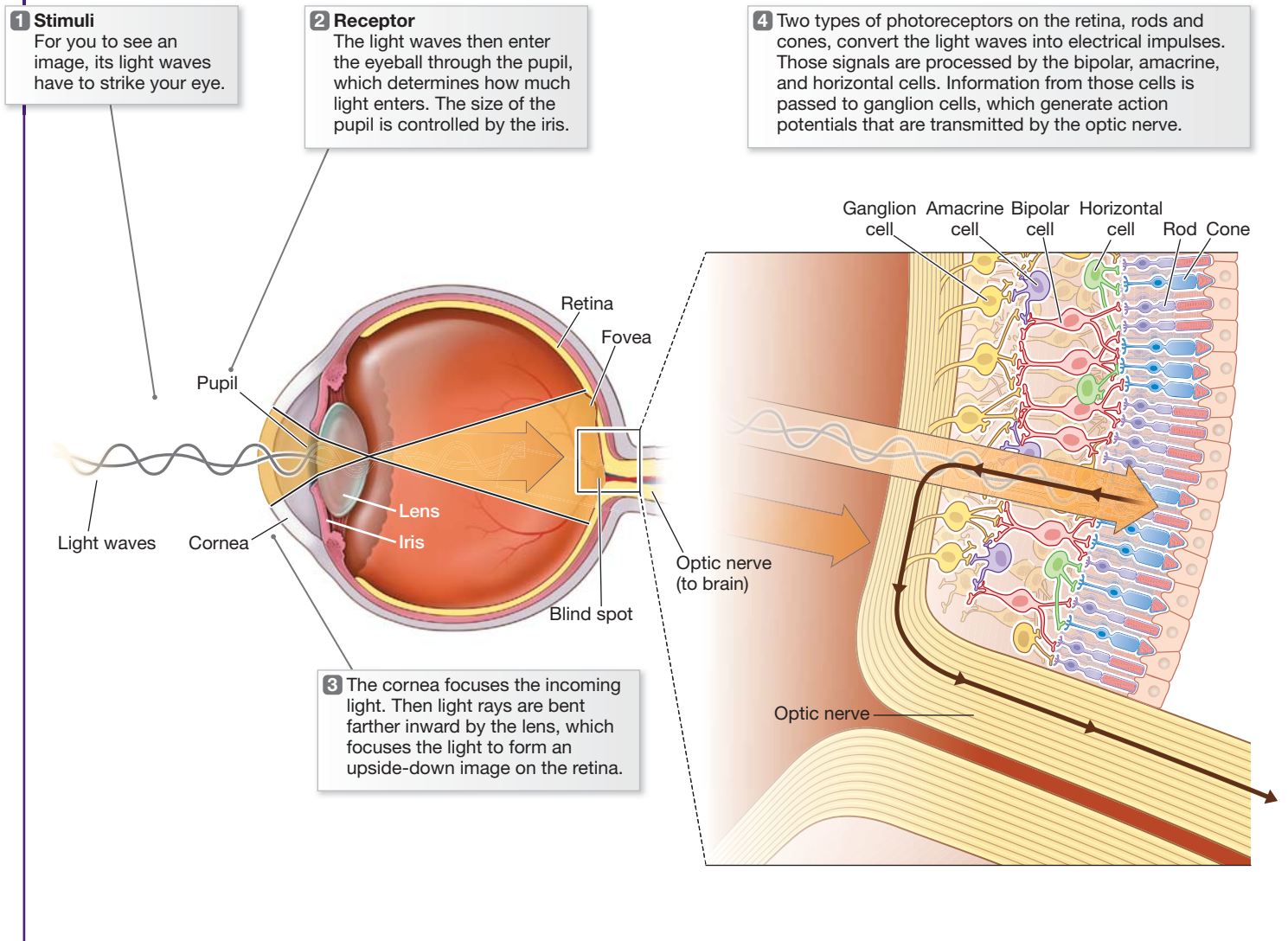


FIGURE 5.19 Try for Yourself: Find Your Blind Spot

To find your blind spot, hold this book in front of you and look at the dot, closing your left eye. Move the book toward and away from your face until the rabbit disappears.

You can repeat this for your right eye by turning the book upside down.



**Result:** The optic nerve creates the blind spot—a small point at the back of the retina. There are no receptors at this spot because it is where the nerves leave the eye.

about the size of your blind spot. The brain normally fills in this gap automatically, so you assume the world continues and are not aware that a blind spot exists in the middle of your field of vision. However, you can isolate your blind spot (FIGURE 5.19).

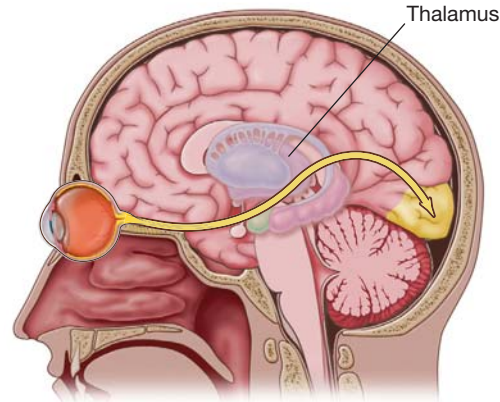
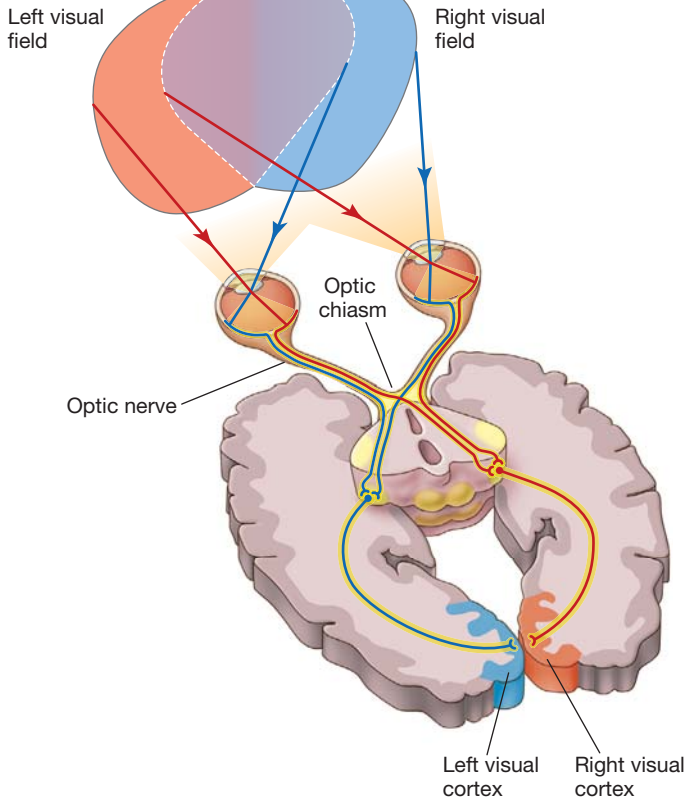
Each optic nerve carries information to the central nervous system. At the *optic chiasm*, half of the axons in the optic nerves cross (those that project from the portion of the retina nearest the nose). Information from the left side of visual space (i.e., everything visible to the left of the point of gaze) is projected to the brain's right hemisphere and vice versa. The first synapse of the majority of ganglion cells lies within the visual areas of the thalamus, and visual information is transmitted from there to the *primary visual cortex*, cortical areas in the occipital lobe, at the back of the head. The pathway from the retina to this region carries all the information that we consciously experience as seeing.

### 5 Pathway to the brain

Signals from the left visual field go to the right portion of each retina, follow along the optic nerve to the optic chiasm, and then travel through the right thalamus to the right visual cortex. Signals from the right visual field go to the left portion of each retina, follow along the optic nerve to the optic chiasm, and then travel through the left thalamus to the left visual cortex.

### 6 Resulting perception

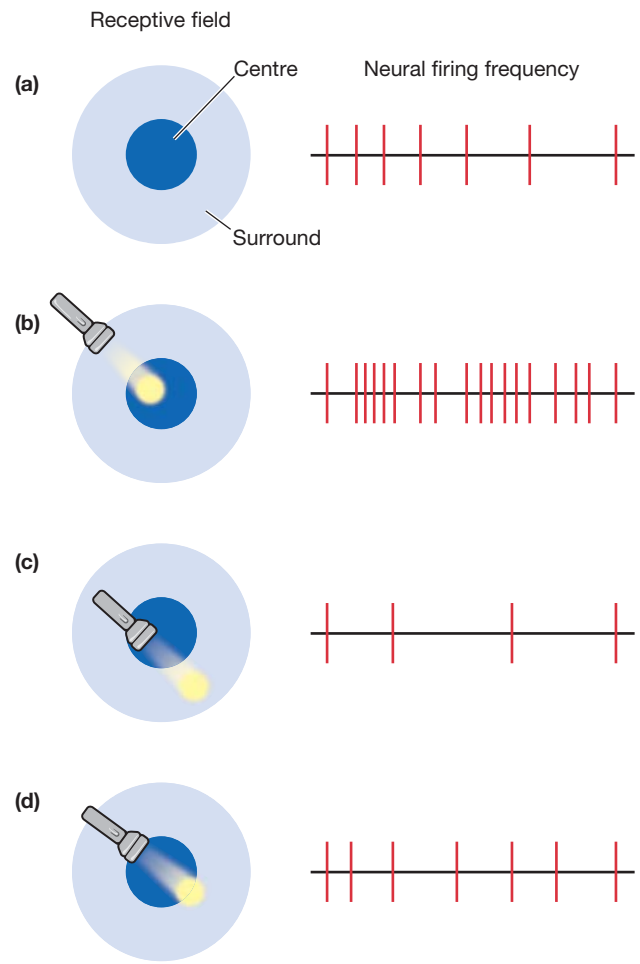
As a result, you can see the beautiful Lake Louise.



**THE DETECTION OF VISUAL INFORMATION** Sensory neurons are generally picky about what they respond to in the world—each has a particular “tuning.” To understand how this works, think of a tuning fork tuned to, say, middle C. If the air around this tuning fork vibrates at the frequency of middle C, those vibrations will make the tuning fork vibrate—that is, the fork will resonate with the energy around it. However, if the air vibrates at a different frequency, the tuning fork will not resonate. Similarly, particular visual neurons respond best to particular colours, particular shape orientations, or particular directions of motion. This tuning property of a given visual neuron specifies its receptive field. A **receptive field** is the population of sensory receptors that influences activity in a sensory neuron, the region within which the cell responds to a given stimulus. As in the tuning analogy, it responds best to some stimuli. Receptive fields are found for many sensory systems; the receptors can be in a region of skin or a set of photoreceptors in the retina. Since the eye projects an image of the visual scene onto the retina, visual receptive fields can be thought of as being located on a specific region of the retina or a specific location in visual space. One of the most common types

**receptive field** The region of visual space to which neurons in the primary visual cortex are sensitive.

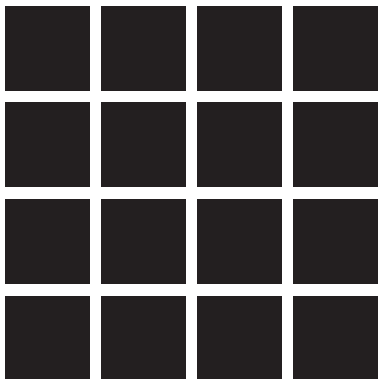
**FIGURE 5.20 Receptive Fields** (a) A typical receptive field consists of a centre and a surround. When there is no light, the cell fires at its baseline rate. (b) When light is shined in the centre, the neural firing frequency increases. (c) When light is shined in the surround, the neural firing frequency decreases. (d) When light is shined in the centre and in the surround, the cell's firing rate is balanced out and is similar to its baseline rate.



**lateral inhibition** A visual process in which adjacent photoreceptors tend to inhibit one another.

**FIGURE 5.21 Try for Yourself: Lateral Inhibition with the Hermann Grid**

Look at the figure as a whole and you immediately will see darkened spots at the intersections of the white lines.



However, if you look directly at the intersections, or cover all but one row of squares, you will see that the dark spots are illusory.

**Result:** The Hermann grid demonstrates lateral inhibition. Receptors coding information from the white lines are inhibited by their neighbours on two sides. Receptors coding information from the intersections, however, are inhibited from four sides, so they respond less vigorously. Thus the intersections appear to be darker than the lines.

of visual receptive fields is a circle that consists of a centre region and a surrounding region. In this type of receptive field, light directed toward the centre region causes the cell to become more active, whereas light directed toward the surrounding region inhibits the cell's firing (FIGURE 5.20).

**LATERAL INHIBITION** Our visual systems are especially sensitive to edges because edges tell us where objects end. If a rod or cone is stimulated, it sends information to the brain, but it also sends information to its neighbouring receptors, inhibiting their activity. The physiological mechanism causing this effect, **lateral inhibition**, emphasizes changes in visual stimuli. (FIGURE 5.21 shows one result of lateral inhibition: the illusion of grey dots appearing at the intersections of white lines against a dark background. Another result, simultaneous contrast, is that an object will look lighter against a black background than against a white one; see also Figure 5.28.) The visual system is especially sensitive to edges and contours. From a very early stage of processing, then, the visual system's circuitry is "wired" to make finding objects' boundaries easier.

**THE COLOUR OF LIGHT IS DETERMINED BY ITS WAVELENGTH** Humans can distinguish among millions of shades of colour. But when we look at colours—whether we are choosing which crayons to colour with, matching paint samples with already painted walls, finding the right colour thread for tightening a button on a shirt—we are not seeing the actual shades. We are seeing the light waves that objects (crayons, paint, walls, thread, you name it) reflect to our eyes. Visible light consists

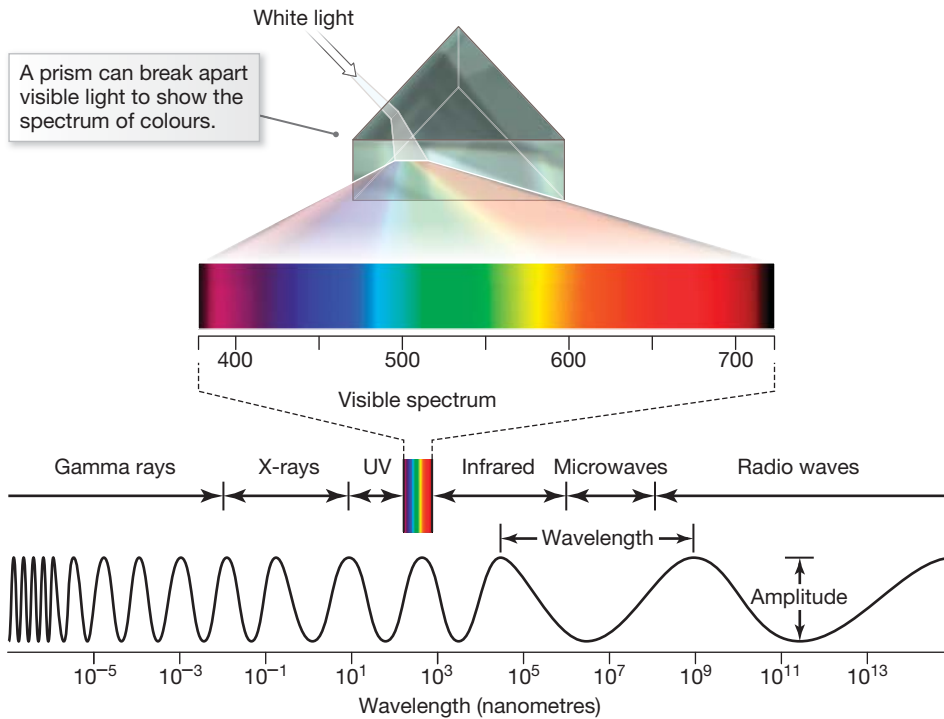


FIGURE 5.22 The Colour Spectrum

of electromagnetic waves ranging in length from about 400 to 700 nanometres (abbreviated *nm*; this length is about one billionth of a metre). In simplest terms, the colour of light is determined by the wavelengths of the electromagnetic waves that reach the eye (FIGURE 5.22). It would be wrong, however, to equate specific physical wavelengths with specific perceived colours. There are three kinds of cones, and each kind is most sensitive to different wavelengths. This differential sensitivity is illustrated in FIGURE 5.23, which shows the percentage of light at different wavelengths that is absorbed by each kind of cone. How the brain converts physical energy into the experience of colour is quite complex and can be understood only by considering the response of the visual system to different wavelengths at the same time. When we see white light, for example, our eyes are receiving the entire range of wavelengths in the visible spectrum.

We categorize colour along three dimensions: *hue*, *brightness*, and *saturation*. Hue consists of the distinctive characteristics that place a particular colour in the spectrum:

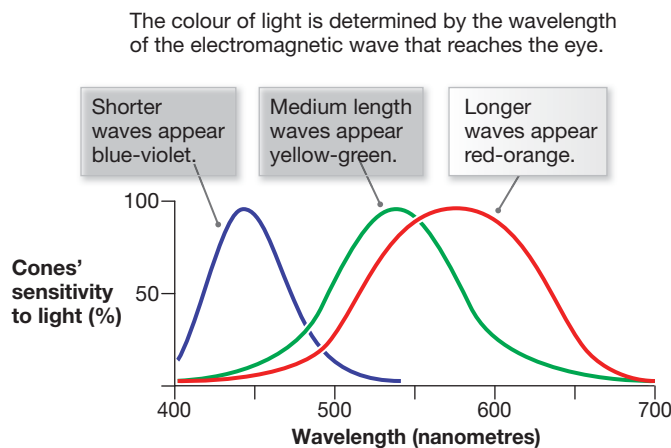


FIGURE 5.23 The Experience of Colour

a particular colour's greenness or orangeness, for example, which will depend primarily on the light's dominant wavelength when it reaches the eye. Brightness is the colour's perceived intensity, or luminance, which is determined chiefly by the total amount of light reaching the eye—think here of the difference between, say, a bright blue and a pale blue of the same shade. However, do not confuse brightness, a physical dimension, with *lightness*, a psychological dimension that has no simple physical correlate. An area's lightness is determined by its brightness relative to its surroundings. Because of simultaneous contrast, two examples of the same colour—two greys with the same brightness, say—can differ in lightness, depending on the surrounding levels of brightness. For this reason, lightness is more useful than brightness for describing appearance. The third dimension, saturation, is a colour's purity, or intensity—the vividness of the hue. Saturation varies according to the mixture of wavelengths in a stimulus. Pure spectral colours (e.g., blue, green, red) have only one wavelength, whereas pastels (e.g., baby blue, lime green, and pink) have a mixture of many wavelengths.

To determine if your colour vision is in the normal range, try the *Color Vision Screening Inventory* (FIGURE 5.24). Like the hearing inventory in Figure 5.15, this inventory is not intended as a medical diagnosis. If your score indicates that you likely have a colour vision deficit, have your colour vision assessed by a vision professional such as an ophthalmologist or optometrist.

**SUBTRACTIVE COLOUR MIXING** A colour is determined by the mixture of wavelengths from a stimulus. Any given colour can be produced in either of two ways, depending on the stimuli: *subtractive* and *additive* mixture of wavelengths

#### FIGURE 5.24 Try for Yourself: Color Vision Screening Inventory (CVSI)

Developed by the University of British Columbia's Stanley Coren and A. Ralph Hakstian (1987, 1988), this questionnaire assesses colour perception. For each question, select the response that best describes you and your behaviours.

You can select from among the following response alternatives: **Never** (or almost never), **Seldom**, **Occasionally**, **Frequently**, **Always** (or almost always).

Circle the letter corresponding to the first letter of your choice.

1	Do you have difficulty discriminating between yellow and orange?	N S O F A
2	Do you have difficulty discriminating between yellow and green?	N S O F A
3	Do you have difficulty discriminating between grey and blue-green?	N S O F A
4	Do you have difficulty discriminating between red and brown?	N S O F A
5	Do you have difficulty discriminating between green and brown?	N S O F A
6	Do you have difficulty discriminating between pale green and pale red?	N S O F A
7	Do you have difficulty discriminating between blue and purple?	N S O F A
8	Do the colour names that you use disagree with those that other people use?	N S O F A
9	Are the colours of traffic lights difficult to distinguish?	N S O F A
10	Do you tend to confuse colours?	N S O F A

**Result:** Score your responses 1 for “Never,” 2 for “Seldom,” 3 for “Occasionally,” 4 for “Frequently,” and 5 for “Always.”

Then add together your scores for the 10 questions. If your score is 17 or higher, you have an 89 percent likelihood of failing a standard screening test for colour vision.

The *Color Vision Screening Inventory* is copyrighted by SC Psychological Enterprises Ltd. and is reprinted here with permission. Additional vision screening questionnaires are available on StudySpace: [www.norton.com/studyspace](http://www.norton.com/studyspace).



(FIGURE 5.25). Mixing paints, for example, is one form of **subtractive colour mixing**, because the mixture occurs within the stimulus and is a physical process. Paint colours are determined by pigments—chemicals on objects’ surfaces that absorb different wavelengths of light and prevent them from being reflected to the eye. The colour of a pigment is determined by the wavelengths that are reflected and enter the eye. When pigments are mixed, they absorb (subtract) each other’s wavelengths, and the resulting colour—the colour we see—corresponds to the wavelengths that are “left over.” If we mix blue and yellow paints, we get green, because the yellow pigment absorbs the blue wavelengths and the blue pigment absorbs the red and yellow wavelengths. What remain to be reflected are the wavelengths corresponding to green, because these wavelengths are not absorbed. When we see a blue shirt, it is blue because the material the shirt is made from has absorbed medium and long wavelengths (yellow and red) and is reflecting only short wavelengths that are perceived as blue. Yellow pigments absorb shorter (blue) and longer (red) wavelengths, but they reflect wavelengths in the central yellow region of the visible spectrum. Red, yellow, and blue are the *subtractive primary colours*. Mix all three together and you get black, because together these pigments absorb nearly all the colours of the visible spectrum.

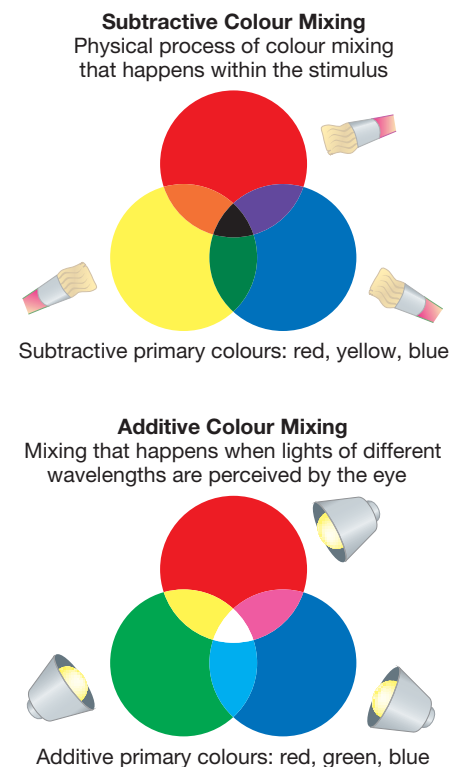
**ADDITIVE COLOUR MIXING** When lights of different wavelengths are mixed, what you see is determined by the interaction of these wavelengths within the eye’s receptors. This process is called **additive colour mixing**. Stage lighting designers employ additive colour mixing, for example, when they aim red and green lights at the same point on a stage to create a yellow light. In fact, as laid out by the *three primaries law of colour*, almost any colour can be created by combining just three wavelengths, so long as one is from the long-wave end of the spectrum (red), one is from the middle (green-yellow), and one is from the short end of the spectrum (blue-violet). For reasons that will become clear soon, most psychologists consider the *additive primary colours* to be red, green, and blue. Whereas mixing red, green, and blue paint yields black paint, mixing red, green, and blue light yields white light. The mathematician and physicist Isaac Newton discovered that white light is made up of many colours of light. You can see this for yourself with a prism (see Figure 5.22). Because different wavelengths of light bend (refract) at different angles when they pass through a prism, white light entering a prism leaves it with all the colours of a rainbow. Indeed, rainbows form in the sky because tiny water droplets in the air function as prisms, refracting sunlight in different directions.

**EXPLAINING COLOUR VISION** An object appears to be a particular colour because of the wavelengths it reflects. Thus colour is a property of our visual system; there is no colour in the physical world. The colours that always look so tantalizing in a new box of crayons are the products of your visual system and not properties of the crayons!

Colour vision begins in the retina’s centre, where the cone cells transduce light into neural impulses. There are three types of cones in the retina, and each responds best to a different wavelength of light. One type of cone is most sensitive to blue light (short wavelengths), another is most sensitive to green light (medium wavelengths), and the remaining cones are most sensitive to red light (long wavelengths). The three cone populations are therefore called “S,” “M,” and “L” cones because they respond maximally to short, medium, and long wavelengths, respectively. Yellow light looks yellow because it stimulates the L and M

**subtractive colour mixing** A way to produce a given spectral pattern in which the mixture occurs within the stimulus itself and is actually a physical, not psychological, process.

**additive colour mixing** A way to produce a given spectral pattern in which different wavelengths of lights are mixed. The percept is determined by the interaction of these wavelengths with receptors in the eye and is a psychological process.



**FIGURE 5.25** Subtractive and Additive Colour Mixing

### FIGURE 5.26 Try for Yourself: Afterimage

For at least 30 seconds, stare at this version of the Union Jack, flag of the United Kingdom. Then look at the blank space to the right.



**Result:** Because your receptors have adapted to the green and orange in the first image, the afterimage appears in the complementary colours red and blue. You can tell that afterimages are caused by events in the retina, because the afterimage moves with you as you move your eyes, as though it is “painted” on the retina.

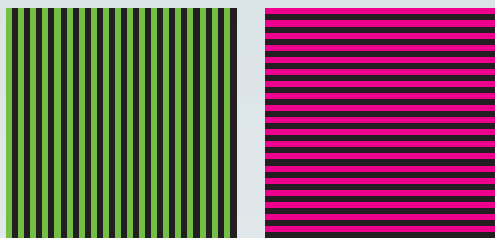
(Hering, 1878/1964). When we stare at a red image for some time, we see a green afterimage when we look away (and vice versa). Likewise, when we stare at a blue image for some time, we see a yellow afterimage when we look away (and vice versa; **FIGURE 5.26**). We also have trouble visualizing certain colour mixtures. For instance, it is easier to imagine reddish yellow or bluish green than reddish green or bluish yellow.

That some colours seem to be opposites cannot be explained by the responses of the different cones in the retina. To account for opposites, we must turn to the second stage in visual processing, which occurs in the ganglion cells—the cells that make up the optic nerve, which carries information to the brain. Different combinations of cones converge on the ganglion cells in the retina.

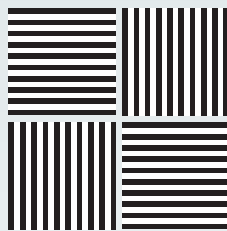
One type of ganglion cells may receive excitatory input from L cones (the ones that respond to long wavelengths, which we see as red) but may be inhibited by M cones (medium wavelengths, which we see as green). These cells create the perception that red and green are “opposites.” Other ganglion cells are excited by input from S cones (short wavelengths, which we see as blue) but are inhibited by both L- and M-cone activity (or vice versa). These different types of ganglion cells that work in opposing pairs create the perception that blue and yellow are opposites. (Opposite colours are involved in the McCollough effect, named for the American vision researcher Celeste McCollough, who first described it. For a demonstration of this visual phenomenon, which is among many that we do not fully understand, see **FIGURE 5.27**.)

### FIGURE 5.27 Try for Yourself: The McCollough Effect

Alternate your gaze from the green stimulus with vertical lines to the magenta stimulus with horizontal lines, changing from one to the other approximately every second for 40 seconds.



Then look at the black-and-white stimulus, composed of vertical and horizontal lines.



What do you see?

**Result:** You should see magenta vertical lines and green horizontal lines. Because the McCollough effect can last for hours or even a day, it cannot be explained by simple neural fatigue. For this reason, the effect more likely occurs in higher brain regions, not in the eye. As noted in the text, the visual system is especially primed to process information about edges, and colour-related edge perception may be involved.

**SIMULTANEOUS CONTRAST** *Simultaneous contrast* is an optical illusion in which identical stimuli appear different when presented against different backgrounds. Even if we know that these stimuli are identical, we cannot make ourselves see them as the same (FIGURE 5.28). One theory to explain this effect is that lateral inhibition in the retina emphasizes the difference between an object and its background. Whatever its cause, simultaneous contrast again illustrates the theme that we often are unaware of factors affecting our perception of the world. (Other colour effects created by the visual system are shown in FIGURE 5.29.)

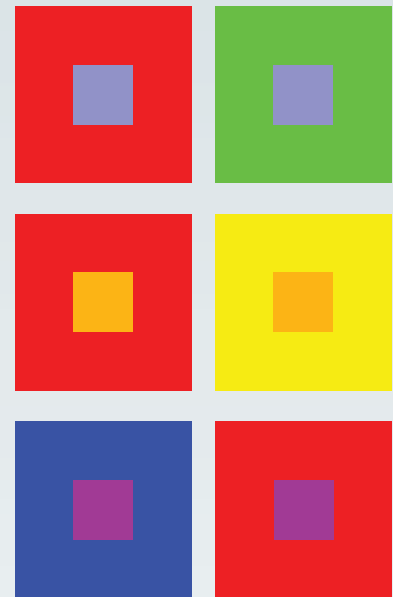
## Humans and Animals Have Other Sensory Systems

Humans have several internal sensory systems in addition to the five primary ones. Subtle sensory systems send messages to the brain about things such as blood glucose level and blood pressure. The **kinesthetic sense**, which some researchers group with the touch senses, refers to sensations we gather from receptors, in muscles, tendons, and joints, that pinpoint the position in space and the movements of both our body and our limbs. This information helps us coordinate voluntary movement and is invaluable in avoiding injury. The **vestibular sense** uses data from receptors in the semicircular canals of the inner ear. These canals contain a liquid that moves when the head moves, bending hair cells at the ends of the canal. The bending generates nerve impulses that inform us of the head's rotation and is thus responsible for a sense of balance. It explains why inner-ear infections or standing up quickly can make us dizzy. The experience of being seasick or carsick results in part from conflicting signals arriving from the vestibular system and the visual system.

In his book *Sensory Exotica* (1999), the psychologist Howard Hughes points out that humans and other animals have several internal sensory systems in addition to the five primary senses. For instance, researchers are studying nonhuman animals' sensory systems, such as *sonar senses* and *electroreception* (senses based on electrical

**FIGURE 5.28 Try for Yourself: Simultaneous Contrast**

Look at the colours of the central squares in each pair. Do they look the same or different?

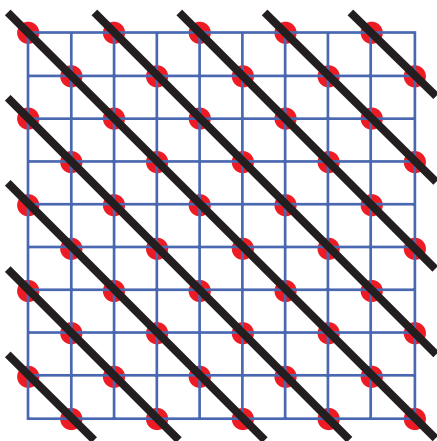


**Result:** The central squares in each pair are identical, but they look different because of the different background colours. For example, most people see the grey square that is surrounded with red as lighter than the grey square surrounded with green. If you doubt that the central squares are identical, cover the surrounding portions of each square.

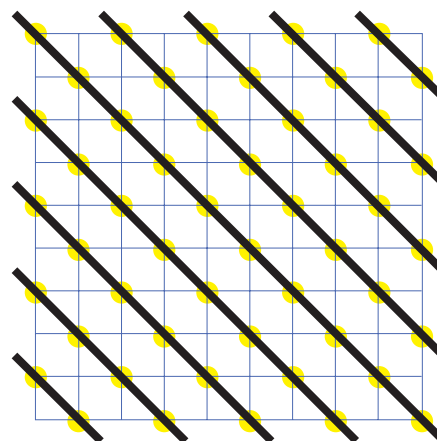
**kinesthetic sense** Perception of our limbs in space.

**vestibular sense** Perception of balance.

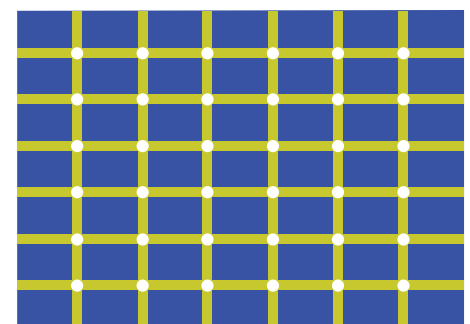
**(a) The Coloured Ray Illusion**



**(b) Illusory Yellow Lines**



**(c) Lights of Sweden Illusion**



**FIGURE 5.29 Colour Illusions** (a) Look closely at this figure. Do red lines appear to run on the diagonal between the red intersections? These lines do not physically exist—your visual system is filling them in. (b) Illusory yellow lines appear to run obliquely over the grid. (c) Do you see a blue light that appears to scintillate in white circles? Scientists believe that visual illusions such as the three illustrated here are due to lateral inhibition and the size and shape of receptive fields.



**FIGURE 5.30 Exotic Sensory Systems**  
Bats use sonar to navigate through their environment.

fields) (FIGURE 5.30). Our understanding of sensory systems that use sonar for navigation comes primarily from the study of both bats and dolphins. These animals produce calls and then respond to the echoes of those calls; the system is biosonar because the sound waves emanate from the animal. Electroreception operates in a similar way: Some fish emit an electrical field and then analyze disruptions in the field to avoid predators or find prey. Others respond to the electrical fields emitted by other fish. In each case, evolution has produced an adaptive solution that allows an animal to create or sense a form of energy and use that information to interact with the animal's environment.

### The Evidence for Extrasensory Perception (ESP) Is Weak or Nonexistent

What about the so-called *sixth sense*, the “unexplainable” feeling that something is about to happen? Humans' many sensory systems provide information about the world, but they are sensitive to only a small range of the energy available in any environment. For instance, dogs can hear much higher frequencies than humans can, and many insects can sense energy forms that we cannot detect. Might frequencies or energy forms exist that scientists have not discovered but that allow some people to read other people's minds, predict the future by examining the stars, or communicate with ghosts? Might people be able to perceive information beyond ordinary sensory information through *extrasensory perception*, or *ESP*?

Many reports of ESP are based on anecdotal cases. Anecdotes are not science, even if people tell stories in ways that sound scientific. Psychological scientists reject claims supported only by anecdotes because such evidence is difficult to disprove and because ordinary thought processes can explain many of the claims. For instance, if you see a couple fighting all the time, you might predict accurately that they will break up, but that does not make you a psychic. Much of our social perception requires us to be sensitive to the subtle cues that guide behaviour in a situation. But the information we glean from social situations does not arrive from some “extra” sensory system.

Perhaps the best evidence for ESP was obtained by the social psychologist Daryl Bem and his collaborator Charles Honorton (1994). In their studies, a “sender” in a soundproof booth focused on a randomly generated image, and a receiver in another room tried to sense the sender's imagery. The receiver was then asked to choose among four alternatives, one of them correct. By chance, the receivers should have been correct 25 percent of the time, but across 11 studies, Bem and Honorton found that receivers were right about 33 percent of the time. Is this evidence of ESP? Many psychological scientists say that other factors in the experiments might have affected the results; after all, receivers were wrong 67 percent of the time. A statistical review of many such studies found little support for ESP (Milton & Wiseman, 2001). Moreover, numerous scientific organizations and government agencies have reviewed decades of research and have concluded that no such phenomenon exists.

The Amazing Randi, also known as James Randi, is a well-known magician and escape artist devoted to disabusing people of their beliefs in the supernatural. In 1996, he established a \$1,000,000 prize for anyone who could demonstrate psychic powers under controlled conditions. No one has won this prize. He has produced video clips of psychics wearing earphones that enabled them to receive information from others in the room and using other clever tricks that make them appear to have extrasensory powers. Psychics draw on social factors, for example, to *read* information from their clients and their audiences.

But does any of this prove that ESP does not exist? An important quality of critical thinking is to keep an open mind and not conclude that something does not exist just because it has not yet been demonstrated. The only reasonable conclusion is that the evidence for ESP is currently weak and that healthy skepticism demands better evidence. Psychology is an empirical science, of course, and further psychological research on ESP would require empirical methods of science. What kinds of studies and what kinds of evidence would prove or disprove ESP's existence?

### CRITICAL THINKING SKILL

## Understanding That Perception Can Be Deceiving

As a result of the McCollough effect (see Figure 5.27), you can look at a black-and-white grid and see coloured lines. Such optical effects have inspired perception psychologists to modify the expression “Seeing is believing” to “Seeing is deceiving, at least some of the time.” Perhaps you believe in psychic powers because you have seen a stage performer accomplish amazing feats. Be warned: Most magic tricks are designed to fool your basic senses; they are elaborate examples of visual illusions like those presented in this chapter. They rely on the fact that our sensory systems are far from perfect and that our expectations shape much of what we perceive. In short, they are *tricks*, not evidence of psychic abilities. Magic’s allure may be strong, but given all the laboratory studies showing that we often perceive the world the way we expect it to be rather than the way it is, why do people still believe in magic—in fact, claim to have seen it with their own eyes?

Good magicians know we are easily distracted by movement, so to perform their illusions they first capture our attention. Have you ever wondered why people who get “sawed in half” have to go inside a box first or why people who levitate need to be covered or why the magician needs a cloth to cover the disappearing rabbit? The box, the covering, or the cloth is used to conceal the trick that gives rise to the perception that something supernatural is happening (FIGURE 5.31).

Do you want to be sawed in half while you are in a box? No problem—as you step into the box, fold your legs so that you take up only half the box (all of you above the saw line). Let fake legs that look like yours and shoes identical to ones you are wearing dangle out the other end of the box. A variation on this trick is to have someone small in the bottom half of the box wearing shoes identical to yours, so when you are “sawed in half,” your entire body is in the top box and someone else is in the bottom box waving what appear to be your disconnected feet. This trick can be a lot of fun, but it does not represent magic.

To bend a spoon with your bare hands before an audience, the trick is to have bent the spoon beforehand and kept it concealed in your hand.



**FIGURE 5.31 Think Critically: Are Magic Tricks Real?** Are there ways to explain what is going on in these pictures without believing in magic?

Proudly show the spoon to your audience with the bowl or flat side facing out. From that angle, the spoon will look straight. Talk to the audience to distract them while you rub the spoon. In a short while, while the audience is watching, allow the spoon's bent part to just peek out from between your fingers so that it appears to be bending. Anyone can get quite good at this, with a little practice.

Levitating is more difficult than bending a spoon. Wear shoes that you can easily slip out of, and attach the shoes to each other so that when one rises, the other will too. Place a curtain or blanket in front of yourself, allowing your shoes to show beneath it. Surreptitiously slip one foot out of its shoe and step onto a small box or platform, keeping your knees bent. As you straighten your knees, you will appear to be slowly rising. Your shoes will appear to rise together as you support yourself on the foot that is on the box or platform. Wave your arms, arch your chest, chant, or use other techniques that will draw the audience's attention from your feet. As you rise onto the foot that is on the box or platform, keep your dangling shoes just visible so you will appear to be levitating. With some practice, you too can levitate like a pro.

## SUMMING UP

### What Are the Basic Sensory Processes?

All the senses share similar processes. Each has receptors that respond to different physical or chemical stimuli by transducing them into some pattern of brain activity. Typically, different receptors respond to different types of stimuli, and most sensory systems integrate signals from these different receptors into an overall sensation. This system allows a relatively small number of receptors to code a wide variety of stimuli. For example, the visual system can interpret the entire range of colours with only three cone types, and all the taste sensations are produced by five primary taste receptors. These various sensory receptors help the perceptual system receive important information that assists in solving adaptive problems. Sensory information, although obtained from the outside world, is processed entirely in the brain to produce sensory experience through perception.

## MEASURING UP

1. The sensory systems \_\_\_\_\_.
  - a. use all the available energy in their environment to create a true representation of both objects and events
  - b. use only a small portion of the available energy in their environment
2. A general principle regarding sensation is that \_\_\_\_\_.
  - a. the combined firing of many different receptors and the neurons they connect with creates our sensations
  - b. each sensation (for example, seeing a blue colour or hearing a high-pitch tone) is coded by one type of receptor, which is sensitive to only one type of stimulus
3. An intense stimulus, such as a loud sound or a heavy touch, is coded by \_\_\_\_\_.
  - a. different sensory receptors that project to different areas of the brain
  - b. an increase in the number of neurons that respond to the stimulation

# What Are the Basic Perceptual Processes?

The perceptual system is stunningly intelligent in its ability to guide each of us around. Right this minute, for example, your brain is making millions of calculations—all in milliseconds—to produce a coherent experience of your environment. As a result, your experience is a construction of your brain and resides inside your skull, despite the illusion that the object and events you are experiencing exist in the space around you. Neurons inside your brain do not directly experience the outside world, but they communicate with other neurons inside and outside your brain, and your conscious experience of the world emerges from this communication. For instance, as you stare at a computer screen, you are aware of one image, not the thousands that dance across your retina to create that constant, static scene. What you perceive, then, is vastly different from the pattern of stimulation your retina is taking in. If you were aware of what your brain was doing every moment, you would be paralyzed by information overload. Most of the computations the brain performs never reach your consciousness—only important new outcomes do. How does the brain extract a stable representation of the world from the information the senses provide? Perception research seeks to answer that question.

Perceptual psychologists have drawn on many disciplines, crossing the levels of analysis, to understand how humans represent (or misrepresent) the world. Areas as diverse as art, computer science, philosophy, anatomy, and physiology have informed the understanding of perception. As discussed in Chapter 1, for example, music has been used to explore various aspects of perception, from how genes predispose perfect pitch to how sound can affect mood. In addition, researchers have worked backward from cases where brain injuries have disrupted perception, inferring how the intact brain processes information.

## Perception Occurs in the Brain

So far, you have seen how sensory stimuli are transduced into electrical impulses by sensory receptors and transmitted to the brain by nerves. These electrical impulses are all that the brain works with to create a person's rich variety of perceptual experiences. With the exception of olfaction, all sensory information is relayed to cortical and other areas of the brain from the thalamus. From the thalamus, information from each sense is projected to a specific region of the cerebral cortex. In these *primary sensory areas* (FIGURE 5.32), the perceptual process begins

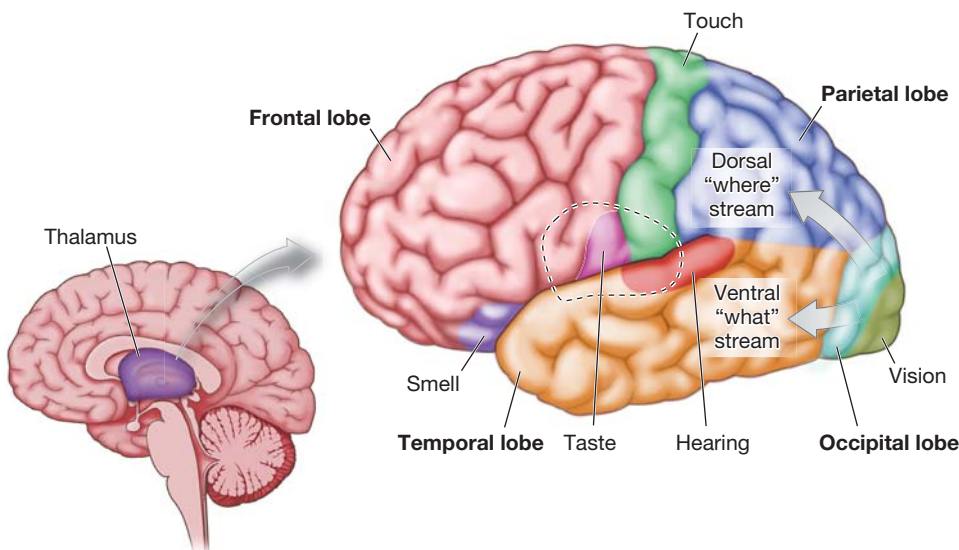
### LEARNING OBJECTIVES

Explain how the “what-where” paths in the brain process object information.

Define “top-down” and “bottom-up” processes and describe how they work together in face perception.

Illustrate the Gestalt principles of form perception.

List and describe binocular and monocular cues to depth.



**FIGURE 5.32 Primary Sense Regions**

These are the primary sense areas where information about taste, touch, hearing, smell, and vision are projected. Note that separate “streams” of visual information—what you see and where it is—are sent from the occipital lobe (visual cortex) to different parts of the brain for further processing.

in earnest. The following section considers perceptual processing in hearing, touch, and vision. The brain regions involved in taste and smell are less well understood and therefore will not be discussed here.

**HEARING** Auditory neurons in the thalamus extend their axons to the *primary auditory cortex* (called *A1*, for the *first* auditory area), which is in the temporal lobe. Neurons in this region code the frequency (or pitch) of auditory stimuli. Neurons toward the rear of A1 respond best to lower frequencies, such as that of a foghorn, whereas those toward the front of A1 respond best to higher frequencies, such as that of a train whistle.

**TOUCH** Touch information from the thalamus is projected to the *primary somatosensory cortex* (called *S1*), which is in the parietal lobe. In the 1940s, in a classic series of studies of patients undergoing brain surgery, the neurosurgeon Wilder Penfield (Penfield & Jasper, 1954), at McGill University, discovered that electrical stimulation of S1 could evoke the sensation of touch in different regions of the body. Penfield found that neighbouring body parts tended to be represented next to one another in S1, so that the body is effectively mapped out there according to physical proximity. As shown in Chapter 3's drawing of the homunculus (see Figure 3.26), more-sensitive body parts have relatively larger amounts of cortical tissue dedicated to them. The most sensitive regions of the body, such as lips and fingers, have a great deal of S1 devoted to them. Other areas, such as the back and the calves, have very little.

**VISION** The study of perception has focused to a large extent on the visual cortex and the multiple areas in which the retinal image is processed. The complexity of visual perception is underscored by the amount of cortical real estate dedicated to processing visual information. Some estimates suggest that up to half the cerebral cortex may participate in visual perception in some way. As noted above, the *primary visual cortex* (*V1*) is in the occipital lobe. The neural pathway from the retina to the occipital lobe preserves spatial relationships, so that adjacent areas of the retina correspond to adjacent areas in V1.

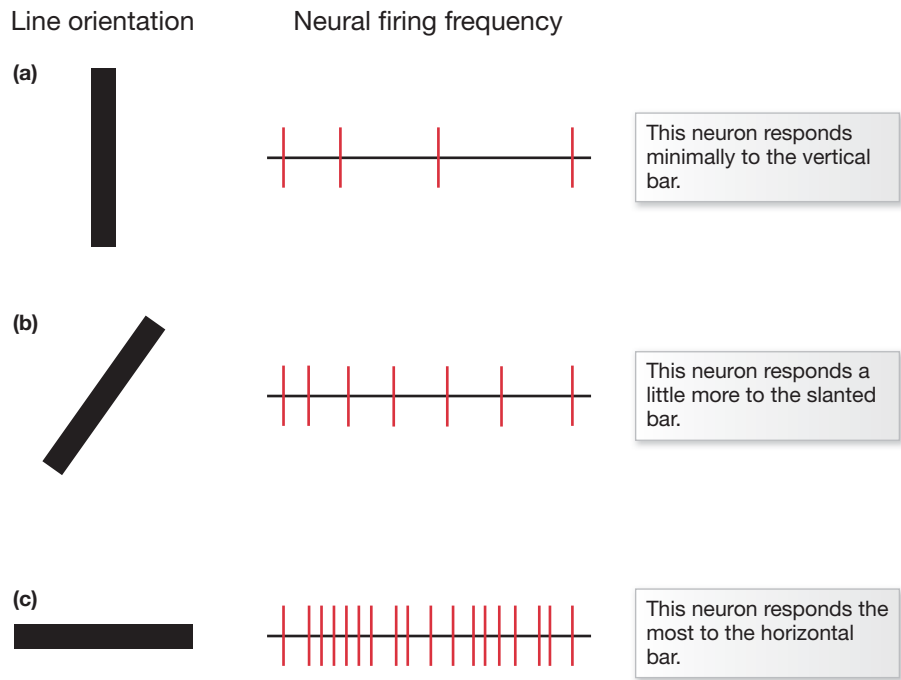
In the 1960s, the neurophysiologists David Hubel, of Canada, and Torsten Wiesel, of Sweden (1962), began exploring the properties of neurons in V1 by recording activity from single cells—work for which they were awarded a Nobel Prize. They discovered that some neurons in the primary visual cortex respond more to lines of particular orientations than to any other type of stimulus, including lines tilted at a different angle; for example, some neurons increase their firing rate when a vertical line segment is presented in their receptive field (**FIGURE 5.33**). The firing rate of these cells, termed *simple cells* by Hubel and Wiesel, decreases as the orientation of the line segment is rotated away from the preferred orientation. Further studies by Hubel and Wiesel and others have also found neurons that specialize in detecting either corners, colours, the ends of lines, or more complex visual features.



*“Great! O.K., this time I want you to sound taller,  
and let me hear a little more hair.”*

**WHAT VERSUS WHERE** One core discovery of the past few decades has been that neurons in different parts of





**FIGURE 5.33 Simple Cells** Some neurons, called simple cells, respond more to lines of particular orientations.

the brain tend to have different types of receptive fields. These areas appear to process specific aspects of a visual stimulus, such as colour or motion. (As noted above, other sensory systems also have receptive fields.) One important theory proposes that visual areas beyond V1 form two parallel processing streams: The lower, *ventral stream*, pathway appears to be specialized for the perception and recognition of objects, such as determining their colours and shapes, whereas the upper, *dorsal stream*, pathway seems to be specialized for spatial perception—determining where an object is and relating it to other objects in a scene. (Both pathways are shown in Figure 5.32.) These two processing streams therefore are known as the “*what*” pathway and the “*where*” pathway (Ungerleider & Mishkin, 1982). Subsequent brain imaging studies have confirmed that brain regions in the upper pathway are activated by tasks that require decisions about spatial relationships between objects, whereas regions in the lower pathway are activated by tasks that require identifying objects.

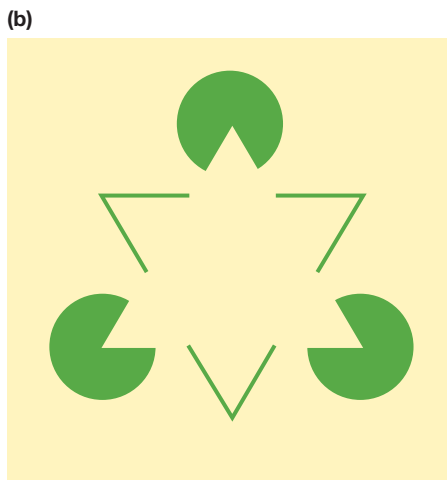
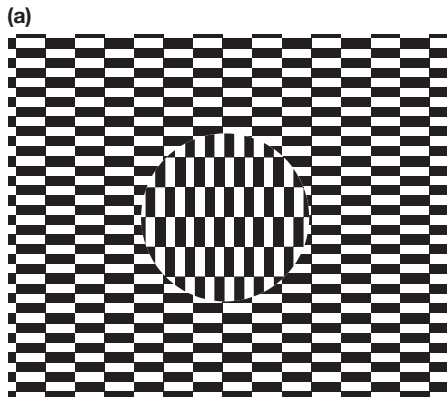
Damage to certain regions of the visual cortex provides evidence for distinguishing between these two streams of information. Consider the case of D.F., who was studied intensively by Mel Goodale, of the University of Western Ontario, and his British colleague David Milner (Goodale & Milner, 1992). At age 34, D.F. suffered carbon monoxide poisoning that damaged her visual system, particularly regions involved in the “*what*” pathway. She was no longer able to recognize the faces of her friends and family members, common objects, or even drawings of squares or of circles. She could recognize people by their voices, however, and objects if they were placed in her hands. Her condition—*object agnosia*, the inability to recognize objects—is striking in what she could and could not do. When presented with a drawing of, say, an apple, she could not identify or reproduce it. But if asked to draw an apple, she could do so from memory. Despite major deficits in object perception, she could use visual information about the size, shape, and orientation of objects to control visually guided movements—her “*where*” pathway appeared to be intact. For instance, she could walk across a room and step around things adeptly. She could reach out and shake a person’s hand. Most confounding, in laboratory tests, she could reach out and grasp a block, with the exactly right distance between her fingers,

even though she could not tell you what she was going to pick up or how large it was. Thus her conscious visual perception of objects was impaired—she was not aware of taking in any visual information about objects she saw. However, other aspects of her visual processing were unaffected. The intact regions of her visual cortex allowed her to use information about the size and location of objects despite her lack of awareness. As illustrated by D.F.'s case, these systems operate independently to help us understand the world around us. Here again, the biological revolution has helped change scientists' understanding of psychological processes.

## Object Perception Requires Construction

The neural computations required for object perception begin in the early stages of visual processing. As discussed above, lateral inhibition among neurons in the retina helps accentuate areas of changing stimulation—which are likely to correspond to the edges of objects. In addition, the work of Hubel and Wiesel on the properties of neurons in the primary visual cortex strongly suggests that one of the most important roles for V1 (the primary visual area in the brain) is to extract those edges and contours that define the boundaries of objects. Thus one of the first steps in processing a form appears to be encoding the features that compose it.

Among the tools psychological scientists have for understanding the brain's use of information are optical illusions. Many perceptual psychologists believe that illusions reveal the operations of the mechanisms that help our visual systems determine the sizes and distances of objects in the visual environment. In doing so, illusions illustrate how we form accurate representations of the three-dimensional world. Researchers rely on these tricks to reveal automatic perceptual systems that, in most circumstances, result in accurate perception (FIGURE 5.34).

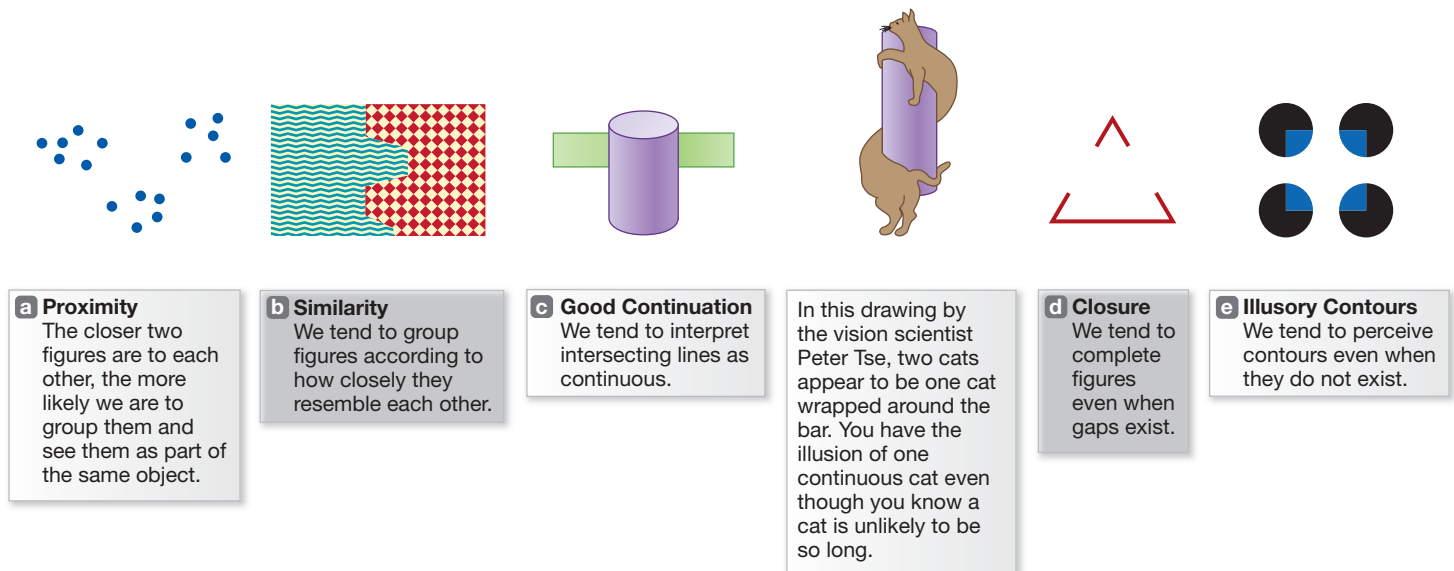


**FIGURE 5.34 Optical Illusions** (a) The Ouchi illusion—named for the Japanese artist Hajime Ouchi, who invented it—shows how we separate a figure from its background. Here, the object is a circle made of lines offset from the rest of the display. Scrolling the image horizontally or vertically gives a much stronger effect. Some people report seeing colours and movement in this illusion. (b) The illusory triangle in front of the circles is not physically present—it is an illusion created by your visual system. It also appears brighter than the surrounding area, as would be expected if it were closer to the observer.

**GESTALT PRINCIPLES OF PERCEPTUAL ORGANIZATION** Within our brains, what exactly happens to the information the senses take in about an object's features? How does that information get organized? In the years just before World War I (as discussed in Chapter 1), psychologists in both Germany and North America began theorizing that perception is more than the result of accumulating sensory data. The German word *Gestalt* means “shape” or “form,” but as used in psychology it means “organized whole.” The founders of Gestalt psychology postulated a series of laws to explain how perceived features of a visual scene are grouped into organized wholes. Gestalt psychology holds that our brains use innate (that is, built-in) principles to organize sensory information (FIGURE 5.35).

**PROXIMITY AND SIMILARITY** Two of the most important Gestalt laws concern proximity and similarity. The *principle of proximity* states that the closer two figures are to each other, the more likely we are to group them and see them as part of the same object (Figure 5.35a). You might already be familiar with the *principle of similarity* as illustrated by the *Sesame Street* song and game “One of These Things Is Not Like the Others.” We tend to group figures according to how closely they resemble each other, whether in shape, colour, or orientation (Figure 5.35b). According to both of these principles, we tend to cluster elements of the visual scene, enabling us to consider them as wholes rather than as individual parts. For example, we often perceive a flock of birds as a single entity because all the elements, the birds, are similar and in close proximity.

**THE “BEST” FORMS** Other Gestalt laws describe how we perceive a form's features. *Good continuation* is the tendency to interpret intersecting lines as continuous



**FIGURE 5.35 Gestalt Principles** Gestalt psychology describes how perceived features of a visual scene are grouped into organized wholes.

rather than as changing direction radically. Good contour continuation appears to play a role in completing an object behind an *occluder*, which can be anything that hides a portion of an object or an entire object from view. For example, in Figure 5.35c the bar in the left-hand illustration appears to be completely behind the occluder. However, good continuation may operate over more complex representations than contour information. For example, in the right-hand illustration (by the vision scientist Peter Tse), two cats appear to be one extremely long cat wrapped around the pole, yet no continuous contours permit this completion. *Closure* refers to the tendency to complete figures that have gaps, as in Figure 5.35d.

A phenomenon that illustrates several Gestalt principles is *illusory contours*, which refers to the fact that we perceive contours (boundary lines) even though they do not exist. Illusory contours appear when stimulus configurations suggest that contours ought to be present—for example, when cues to depth are implied or useful in interpreting a pattern (Figure 5.35e).

**FIGURE AND GROUND** One of the visual perception system’s most basic organizing principles is distinguishing between figure and ground. A classic illustration of this is the *reversible figure illusion* (see Figure 1.17), in which we see either a full face or two faces looking at each other—but not both at the same time. In identifying either figure—indeed, *any* figure—the brain assigns the rest of the scene to the background. In this illusion, the “correct” assignment of figure and ground is ambiguous, so the figures periodically reverse (switch back and forth) as the visual system strives to make sense of the stimulation. In ways like this, visual perception is dynamic and ongoing.

As discussed in Chapter 1, Richard Nisbett and his colleagues (2001) have demonstrated cultural differences between Eastern people’s perceptions and Western people’s. Easterners focus on a scene holistically, whereas Westerners focus on single elements in the forefront. Thus Easterners will more likely be influenced by the (back)ground of a figure, and Westerners will more likely extract the figure from its (back)ground.

In Figure 1.16, it is hard to see the Dalmatian standing among the many black spots scattered on the white background because the part of the image corresponding

to the dog lacks contours that define the dog's edges and because the dog's spotted texture resembles that of the background. Many observers find that they first recognize one part of the dog—say, the head—and from that are able to discern the dog's shape. Once you perceive the dog, it becomes very difficult to *not* see it the next time you look at the figure. Thus memories of particular shapes can inform shape processing.

**bottom-up processing** A hierarchical model of pattern recognition in which data are relayed from one processing level to the next, always moving to a higher level of processing.

**top-down processing** A hierarchical model of pattern recognition in which information at higher levels of processing can also influence lower, “earlier” levels in the processing hierarchy.

**BOTTOM-UP AND TOP-DOWN INFORMATION PROCESSING** How do we assemble the information about parts into a perception of a whole object? According to most models of the process, pattern recognition is hierarchical, using **bottom-up processing**. This means data are relayed from lower to higher levels of processing. But perception is actually a combination of bottom-up and **top-down processing**, in which information at higher levels of processing can influence lower, “earlier” levels in the processing hierarchy. For this reason, context affects perception: What we expect to see influences what we perceive, as in the Dalmatian illustration discussed just above. Also consider the incomplete letters in **FIGURE 5.36**, where the two shapes in the centre of each word are perceived as either “H” or “A” depending on which interpretation would make sense in the context of the word.

Faulty expectations can lead to faulty perceptions. For example: On November 28, 1979, Air New Zealand Flight 901 crashed into the slopes of Mount Erebus, on Ross Island in Antarctica, causing the deaths of the 237 passengers and 20 crew members. Because the aircraft's flight computer had been programmed incorrectly, the plane was far off course. In addition, the pilot had descended below the minimum altitude allowed for the flight. These factors do not explain, however, why the flight crew failed to notice the 3,800-metre volcano looming in front of them, until moments before impact.

Psychologists testifying at the commission of inquiry offered a possible, if startling, explanation—the pilots saw what they expected to see. One unique hazard of Antarctic aviation is “whiteout,” in which the sky and the snow-covered terrain appear to merge and pilots are unable visually to distinguish the ground or the horizon. The pilots believed they were flying over the Ross Ice Shelf, hundreds of kilometres from their actual location. They did not expect to encounter mountains anywhere near their flight path. The psychologists argued that the few visual cues available to the pilots were sufficiently consistent with what they expected to see that in their minds their expectations were confirmed. Since there appeared to be no danger, the pilots decided, fatally, to reduce altitude to give the passengers a better view of the spectacular Antarctic landscape. The combination of an unusually sparse visual environment and the pilots' beliefs conspired to fool their visual systems into seeing terrain that was not there—and failing to see the mountain that was.

# THE CAT

**FIGURE 5.36 Context** Context plays an important role in object recognition. Depending on the context, the same shape can be easy or difficult to recognize. Here, the *H* in *THE* is identical to the *A* in *CAT*, yet you have no trouble recognizing each as a different letter in its context.

**FACE PERCEPTION** One special class of object that the visual system cares about is faces, and psychological scientists have studied face perception across multiple levels of analysis, from how different brain regions seem to be especially responsive to anything that resembles a face, to how people determine whose face they are looking at, to how a face's various characteristics determine whether we find that face attractive. As highly social animals, humans are well able to perceive and interpret facial expressions. Several studies support the idea that human faces reveal “special” information that is not available in any other way. For example, we can more readily discern information about a person's mood, attentiveness, gender, race, age, and so on by looking at that person's face than by listening to the person talk, watching the person walk, or studying his or her clothing (Bruce & Young, 1986). Some people have selected deficits in the ability

to recognize faces (a condition known as *prosopagnosia*) but not in the ability to recognize other objects (Farah, 1996). Although patient D.F., mentioned earlier, has trouble with object recognition, she is able to tell you whether something is a face or not and whether that face is upside down or not. This ability implies that facial recognition differs from object recognition (Steeves et al., 2006). Because D.F. also has *prosopagnosia*, she cannot tell one face from another.

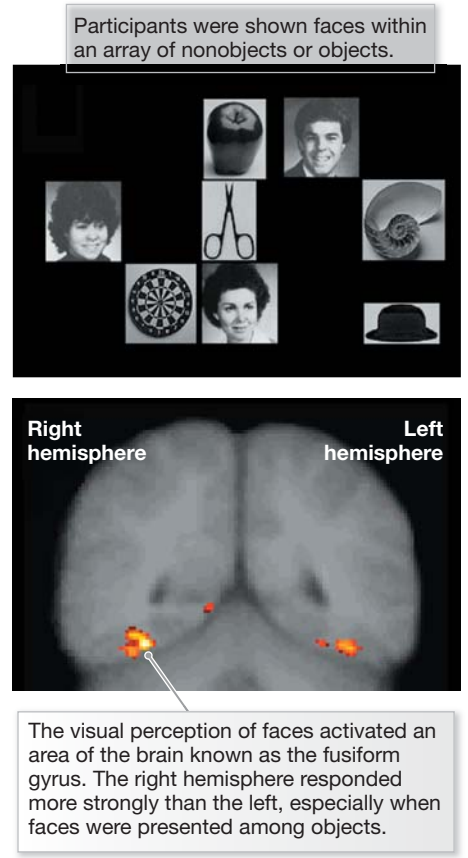
At the biological level of analysis, faces are so important that certain brain regions appear to be dedicated solely to perceiving them. As part of the “what” stream discussed above, certain cortical regions, and even specific neurons, seem to be specialized to perceive faces. A number of separate brain imaging studies have found that a region of the *fusiform gyrus*, in the right hemisphere, may be specialized for perceiving faces (Grill-Spector, Knouf, & Kanwisher, 2004; McCarthy, Puce, Gore, & Allison, 1997; **FIGURE 5.37**). Indeed, this brain area responds most strongly to upright faces, as we would perceive them in the normal environment (Kanwisher, Tong, & Nakayama, 1998). Other brain areas are sensitive to changes in faces, such as in facial expression and gaze direction. A face’s emotional significance appears to activate the amygdala, which is involved in calculating potential danger (Adams, Gordon, Baird, Ambady, & Kleck, 2003; Adolphs, 2003).

In a series of studies, researchers found that people more quickly and accurately recognize angry facial expressions than happy ones (Becker, Kenrick, Neuberg, Blackwell, & Smith, 2007). In addition, the researchers found that most people recognize anger more quickly on a man’s face than on a woman’s, and they found the reverse for happiness. The researchers think these results are due partly to people’s beliefs that men express anger more often than women do and that women express happiness more often than men do, but they also think that female and male facial features drive the effect. Bushy eyebrows low on the face, for example, will more likely be perceived as an expression of anger, and men typically have bushier and lower eyebrows than women. Evolutionary psychology posits an advantage to the detection of angry faces, and given that men in every society commit most violent crimes, it is adaptive to be especially fast and accurate at recognizing angry male faces. Thus facial recognition supports the idea that the mind is adaptive.

Men and women also differ in their abilities to recognize the faces of people they have previously encountered. Females of all ages more accurately recognize faces (e.g., Lewin & Herlitz, 2002). Perhaps the most surprising finding is that girls and women are most accurate when recognizing female faces, an example of the *own-sex bias*. Females’ ability to recognize female faces better than male faces, like their better performance than males on all measures of face recognition, has been replicated cross-culturally with both participants and face stimuli from Sweden and Bangladesh (Herlitz & Kabir, 2006; Rehman & Herlitz, 2006).

People of both sexes have a surprisingly hard time recognizing faces, especially unknown faces, that are upside down. We are much worse at this task than we are at recognizing other inverted objects. The inversion interferes with the way people perceive the relations among facial features (Hancock, Bruce, & Burton, 2000). For instance, if the eyebrows are bushier than usual, this facial characteristic is obvious if the face is upright but not detectable when the face is inverted. One interesting example of the perceptual difficulties associated with inverted faces is evident in the Thatcher illusion, so called because the effect was first studied using photos of the former British prime minister Margaret Thatcher (Thompson, 1980; **FIGURE 5.38**).

At the social level, people are better at recognizing members of their own race or ethnic group than members of other races or ethnic groups. There is some truth to the old saying *They all look alike*, but the saying applies to all groups. This effect may occur because people have more exposure to people of their own ethnicity



**FIGURE 5.37 Perceiving Faces** Brain imaging shows increased activity in the right hemisphere when faces are viewed.

### FIGURE 5.38 Try for Yourself: The Thatcher Illusion

These two inverted pictures of Margaret Thatcher look normal. Turn your book upside down to reveal a different perspective.



**Result:** Inversion of the whole face interferes with the perception of the individual components. This effect implies that we pay most attention to the eyes and mouth; as long as they are oriented correctly, the rest of the face appears normal even if it is not.

(Gosselin & Larocque, 2000). From their Canadian study of facial morphology and children's categorization of facial expressions of emotions, Pierre Gosselin

and Chantale Larocque were able to determine that Asian faces were categorically more expressive of fear and surprise, whereas Caucasian faces were categorically more expressive of disgust. Indeed, in Canada, where whites greatly outnumber Asians, whites are much better at recognizing white faces than Asian faces (Ng & Lindsay, 1994). An interdisciplinary team of social and cognitive psychologists from Stanford University sought to examine the neural correlates of this same-race effect (Golby, Gabrieli, Chiao, & Eberhardt, 2001). They asked white and black participants to remember pictures from both groups along with pictures of objects (antique radios) as a control comparison. They found a significantly greater activation in a region of the fusiform gyrus for same-race faces compared to other-race faces, especially for whites, and that these activations were associated with better recognition of those faces (FIGURE 5.39). One possible explanation for why this effect appears to be

### FIGURE 5.39 Scientific Method: Face Recognition

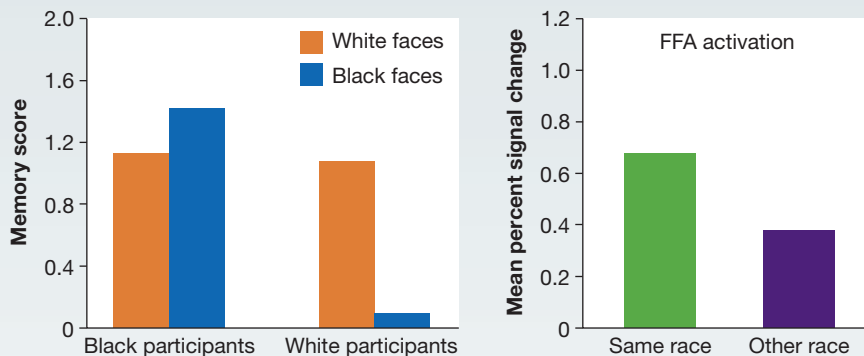
**Hypothesis:** People are better at recognizing faces from their own racial or ethnic group than from other racial or ethnic groups.

#### Research Method:

1 Black and white participants were shown a series of photographs of black and white faces, and the neural activity in their fusiform facial areas was recorded.

2 The participants were then shown those faces again, mixed in with a larger set of photographs to determine which faces they could remember seeing, and the neural activity in their fusiform facial areas was recorded.

**Results:** Black and white participants were better at recognizing same-race faces, but this finding was significantly greater in the white participants. There was significantly greater activation in the fusiform gyrus when viewing same-race faces.



**Conclusion:** We attend to and more accurately encode information about the faces of people whose race is the same as our own. Brain imaging supports the behavioural results, showing more activity in the fusiform face area when people view same-race faces.

**Table 5.3 Research on Face Perception and Face Identification**

Level of Analysis	Researchers	Findings
Biological	Grill-Spector, Knouf, & Kanwisher, 2004; McCarthy, Puce, Gore, & Allison, 1997	Fusiform gyrus shows more activity in perceiving own-race faces than in perceiving other-race faces.
Individual	Lewin & Herlitz, 2002	Generally, females recognize faces better than males do, and females recognize female faces better than male faces.
Social	Becker, Kenrick, Neuberg, Blackwell, & Smith, 2007	Most people are faster at recognizing anger than happiness and are faster at recognizing anger on men's faces and happiness on women's faces.
Cultural	Herlitz & Kabir, 2006; Rehman & Herlitz, 2006	Swedes and Bangladeshis better identified faces from their own races/cultures ( <i>own-race bias</i> ).

smaller for blacks is that they are in the minority and therefore have more outgroup exposure than do whites. Thus cultural context may affect the perception of faces as well as other objects (For a review of research on face perception and face identification, see **TABLE 5.3**.)

**REGAINING VISION BY FIXING THE EYES** People see with their brains, not with their eyes (Enns, 2005). Most people who become blind later in life have lost sensory input from the retina, yet they still remember what objects look like and can visualize them. What happens when we repair the visual system after someone has lost his or her sight? Does perception return to the way it was before? With advances in medical treatment, many people who have become blind because of illness or injury are now regaining their sight. For instance, Nogaye Gueye, a 58-year-old woman from Senegal, lost her sight because of cataracts (**FIGURE 5.40A**). Volunteer surgeons from Sight Savers International performed a 20-minute procedure that restored her vision. In a BBC interview, Gueye said she had not wanted to get too excited, in case the surgery did not work. Indeed, when the doctors first took the bandage off, she could see only blue. While traveling home, she made out objects such as palm trees and cars. But then her sight slowly returned: “During the day, I gradually began to see all the other colours again. I was very excited now. The first thing I wanted to look at was my nieces and nephews, and to see their small children for the first time.” Gueye’s vision returned to normal, but she had been blind for only 2 of her 58 years. What would restored sight be like for a person who had been blind much longer?

Michael May, an American, lost his eyesight in a chemical explosion when he was three and a half years old. In March 2000, at age 43, he underwent an experimental procedure: a cornea and stem cell transplant on his right eye (the other eye was lost entirely in the explosion). Prior studies had found that people whose sight was restored after many years had great difficulty using visual information. The psychological scientists Ione Fine, Donald MacLeod, and their colleagues followed May’s progress and tested his visual capacities (Fine et al., 2003). Two years after the surgery, May was able to detect colour and motion, but he still had great difficulty with other visual tasks, especially those that required higher-level constructive processes, such as using depth cues and identifying objects (**FIGURE 5.40B**). Indeed, he had special difficulty recognizing faces; he could not recognize his wife or children by sight alone, and he had a hard time judging if someone was male or female by looking at the person’s face. A brain imaging study showed that brain areas that normally react robustly to both faces and objects were not at all active for May. But the brain

**(a)****(b)****FIGURE 5.40 Advances in Treatment**

**(a)** Nogaye Gueye, who had been blind for two years, regained her vision following 20-minute cataract-removal surgery. **(b)** Michael May, pictured here playing soccer with his son, became blind at age three; his vision in one eye was partially restored by corneal and stem cell implants.



**FIGURE 5.41** **Painting by a Uniquely Talented Blind Artist** Born totally blind, Esref Armagan is able to paint scenes, such as this landscape, that he has never seen.

regions that process motion reacted similarly to the same brain regions in typical research participants. Motion, however, is still a strange experience for him. May had been an expert skier, having learned through verbal instructions. After the surgery, he skied with his eyes closed because the overwhelming sensation of motion gave him a frightening sense that he was going to crash. He also became more nervous about crossing roads, which he used to do without much thought. So was having his sight restored a good or bad experience for May? According to May, not a day goes by that he does not appreciate the return of his sight.

May's case provides some interesting insights into visual perception. The brain is fine-tuned through experience: If a cortical region is not used in perception, it ceases to develop normally. Perhaps most interesting is how May's brain had adapted to his loss of vision, so that he was highly successful in navigating his environment using his other senses. Regaining his sight added new joys, but his way of interacting with the world was thrown into turmoil by the novel experience of vision. Even though his progress is slow, May continues to develop better vision with hard work. This outcome demonstrates that brain plasticity continues well into adulthood. It will be interesting to observe May's progress over the coming years as his brain continues to learn how to use sensory cues effectively.

Can someone who has been totally blind since birth create art that resembles the visual experiences of sighted people? Most congenitally blind people cannot render things realistically, but one exceptional individual has never had vision but has received acclaim for his realistic paintings. Born in a poor Turkish family, Esref Armagan received no formal education or art training, yet he taught himself to write and draw. Instead of using a brush, he paints with his hands. To paint a portrait, he asks a sighted person to outline the contours of the person he is painting from a photograph of that person. He then turns the paper over to feel the outlines of the tracing and transfers what he feels to another paper, which he then paints. John Kennedy, at the University of Toronto, has studied Armagan's unusual techniques and verified his artistic abilities (**FIGURE 5.41**).

## Depth Perception Is Important for Locating Objects

One of the visual system's most important tasks is to locate objects in space. Without this capacity, we would find it difficult to navigate in and interact with the world. One of the most enduring questions in psychological research is how we are able to construct a three-dimensional mental representation of the visual world from two-dimensional retinal input. That we can see depth in a photograph illustrates this point. A three-dimensional array of objects creates exactly the same image on the retina that a photograph of the same array of objects does. Despite this inherent ambiguity, we do not confuse pictures with the scenes they depict. We use the ambiguous nature of depth perception when we look at photographs, movies, and television images. We are able to perceive depth in these two-dimensional patterns because the brain applies the same rules or mechanisms that it uses to work out the spatial relations between objects in the three-dimensional world. To do this, the brain rapidly and automatically exploits certain prior assumptions it has about the nature of the relationship between two-dimensional image cues and three-dimensional world structure. Among these assumptions are cues that help the visual system perceive depth. These depth cues can be divided into those available from both eyes together, called **binocular depth cues**, and those available from each eye alone, called **monocular depth cues**.

**BINOCULAR DEPTH PERCEPTION** One of the most important cues to depth perception is the **binocular disparity** (or *retinal disparity*) caused by the distance

**binocular depth cues** Cues of depth perception that arise from the fact that people have two eyes.

**monocular depth cues** Cues of depth perception that are available to each eye alone.

**binocular disparity** A cue of depth perception that is caused by the distance between a person's eyes, which provides each eye with a slightly different image.

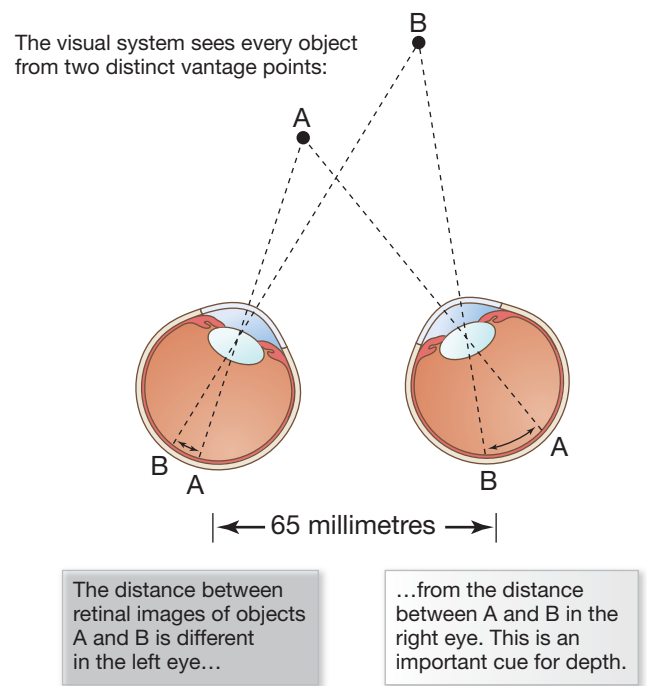


between humans' two eyes. Because each eye has a slightly different view of the world, the brain has access to two different but overlapping retinal images. The brain uses the disparity between these two retinal images to compute distances to nearby objects (FIGURE 5.42).

The ability to determine an object's depth based on that object's projections to each eye is called *stereoscopic vision*. In 1838, the physicist and inventor Charles Wheatstone created the stereoscope, a device that enables a viewer to perceive depth in a pair of two-dimensional pictures, each taken from a slightly different perspective. The resulting three-dimensional image is due to the brain's reconciling the disparate image received by each eye. Wheatstone used the stereoscope to demonstrate that depth perception is influenced by binocular disparity and thus that stereoscopic vision is an important cue for an object's depth. The stereoscope became a popular parlor amusement. In 1849, David Brewster, the physicist who invented the kaleidoscope, created the autostereogram—an optical illusion that turns specially designed pairs of two-dimensional images into three-dimensional images by presenting them in an unfocused manner (thus delivering a slightly different image to each eye; see FIGURE 5.43).

**MONOCULAR DEPTH PERCEPTION** Although binocular disparity is an important cue for depth perception, it is useful only for objects relatively close to us. Furthermore, we can perceive depth even with one eye closed, because of monocular depth cues. Artists routinely use these cues to create a sense of depth, so they are also called *pictorial depth cues*. The Renaissance painter, sculptor, architect, and engineer Leonardo da Vinci first identified many of these cues, which include:

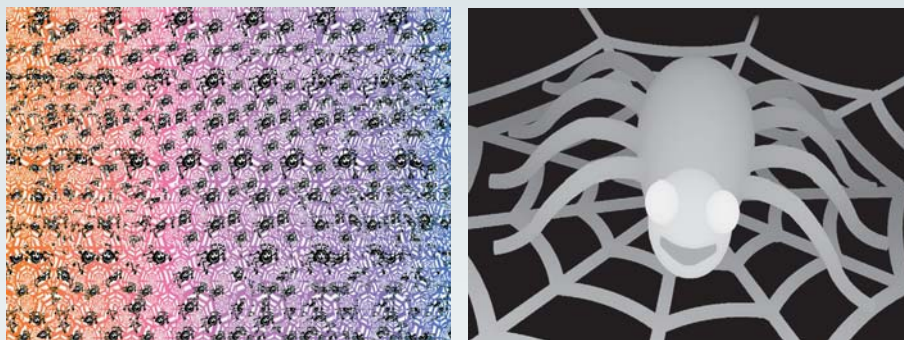
- *Occlusion*: A near object occludes (blocks) an object that is farther away.
- *Relative size*: Far-off objects project a smaller retinal image than close objects do.



**FIGURE 5.42 Binocular Disparity** To demonstrate your own binocular disparity, hold one of your index fingers out in front of you and close first one eye and then the other. Your finger appears to move because each eye, due to its position relative to the object in question (i.e., the finger), has a unique retinal image.

**FIGURE 5.43 Try for Yourself: Autostereogram**

Hold the picture on the left close to your eyes and stare straight ahead. Try to relax your eyes and let them look through the book to an imaginary point in the distance. Slowly move the book away from you, still fixating on that imaginary point. Try to allow the doubled images to fall on top of each other and keep them there.



**Result:** The result of superimposing the images should be a three-dimensional effect. The picture on the right is the embedded image. If you do not see it in a few minutes, stop and try again later. Each eye is focusing at a different depth plane, so when the images are superimposed they appear to “pop out” in depth.

- *Familiar size*: We know how large familiar objects are, so we can tell how far away they are by the size of their retinal images.
- *Linear perspective*: Parallel lines appear to converge in the distance.
- *Texture gradient*: As a uniformly textured surface recedes, its texture continuously becomes denser.
- *Position relative to horizon*: All else being equal, objects below the horizon that appear higher in the visual field are perceived as being farther away. Objects above the horizon that appear lower in the visual field are perceived as being farther away.

Can you identify these cues to depth in **FIGURE 5.44**, Edvard Munch's painting *Evening on Karl Johan Street* (circa 1892)?

### Culture Influences Perception

It may seem obvious that cues to depth can give rise to the perception of three dimensions on a flat canvas. But psychologists have wondered if these cues have to be learned or whether they emerge automatically as a by-product of normal three-dimensional perception. One problem in investigating questions like this one is that researchers need to find people who from young ages have not had the sort of experiences that would teach them how to interpret pictorial depth. Most people have regular access to pictures and live in a “carpentered world,” where buildings and other structures have straight edges and parallel lines. If you grew up in a carpentered world, as most readers of this book probably did, you have had a lifetime of experience learning that, for example, parallel lines seem to converge in the distance. The *Mueller-Lyer illusion*, one of the visual illusions most frequently employed in psychological research, provides a way of answering

**FIGURE 5.44** Pictorial Depth Cues



**Occlusion**  
The tree blocks the building behind it.

**Relative size**  
The people at the front of the picture are larger than the people toward the middle and back of the picture.

**Familiar size**  
We know about how tall the man in the middle is, so we can guess how far away he must be.

**Linear perspective**  
The lines of the street and of the buildings converge toward the horizon.

**Texture gradient**  
The texture of the buildings gets denser as the buildings recede into the distance.

**Position relative to horizon**  
The figures get higher toward the horizon line—that is, the farther away they are.

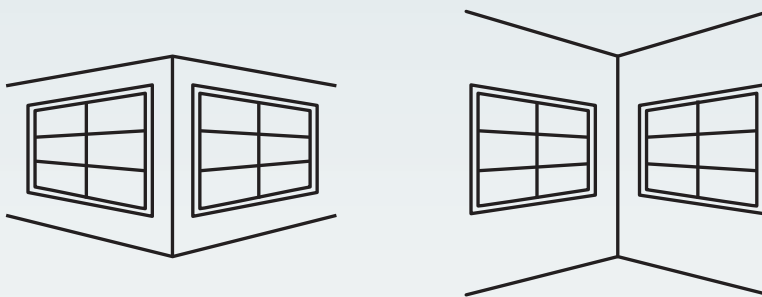
FIGURE 5.45 Try for Yourself: The Mueller-Lyer Illusion

Which of these two lines appears longer?



**Result:** In the figure above, the horizontal lines are the same length, but the one on top appears longer because we unconsciously infer that it is farther away from us. We associate the ends of the top line with greater visual depth.

In the figure below, notice how the edges of the walls provide cues to depth. The vertical lines are the same length, but the one on the right appears longer. Note, however, that people who are raised in cultures where there are not carpentered corners are not susceptible to this illusion (Segall, Campbell, & Herskovits, 1966).



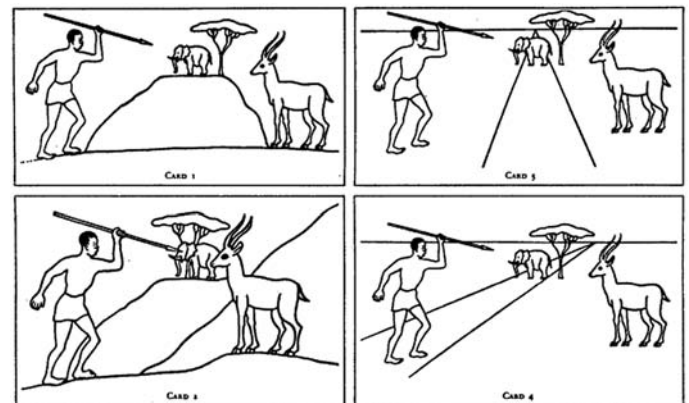
the question of whether people automatically use pictures' depth cues or whether they learn how to use them (FIGURE 5.45).

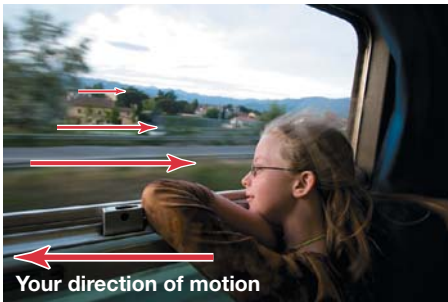
Do people who live in areas of the world where there are few or no buildings with straight edges, and who have little or no experience with pictures, recognize pictorial depth cues? Do they see the Mueller-Lyer illusion the same way that people who live in carpentered worlds do? To find out, the South African anthropologist William Hudson (1967) drew a series of stimuli with different depth cues (FIGURE 5.46), and then presented these stimuli to schooled and unschooled black and white South Africans. The participants who had attended school were better at identifying the objects in the pictures than those who had never attended school, and the findings were the same for both races. This investigation was repeated with the Baganda people of Uganda (Kilbride & Robbins, 1969). The researchers found that Bagandas who lived in urban areas correctly identified more of the objects and animals in the drawings than those who lived in rural areas; among those who lived in rural areas, those who were more acculturated to the larger society identified more elements in the pictures correctly than those who were less acculturated. The researchers concluded that cultural experiences are important factors in the acquisition and development of visual-perceptual skills.

Given the finding that people in different cultures were not equally good at identifying the objects in the pictures drawn by Hudson (1967), what would you predict about cultural differences in susceptibility to the Mueller-Lyer illusion? Cross-cultural studies have shown that people who grew up in and live in uncarpentered worlds, and who have had little experience

FIGURE 5.46 Drawings Used to

**Investigate Depth Cues** These are two of the drawings used by Hudson (1967) and Kilbride and Robbins (1969) to study if depth cues are learned and therefore dependent on cultural experiences. The converging lines in the right-hand drawings provide pictorial cues to depth that are missing from the drawings on the left.





**FIGURE 5.47 Motion Parallax** Near objects seem to pass us more quickly in the opposite direction of our movement. Objects farther away seem to move more slowly.



**FIGURE 5.48 Distance Perception** This picture, by Rebecca Robinson, captures what appears to be a tiny Sarah Heatherton standing on James Heatherton's head. This illusion occurs because the photo does not convey the hill on which Sarah is standing and so fails to present depth information.

**FIGURE 5.49 The Ames Box** Ames played with depth cues to create size illusions. For example, as illustrated here, he made a diagonally cut room appear rectangular by using crooked windows and floor tiles. When one child stands in a near corner and another (of similar height) stands in a far corner, the room creates the illusion that they are equidistant from the viewer; therefore, the closer child looks like a giant compared to the child farther away. An Ames room can be experienced by viewers at the Ontario Science Centre in Toronto.

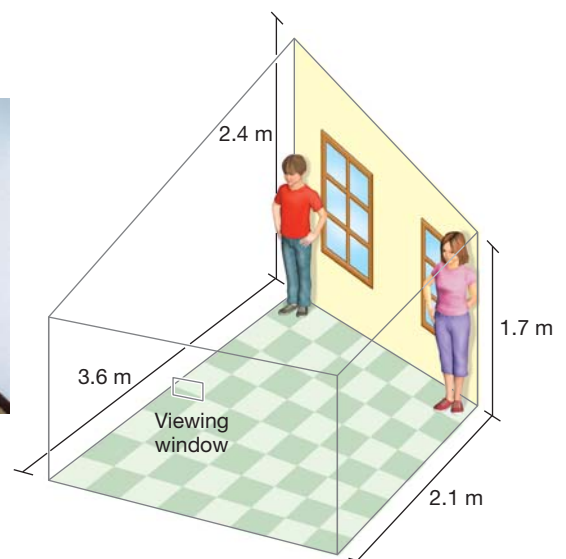
with modern technologies and with two-dimensional representations of the world, will more likely perceive the two lines in the Mueller-Lyer illusion as the same length (Segall, Campbell, & Herskovits, 1966).

**MOTION CUES FOR DEPTH PERCEPTION** Motion is another cue for depth. *Motion parallax* is the relative movements of objects that are at various distances from the observer. When you watch the scenery from a moving car, for example, near objects seem to pass quickly, far objects more slowly (FIGURE 5.47). If you fixate on an object farther away, such as the moon, it appears to match your speed. If you fixate on an object at an intermediate distance, anything closer moves opposite your direction relative to that object, whereas anything farther moves in your direction relative to the object. Motion cues such as these help the brain calculate which objects are closer and which are farther away.

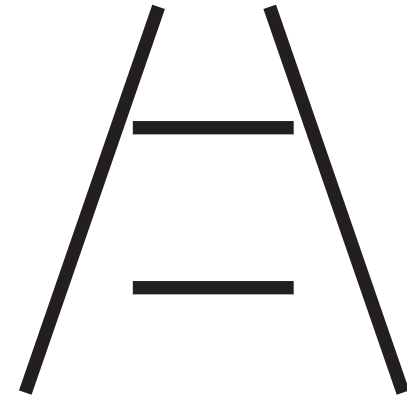
### Size Perception Depends on Distance Perception

The size of an object's retinal image depends on that object's distance from the observer; the farther away it is, the smaller its retinal image. To determine an object's size, then, the visual system needs to know how far away it is. Most of the time, enough depth information is available for the visual system to work out objects' distances and thus infer how large the objects are. However, in some circumstances size perception fails, and objects look bigger or smaller than they really are (FIGURE 5.48). These optical illusions arise when normal perceptual processes incorrectly represent the distance between the viewer and stimuli—depth cues fool us into seeing depth when it is not there. Consider also *Ames boxes* (also called *Ames rooms*), the *Ponzo illusion*, the *horizontal-vertical illusion*, and the *moon illusion*.

**AMES BOXES** Ames boxes, crafted at the Dartmouth College Eye Institute in the 1940s by Adelbert Ames Jr., a painter turned scientist, present powerful depth illusions. These boxes elaborate on the Victorian trick in which a person looking through a peephole would see a furnished room and then open the door to find the room empty—with a dollhouse room nailed to the door. Inside the Ames boxes, rooms play with linear perspective and other distance cues. One such room makes a far corner appear the same distance away as a near corner. Normally, a nearby child projects a larger retinal image than a child farther away, but does not appear larger because the perceptual system takes depth into account when assessing size. If the depth cues are wrong, so the child appears farther away than he is—as in one Ames box—the disproportionate size of his image on your retina makes the child look huge (FIGURE 5.49).



**THE PONZO ILLUSION** The Ponzo illusion (**FIGURE 5.50**), first described by the Italian psychologist Mario Ponzo in 1913, is another classic example of a size/distance illusion. The common explanation for this effect is that monocular depth cues make the two-dimensional figure seem three-dimensional (Rock, 1984). As noted above, parallel lines appear to converge in the distance. Here, the two lines drawn to look like railroad tracks receding in the distance trick your brain into thinking they are parallel. Therefore, you perceive the two parallel lines in the centre as if they are at different distances and thus different in size when they actually are the same size. This illusion shows how much we rely on depth perception to gauge size—the brain defaults to using depth cues even when depth is absent.



**FIGURE 5.50 The Ponzo Illusion** The two horizontal lines appear to be different sizes but are the same length.

## Motion Perception Has Internal and External Cues

We know how motion can cue depth perception, but how does the brain perceive motion? One answer is that we have neurons specialized for detecting movement—they fire when movement occurs. But how does the brain know what is moving? If you look out a window and see a car driving past a house, how does your brain know the car is moving and not the house? Consider the dramatic case of M.P., a German woman who developed selective loss of motion perception following damage to secondary visual areas of the brain—areas critical for motion perception. M.P. saw the world as a series of snapshots rather than as a moving image (Zihl, von Cramon, & Mai, 1983). Pouring tea, she would see the liquid frozen in air and be surprised when her cup overflowed. Before crossing a street, she might spot a car far away, but when she tried to cross, that car would be right in front of her. M.P. had a unique deficit—she could perceive objects and colours but not continuous movement. This section considers three phenomena that offer insights into how the visual system perceives motion: *motion after-effects*, *compensation for head and eye motion*, and *stroboscopic motion perception*.

**MOTION AFTER-EFFECTS** Motion after-effects occur when you gaze at a moving image for a prolonged period and then look at a stationary scene. You experience a momentary impression that the new scene is moving in the opposite direction from the moving image. This illusion is also called the *waterfall effect*, because if you stare at a waterfall and then turn away, the scenery you are now looking at will seem to move upward for a moment. After-effects are strong evidence that motion-sensitive neurons exist in the brain. The theory behind this illusion combines sensory adaptation with neural specificity. The visual cortex has neurons that respond to movement in a given direction. When you stare at a moving stimulus long enough, these direction-specific neurons begin to adapt to the motion, becoming fatigued and therefore less sensitive. If the stimulus is suddenly removed, the motion detectors that respond to all the other directions are more active than the fatigued motion detectors. Thus you see the new scene moving in the other direction. (You can experience this illusion by following the instructions in **FIGURE 5.51**.)

**COMPENSATORY FACTORS** The existence of motion-sensitive neurons does not completely explain motion perception. How do you know, for instance, whether an object is moving or whether you, or your eyes, are moving? Images move across your retina all the time and you do not always perceive them as moving. Each slight blink or eye movement creates a new image on the retina. Why is it that

**FIGURE 5.51 Try for Yourself: Spiral After-Effects**

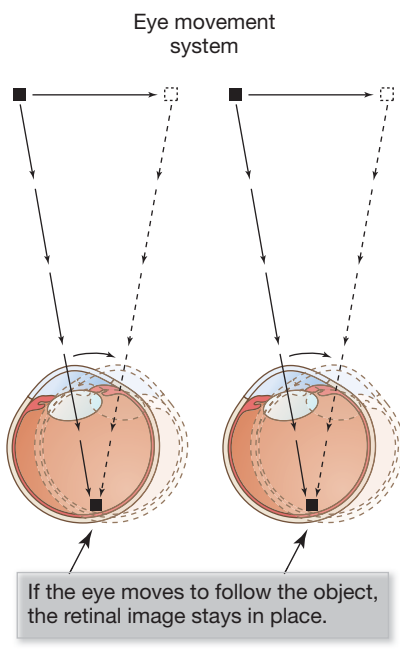
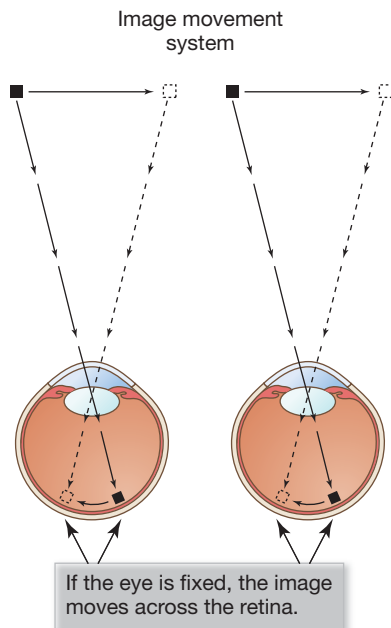
This spiral design creates motion after-effects when you view it spinning for approximately 30 seconds. To see the effect, copy the figure and cut out the copy along the outermost curve. Unbend a paper clip and stick one end through the middle of the figure so that you can spin it, or stick a thumbtack through the centre and put the sharp end into the eraser end of a pencil that can serve as a spinning stick.

After watching the figure spin, immediately shift your gaze to a photo, such as the one of Margaret Thatcher in Figure 5.38.



**Result:** If the spiral appeared to expand as it spun, the photo will appear to shrink. These effects will be created totally by your visual system.

The visual system detects movement in two ways:



**FIGURE 5.52 Perceiving Movement**

every time you move your eye, or your head, the images you see do not jump around? One explanation is that the brain calculates an object's perceived movements by monitoring the movement of the eyes, and perhaps also of the head, as they track a moving object. In addition, motion detectors track an image's motion across the retina, as the receptors in the retina fire one after the other (FIGURE 5.52).

**STROBOSCOPIC MOVEMENT** Movies are made up of still-frame images, presented one after the other to create the illusion of motion pictures. This phenomenon is based on stroboscopic movement, a perceptual illusion that occurs when two or more slightly different images are presented in rapid succession. The Gestalt psychologist Max Wertheimer conducted experiments in 1912 by flashing, at different intervals, two vertical lines placed close together. He discovered that when the interval was less than 30 milliseconds, subjects thought the two lines were flashed simultaneously. When the interval was greater than 200 milliseconds, they saw two lines being flashed at different times. Between those times, movement illusions occurred: When the interval was about 60 milliseconds, the line appeared to jump from one place to another; at slightly longer intervals, the line appeared to move continuously—a phenomenon called *phi movement*. (You can create stroboscopic movement by using FIGURE 5.53.)



**FIGURE 5.53 How Moving Pictures Work** This static series would appear transformed if you spun the wheel. When the slightly different images were presented in rapid succession, stroboscopic movement would tell your brain that you were watching a moving horse.

## Perceptual Constancies Are Based on Ratio Relationships

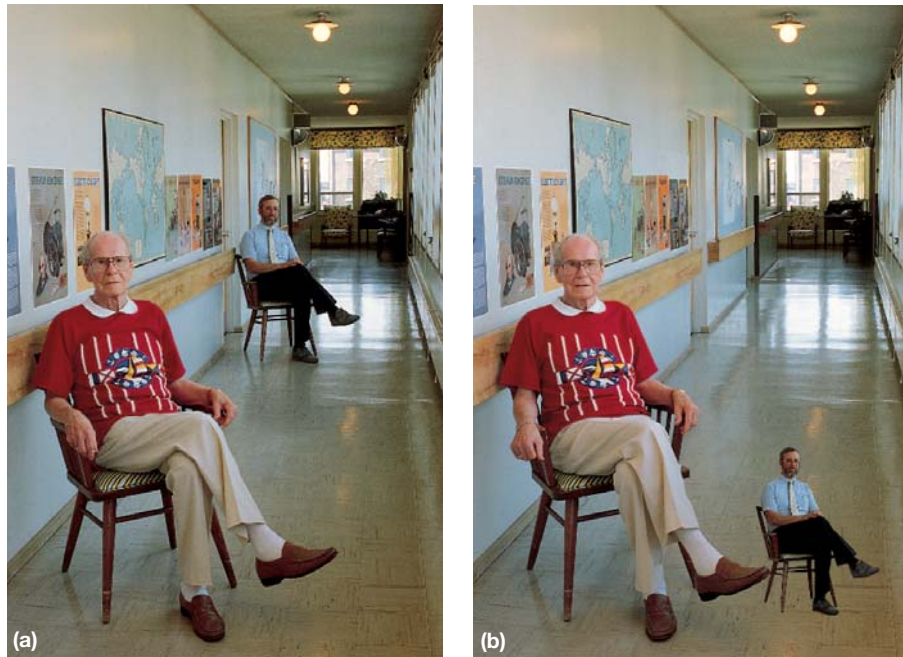
As discussed above, illusions occur when the brain creates inaccurate representations of stimuli. In the opposite situation, **perceptual constancy**, the brain correctly perceives objects as constant despite sensory data that could lead it to think otherwise. Consider your image in the mirror. What you see in the mirror might look like it is your actual size, but the image is much smaller than the parts of you being reflected. (If you doubt this claim, try tracing around the image of your face in a steamy bathroom mirror.) Similarly, how does the brain know that a person is six feet tall when the retinal image of that person changes size according to how near or far the person is (**FIGURE 5.54**)? How does the brain know that snow is white and a tire is black, even when snow at night or a tire in bright light might send the same luminance cues to the retina?

For the most part, changing an object's angle, distance, or illumination does not change our perception of that object's size, shape, colour, or lightness. But to perceive any of these four constancies, we need to understand the relationship between it and at least one other factor. For *size constancy*, we need to know how far away the object is from us. For *shape constancy*, we need to know from what angle we are seeing the object. For *colour constancy*, we need to compare the wavelengths of light reflected from the object with those reflected from its background. Likewise, for *lightness constancy*, we need to know how much light is being reflected from the object and from its background. In each case, the brain computes a ratio based on the relative magnitude rather than relying on each sensation's absolute magnitude. The perceptual system's ability to make relative judgments allows it to maintain constancy across various perceptual contexts. Although their precise mechanisms are unknown, these constancies illustrate that perceptual systems are tuned to detect changes from baseline conditions, not just to respond to sensory inputs.

**perceptual constancy** People correctly perceive objects as constant in their shape, size, colour, and lightness, despite raw sensory data that could mislead perception.

### FIGURE 5.54 Perceptual Constancy

When you look at each of these photos, your retinal image of the bearded man is the same. In **(a)**, depth cues make him look farther away. In **(b)**, the absence of depth cues make him look smaller.



By studying how illusions work, many perceptual psychologists have come to believe that the brain has built-in assumptions that influence perceptions. The vast majority of visual illusions appear to be beyond our conscious control—we cannot make ourselves not see illusions, even when we know they are not true representations of objects or events (FIGURE 5.55). Thus the visual system is a complex interplay of constancies, which allow us to see both a stable world and perceptual illusions that we cannot control.

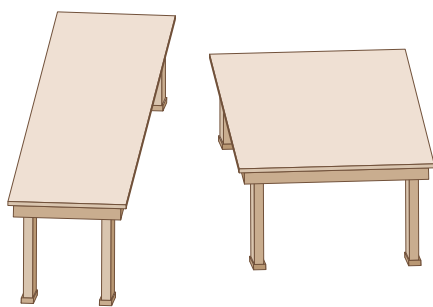
## SUMMING UP

### What Are the Basic Perceptual Processes?

The perceptual system is stunningly intelligent. It takes ambiguous sensory information and constructs rich and meaningful experiences that allow us to navigate the world around us. All perception occurs in the brain, where various perceptual processes take incoming sensations and construct them into meaningful perceptions. Information first arrives in primary sensory regions, such as V1 for vision and A1 for audition, but multiple brain regions contribute to our unified perceptual experience. The perceptual system uses cues from the person's environment to help interpret sensory information. For instance, visual cues help provide information about what objects are and where they are located, as well as information about depth and motion. Contemporary theorists emphasize that perceptions are not faithful reproductions of the physical world but rather are constructed through multiple processes that allow us to taste, smell, touch, hear, and see.

## MEASURING UP

1. Match each of the following monocular depth cues with its description: familiar size, linear perspective, occlusion, position relative to horizon, relative size, texture gradient.
  - a. Parallel lines appear to converge in the distance.
  - b. Near objects block those that are farther away.



### FIGURE 5.55 The Tabletop Illusion

Created by the psychologist Roger Shepard, this illusion demonstrates the brain's automatic perceptual processes. Even when we know the two tabletops are the same size and shape—even if we have traced one image and placed it on top of the other—perspective cues make us see them as different.



- c. We use our knowledge of an object's size to judge the object's distance.
  - d. Smaller objects are judged to be farther away.
  - e. Uniform surfaces appear denser in the distance.
  - f. Objects near the horizon are judged to be farther away.
2. What is binocular disparity?
- a. a disorder in which a person loses depth perception
  - b. a cue to depth caused by the formation of a slightly different image in each eye
  - c. the distance between our eyes
  - d. the ability to see depth in a two-dimensional stimulus by defocusing our vision
3. Perceptual constancy \_\_\_\_\_.
- a. allows us to see objects as stable even when there are large fluctuations in the sensory information we receive
  - b. allows us to understand how physical energy is transduced into neural activity
  - c. is a misnomer because our perceptions are not constant
  - d. was based on the idea that different parts of the brain underlie different perceptual experiences

## CONCLUSION

Perceptual psychologists seek to understand how the brain translates elementary sensations into conscious perception. Our entire experience of the world relies on this translation process. Although perceiving seems effortless, it relies on numerous active processes that work together to construct our experience. Our senses gather information from relatively limited sources of physical energy. We hear few of the available sound waves, for example, and see only a small portion of the electromagnetic spectrum. But our experience does not feel limited, because our perceptual systems allow us to perform the tasks necessary for both survival and reproduction. After more than a century of research, scientists still cannot state definitely how perception works. No single theory or model successfully accounts for more than a fraction of perceptual phenomena. The workings of our perceptual systems have begun to yield to the concerted efforts of psychological scientists working at many levels of analysis, however. With the advent of new technologies for studying the brain, the urgency of these efforts has increased. Perhaps the twenty-first century will yield answers to two of humankind's most enduring questions: How do we know our world? And how are mental events realized in the brain's physical events?

## CHAPTER SUMMARY

### How Do We Sense Our Worlds?

- **Stimuli Must Be Coded to Be Understood by the Brain:** Stimuli reaching the receptors are converted to neural impulses through the process of transduction.
- **Psychophysics Relates Stimulus to Response:** By studying how people respond to different sensory levels, scientists can determine thresholds and perceived change (based on signal detection theory). Our sensory systems are tuned to both adapt to constant levels of stimulation and detect changes in our environment.

### What Are the Basic Sensory Processes?

- **In Taste, Taste Buds Detect Chemicals:** The gustatory sense uses taste buds to respond to the chemical substances that produce at least five basic sensations: sweet, sour, salty, bitter, and umami (savoury). The number and distribution of taste buds vary among individuals. Cultural taste preferences begin in the womb.
- **In Smell, the Nasal Cavity Gathers Odorants:** Receptors in the olfactory epithelium respond to chemicals and send signals to the olfactory bulb, in the brain. Females are much more accurate than males at detecting and identifying odours.
- **In Touch, Sensors in the Skin Detect Pressure, Temperature, and Pain:** The haptic sense relies on tactile stimulation to activate receptors for temperature, for sharp and dull pain, and for other sensations. Neural “gates” in the spinal cord also control pain. We can reduce pain perception by distraction, visualizing pain as more pleasant, being rested and relaxed, learning how to change brain activity that underlies pain perception, and taking drugs that interfere with the neural transmission of pain or render us unconscious.
- **In Hearing, the Ear Detects Sound Waves:** The size and shape of sound waves activate different hair cells in the inner ear. The receptors’ responses depend on the sound waves’ frequency and timing and on the activated receptors’ location along the basilar membrane. Having two ears allows us to locate the source of a sound.
- **In Vision, the Eye Detects Light Waves:** Receptors (rods and cones) in the retina detect different forms of light waves. The lens helps the eye focus the stimulation on the retina for near versus far objects. Colour is determined by wavelengths of light, which activate certain types of cones; by the absorption of wavelengths by objects; or by the mixing of wavelengths of light.
- **Humans and Animals Have Other Sensory Systems:** In addition to the five “basic” senses, humans and other animals have a kinesthetic sense (ability to judge where one’s limbs are in space) and a vestibular sense (ability to compare one’s bodily position to the upright position).

Some animals can use sound waves or disruptions in an electrical field to navigate.

- **The Evidence for Extrasensory Perception (ESP) Is Weak or Nonexistent:** Little or no good evidence supports the intriguing idea that some people have additional sensory systems that allow them to know what other people are thinking, for example, or to see through objects.

### What Are the Basic Perceptual Processes?

- **Perception Occurs in the Brain:** Neural activity in the primary auditory cortex gives rise to hearing. Touch is mediated by neural activity in the primary somatosensory cortex. Vision results from a complex series of events in various areas of the brain but primarily in the occipital lobe.
- **Object Perception Requires Construction:** The Gestalt principles of stimulus organization account for some of the brain’s perceptions of the world. Those perceptions involve cues about similarity, proximity, form, figure and background properties, and shading. Perception involves dual processes: bottom-up (sensory information) and top-down (expectations about what we will perceive).
- **Depth Perception Is Important for Locating Objects:** An object’s pattern of stimulation on each of the two retinas (binocular) informs the brain about depth. The brain uses pictorial (monocular) cues—information about the object’s appearance relative to the surroundings—to perceive depth and relative motion.
- **Culture Influences Perception:** People raised in a carpentered world—who have interacted with carpentered structures—are more prone to illusions based on cues such as linear perspective than are people raised in a noncarpentered world.
- **Size Perception Depends on Distance Perception:** Illusions of size can be created when the retinal size conflicts with the known size of objects in the visual field, as in the Ames, Ponzo, and moon illusions.
- **Motion Perception Has Internal and External Cues:** Motion detectors in the cortex respond to stimulation. The perceptual system establishes a stable frame of reference and relates object movement to it. Intervals of stimulation of repeated objects give the impression of continuous movement. Motion after-effects, which are opposite in motion from things that have been observed, tell us about the fatigue of neural receptors that fire in response to motion in certain directions.
- **Perceptual Constancies Are Based on Ratio Relationships:** We create expectancies about the world that allow us to use information about the shape, size, colour, and lightness of objects in their surroundings to achieve constancy.

## KEY TERMS

additive colour mixing, p. 215	cornea, p. 208	monocular depth cues, p. 230	receptive field, p. 211	subtractive colour mixing, p. 215
audition, p. 204	eardrum (tympanic membrane), p. 204	olfaction, p. 198	retina, p. 208	taste buds, p. 195
binocular depth cues, p. 230	fovea, p. 209	olfactory bulb, p. 198	rods, p. 209	top-down processing, p. 226
binocular disparity, p. 230	gustation, p. 195	olfactory epithelium, p. 198	sensation, p. 188	transduction, p. 189
bottom-up processing, p. 226	haptic sense, p. 200	perception, p. 188	sensory adaptation, p. 193	vestibular sense, p. 217
cones, p. 209	iris, p. 209	perceptual constancy, p. 237	signal detection theory (SDT), p. 192	
	kinesthetic sense, p. 217	pupil, p. 208	sound wave, p. 204	
	lateral inhibition, p. 212			

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## ■ PRACTICE TEST

- Which answer accurately lists the order in which these structures participate in sensation and perception (except for smell)?
  - specialized receptors, thalamus, cortex
  - specialized receptors, cortex, thalamus
  - cortex, specialized receptors, thalamus
  - thalamus, specialized receptors, cortex
- While listening to a string quartet, you find you can easily decipher the notes played by the violins, by the viola, and by the cello. When you focus on the viola, you find some of the notes especially loud and others barely discernable. Which of the following statements best describes your sensations of the quartet?
  - You can decipher qualitative differences among the instruments because of the rate of firing of your sensory neurons, whereas you can make quantitative distinctions—recognizing variations in the notes' intensity—due to the involvement of specific sensory receptors.
  - You can decipher quantitative differences among the instruments because of the rate of firing of your sensory neurons, whereas you can make qualitative distinctions—recognizing variations in the notes' intensity—due to the involvement of specific sensory receptors.
  - You can decipher qualitative differences among the instruments because of the involvement of specific sensory receptors, whereas you can make quantitative distinctions—recognizing variations in the notes' intensity—due to the rate of firing of your sensory neurons.
  - You can decipher quantitative differences among the instruments because of the involvement of specific sensory receptors, whereas you can make qualitative distinctions—recognizing variations in the notes' intensity—due to the rate of firing of your sensory neurons.
- When the violist plays a solo, you cannot hear it. Which of the following statements is the most likely explanation?
  - The differences in intensity between the notes of the solo are too small to be noticeable.
  - The intensity of the auditory stimulation does not exceed the minimum threshold needed for you to detect a sensation.
  - The quartet's playing has left your hearing receptors overstimulated and thus unable to process less intense stimuli.
- Imagine you have a steady, radiating pain across your lower back. No matter how you position yourself, you cannot make the pain go away. Select the answer choices most relevant to this type of pain. More than one choice may be correct.
  - activated by chemical changes in tissue
  - activated by strong physical pressure of temperature extremes
  - fast fibres
  - myelinated axons
  - nonmyelinated axons
  - slow fibres
- A one-year-old girl skins her knees on a rough sidewalk. The girl cries in pain. Which of the following interventions will most likely calm her?
  - Promising to give her a piece of candy if she stops crying.
  - Quickly cleaning and bandaging the skinned knees.
  - Looking intently into her eyes and saying, "Let's take some deep breaths together. Ready. . . Breathe in. . . Now breathe out."
  - Directing the girl's hand on a quick touching tour of the nearby environment and saying things such as "Feel this tree's rough bark. Touch the grass; it tickles. Feel how smooth this rock is!"
- After hours of waiting, a bird watcher hears the call of rare bird species. The bird watcher instinctively turns his head about 45 degrees to the left and sees the bird. Which of the following statements best describes how the bird watcher knew where to turn his head?
  - The call reached the bird watcher's left ear before it reached his right ear; the call was less intense in the bird watcher's right ear than in his left ear.
  - The call reached the bird watcher's left ear before it reached his right ear; the call was less intense in the bird watcher's left ear than in his right ear.
  - The call reached the bird watcher's right ear before it reached his left ear; the call was less intense in the bird watcher's right ear than in his left ear.
  - The call reached the bird watcher's right ear before it reached his left ear; the call was less intense in the bird watcher's left ear than in his right ear.
- In which lobe of the brain (frontal, occipital, parietal, temporal) does each of the following sensory cortices reside?
  - primary auditory cortex
  - primary somatosensory cortex
  - primary visual cortex
- Imagine you are preparing to conduct a brain imaging study of visual processing. Which pathway—dorsal or ventral—do you hypothesize will be activated by each of the following experimental tasks?
  - Deciding which of two objects is farther away.
  - Describing an object's colour.
  - Describing a silhouette's shape.
  - Naming an object.
  - Selecting which two of three objects are closest together.

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## ■ PSYCHOLOGY AND SOCIETY

- Spend a few minutes reviewing "Critical Thinking Skill: Seeking Disconfirming Evidence" (Chapter 3), and then create a  $2 \times 2$  chart for the question *Does ESP exist?* Use information from the chapter, from Internet searches, and/or from peer-reviewed psychology literature to complete the cells of the chart. Based on your analysis of the evidence, write a brief justification for your position.
- Which sense do you think it would be most difficult to live without? Why? Do you think it would be more or less challenging to lose that

sense at birth, at a young age, or later in life? Why? If it were possible to regain that sense at some point in the future, what would be the arguments for or against doing so? Your response should reflect an understanding of how each of the senses helps people navigate the physical world. To start thinking about these questions, revisit the sections in this chapter that discuss the uses of cochlear implants and of surgery to restore partial or full vision.

**The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.**





# Learning

THE PERSON WHO ARGUABLY HAD THE GREATEST INFLUENCE on contemporary psychological science started out as a novelist. Burrhus Frederic (B. F.) Skinner was inspired to pursue writing during his senior year in university after the poet Robert Frost read some of Skinner's work and provided encouraging comments. After many months spent toiling away in his parents' attic, with measly results, Skinner began to contemplate alternative careers. He had wanted to be a novelist so that he could explore large questions about the human condition, but Skinner had always been a bit socially awkward and aloof and did not have the insight into other people's emotions that we associate with great novelists. As a novelist, he could describe people's actions, but this did not help him gain the true understanding he sought into why people act the ways they do. To pursue his intellectual interests in the human condition, particularly in human behaviour, Skinner considered a career in

## How Did the Behavioural Study of Learning Develop?

- Behavioural Responses Are Conditioned
- Phobias and Addictions Have Learned Components
- Classical Conditioning Involves More Than Events Occurring at the Same Time
- Critical Thinking Skill: Recognizing and Avoiding Inappropriate Association Effects in Reasoning

## How Does Operant Conditioning Differ from Classical Conditioning?

- Reinforcement Increases Behaviour

- Both Reinforcement and Punishment Can Be Positive or Negative

- Operant Conditioning Is Influenced by Schedules of Reinforcement

- Biology and Cognition Influence Operant Conditioning

- The Value of Reinforcement Follows Economic Principles

## How Does Watching Others Affect Learning?

- Learning Can Be Passed On through Cultural Transmission
- Learning Can Occur through Observation

- Animals and Humans Imitate Others
- Critical Thinking Skill: Avoiding the Association of Events with Other Events That Occur at the Same Time

## What Is the Biological Basis of Learning?

- Dopamine Activity Underlies Reinforcement
- Habituation and Sensitization Are Simple Models of Learning
- Long-Term Potentiation Is a Candidate for the Neural Basis of Learning

psychology, though he had not taken a single psychology course in university. He became convinced that psychology was his calling after reading the psychologist John B. Watson's book *Behaviorism* (1924) and the novelist H. G. Wells's 1927 *New York Times Magazine* article expressing admiration for the work of the Russian physiologist Ivan Pavlov. Increasingly, the behaviourists' perspective made sense to Skinner.

In graduate school at Harvard University, Skinner came into his own. He received his Ph.D. from Harvard in 1931, but he differed with his professors about what psychologists should study. Many faculty members were concerned about his apparent disdain for their efforts to analyze the mind through *introspection*, an approach then common at Harvard. As discussed in Chapter 1, introspection is the process of thinking about one's own thoughts and feelings and then talking about them as a way of making them public and available for others to study. The main objection to using introspection as a research method is that it is not very reliable. By contrast, behaviourists such as Skinner believed that, to be scientists, psychologists had to study observable actions—the behaviours that people and animals display.

Inspired by the work of Watson and of Pavlov, Skinner believed that he could dramatically change an animal's behaviour by providing incentives to the animal for performing particular acts. For the next half century, he conducted systematic studies of animals, often pigeons or rats, to discover the basic rules of learning. In the process, he outlined many of the most important principles that shape animal and human behaviour, principles as relevant today as they were more than 50 years ago.

His groundbreaking work led Skinner to form radical ideas about behaviourism. Dismissing the importance of mental states and questioning philosophical concepts such as free will, he believed that the application of basic learning principles could create a better, more humane world, one free of poverty and violence. In *Walden Two* (1948), a best-selling novel, he depicts a utopia in which children are raised only with praise and incentives, never with punishment. *Walden Two* has inspired many people; entire communities, such as northern Mexico's Los Horcones and rural Virginia's Twin Oaks, were founded on the principles in it.

Skinner also raised his own children—two daughters—according to the ideas established through his research, especially in emphasizing reward over punishment. The media has sometimes misinterpreted Skinner's parenting as the work of a cold, mad scientist. In the “Baby in a Box” incident, for example, Skinner developed a glassed-in sleeping chamber for his infant daughter Deborah that maintained an optimal temperature and provided a continuous supply of fresh linens (FIGURE 6.1). Contrary to rumors, however, he did not lock his daughter in the box, nor did she grow up to be depressed, sue her father, or commit suicide. In fact, Deborah, a successful artist living in London, England has denounced such rumors. She and her sister, Julie, an author and educator, had excellent relationships with their father until his death, in 1990.

B. F. Skinner's work has been enormously influential throughout society, from classrooms to clinics and beyond. This chapter focuses on what Skinner and a number of other learning theorists, especially Canada's Donald Hebb, have discovered about how learning takes place. This material represents some of psychology's central contributions to our understanding of human and animal behaviour. A cornerstone for a number of the foundational principles of psychological science, learning theories have also affected the other major areas of psychology. This chapter shows how these findings have been used to improve quality of life and to train humans and animals to learn new tasks, how contemporary psychological scientists are discovering the brain mechanisms that support this learning, and what new theories are emerging to explain how we learn.

**FIGURE 6.1** “Baby in a Box” B. F. Skinner developed this crib for his daughter in 1945.



## How Did the Behavioural Study of Learning Develop?

**Learning** is a relatively enduring change in behaviour, one that results from experience. It occurs when animals benefit from experience so that their behaviour is better adapted to the environment. The ability to learn is crucial for all animals. To survive, animals need to learn such things as which types of foods are dangerous, when it is safe to sleep, and which sounds indicate potential dangers. Learning is central to almost all aspects of human existence, from basic abilities, such as walking and speaking, to much more complex ones, such as flying airplanes, performing surgery, or maintaining intimate relationships. Learning also shapes many aspects of daily life, from clothing choices and musical tastes to social rules about how close we stand to each other, cultural values about either exploiting or preserving the environment, and so on.

The essence of learning is understanding how events are related; for example, you might associate going to the dentist with being in pain, and you might associate working with getting paid. Associations develop through *conditioning*, a process in which environmental stimuli and behavioural responses become connected. Psychologists study two types of conditioning. The first, *classical conditioning*, or *Pavlovian conditioning*, occurs when we learn that two types of events go together—for example, when we watch a scary movie and our hearts beat faster. The second, *operant conditioning*, or *instrumental conditioning*, occurs when we learn that a behaviour leads to a particular outcome, such as that studying leads to better grades. This latter type of learning was of greatest interest to B. F. Skinner. Other types include learning by observing others—for example, learning about new fashions by paying attention to what celebrities are wearing.

The rise of learning theory in the early twentieth century was due partly to the dissatisfaction among some psychologists with the widespread use of introspection, in which verbal reports are used to assess mental states. At the time, Freudian ideas were at the heart of psychological theorizing. Freud and his followers used verbal report techniques such as dream analysis and free association to assess the unconscious mental processes they believed were behaviour's primary determinants. In contrast, John B. Watson, arguing that Freudian theory was unscientific and ultimately meaningless, scorned any psychological enterprise that focused on things that could not be observed directly, such as people's mental experiences. According to Watson, observable behaviour was the only valid indicator of psychological activity. Although he acknowledged that thoughts and beliefs existed, he believed they could not be studied using scientific methods.

As discussed in Chapter 1, Watson founded behaviourism, a school of thought based on the belief that animals and humans are born with the potential to learn just about anything. Based on the seventeenth-century English philosopher John Locke's idea of *tabula rasa* (Latin, "blank slate"), which states that infants are born knowing nothing and that all knowledge is acquired through sensory experiences, behaviourism stated that environment and its associated effects on animals were the sole determinants of learning. Watson felt so strongly about the pre-eminence of environment that he issued the following bold challenge: "Give me a dozen healthy infants, well formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations and race of his ancestors" (Watson, 1924, p. 82). In North America, Watson enormously influenced the study of psychology. Behaviourism was the dominant psychological



### LEARNING OBJECTIVES

Explain the types of learning that occur through conditioning.

Differentiate among UR, US, CS, and CR.

Describe the "Little Albert" experiment and explain how it is used as a model for understanding phobias.

**learning** An enduring change in behaviour, resulting from experience.

paradigm there well into the 1960s; it affected the methods and theories of every area within psychology.

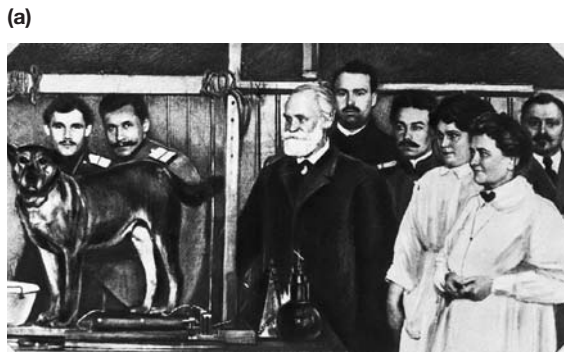
## Behavioural Responses Are Conditioned

Watson developed his ideas about behaviourism after reading the work of Russian Ivan Pavlov, who had won a Nobel Prize in 1904 for his work on the digestive system. Pavlov was interested in the *salivary reflex*, the automatic and unlearned response that occurs when a food stimulus is presented to a hungry animal, including a human. For his work on the digestive system, Pavlov had created an apparatus that collected saliva from dogs so that he could measure differences in salivary output when he placed various types of food into a dog's mouth (FIGURE 6.2). Like so many major scientific advances, Pavlov's contribution to psychology started with a simple observation. One day he realized that the laboratory dogs were salivating before they tasted the food. Indeed, the dogs started salivating the moment a lab technician walked into the room or whenever they saw the bowls that usually contained food. Pavlov's genius was in recognizing that this behavioural response was a window to the working mind. Unlike inborn reflexes, salivation at the sight of a person or of a bowl is not automatic and therefore must have been acquired through experience. This insight led Pavlov to devote the rest of his life to studying the basic principles of learning.

**PAVLOV'S EXPERIMENTS** In a typical Pavlovian experiment, a *neutral stimulus* unrelated to the salivary reflex, such as the clicking of a metronome, is presented along with a stimulus that reliably produces the reflex, such as food. This pairing, a *conditioning trial*, is repeated a number of times; then, on *critical trials*, the metronome sound is presented alone and the salivary reflex is measured. Pavlov found that under these conditions, the sound of the metronome on its own produced salivation. This type of learning, when a neutral stimulus elicits a reflexive response because it has become associated with a stimulus that already produces that response, is now referred to as **classical conditioning, or Pavlovian conditioning**.

**classical conditioning, or Pavlovian conditioning** A type of learned response that occurs when a neutral object comes to elicit a reflexive response when it is associated with a stimulus that already produces that response.

**FIGURE 6.2 Pavlov's Apparatus and Classical Conditioning** (a) Ivan Pavlov, pictured here with his colleagues and one of his canine subjects, conducted groundbreaking work on classical conditioning. (b) Pavlov's apparatus collected and measured a dog's saliva.

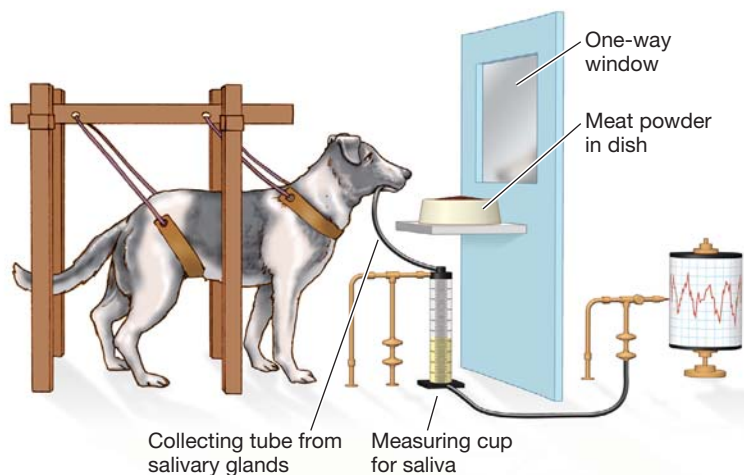


(b)

1 The dog is presented with a bowl containing meat.

2 A tube carries the saliva from the salivary glands to a container.

3 The container is connected to a device that measures the amount of saliva.





Pavlov called the salivation elicited by food the **unconditioned response (UR)**, because it occurred without prior training. An unconditioned response is an unlearned, automatic behaviour, such as any simple reflex. Similarly, the food is the **unconditioned stimulus (US)**. In the normal reflex response, the food (US) leads to salivation (UR). Because the clicking of the metronome produces salivation only after training, it is the **conditioned stimulus (CS)**; it stimulates salivation only after learning takes place. The salivary reflex that occurs when only the conditioned stimulus is presented is the **conditioned response (CR)**; it is an acquired, learned response. Both the unconditioned and the conditioned responses are salivation, but they are not identical: The conditioned response usually is weaker than the unconditioned response, such that the metronome sound produces less saliva than the food does. (The process of conditioning is outlined in **FIGURE 6.3**.)

Consider this common reaction. Watching a frightening scene in a movie, such as one in which someone is attacked, makes you feel tense, anxious, and perhaps

**unconditioned response (UR)** A response that does not have to be learned, such as a reflex.

**unconditioned stimulus (US)** A stimulus that elicits a response, such as a reflex, without any prior learning.

**conditioned stimulus (CS)** A stimulus that elicits a response only after learning has taken place.

**conditioned response (CR)** A response to a conditioned stimulus that has been learned.

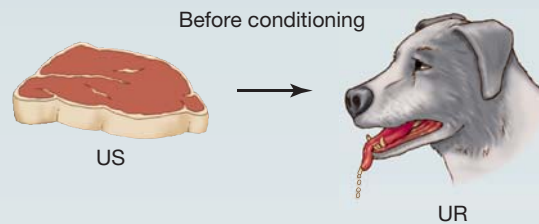
## Real World PSYCHOLOGY

**FIGURE 6.3 Scientific Method: Pavlov's Classical Conditioning**

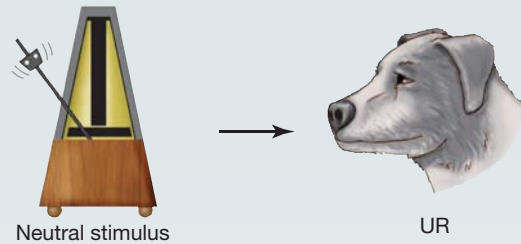
**Hypothesis:** A dog can learn that a bell predicts food.

**Research Method:**

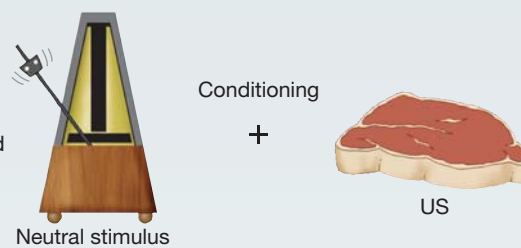
**1** Food (**unconditioned stimulus**) causes the dog to salivate (**unconditioned response**).



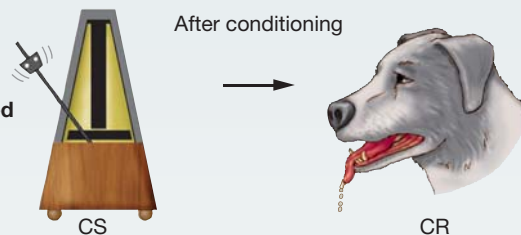
The clicking metronome (**neutral stimulus**) does not cause the dog to salivate.



**2** During conditioning trials, the clicking metronome is presented to a dog along with the food.



**3** During critical trials, the clicking metronome (**conditioned stimulus**) is presented without the food, and the dog's response is measured.



**Result:** After conditioning, the metronome causes the dog to salivate (**conditioned response**).

**Conclusion:** The dog was conditioned to associate the metronome with food.

even disgusted. In this scenario, the frightening scene (the stimulus) and your response to it are unconditioned—they occur naturally. Now imagine a piece of music that does not initially have much effect on you but that you hear in the movie just before each frightening scene. (A good example is the musical theme from the classic 1970s movie *Jaws*.) Eventually you will begin to feel tense and anxious as soon as you hear the music. You have learned that the music, the conditioned stimulus, predicts scary scenes, and therefore you feel the tension and anxiety, the conditioned response. As in Pavlov's studies, the CS (music) produces a somewhat different emotional response than the US (the scary scene)—it may be less intense, more a feeling of apprehension than of fear or disgust. If you later hear this music in a different context, such as on the radio, you will again feel tense and anxious even though you are not watching the movie. You have been classically conditioned to be anxious when you hear the music.

**acquisition** The gradual formation of an association between the conditioned and unconditioned stimuli.

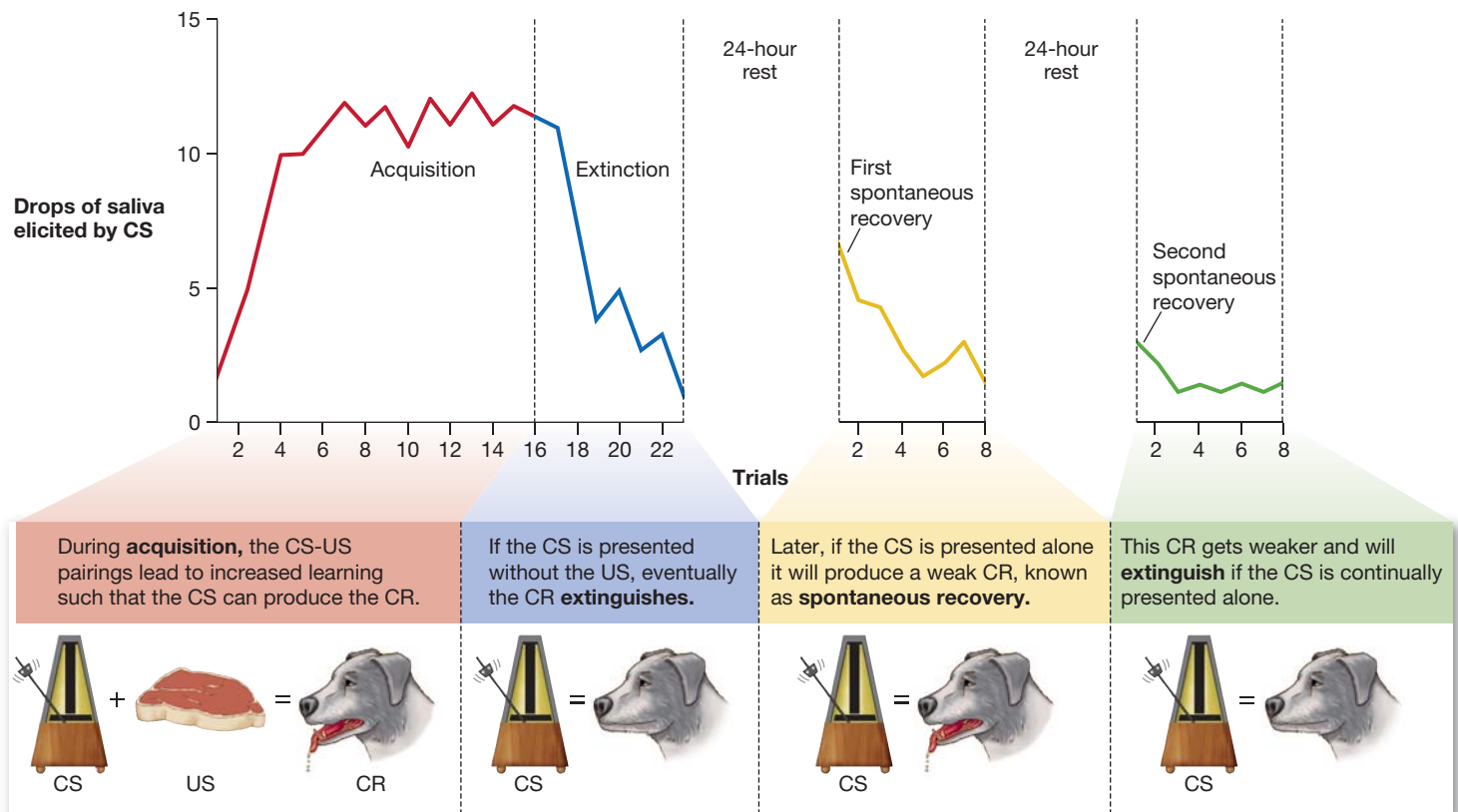
**extinction** A process in which the conditioned response is weakened when the conditioned stimulus is repeated without the unconditioned stimulus.

**spontaneous recovery** A process in which a previously extinguished response re-emerges following presentation of the conditioned stimulus.

**ACQUISITION, EXTINCTION, AND SPONTANEOUS RECOVERY** Like many other scientists (of his time and subsequently), Pavlov was greatly influenced by Darwin's *On the Origin of Species*. Pavlov believed that conditioning is the basis for how animals learn to adapt to their environments. By learning to predict what objects bring pleasure or pain, animals acquire new adaptive behaviours. For instance, suppose that each time it rains, a delicious and nutritious plant blooms. An animal that learns this association will seek out this plant each time it rains. In this example, **acquisition**, the initial learning of a behaviour, is the gradual formation of an association between stimuli, one conditioned (rain) and one unconditioned (plant bloom). From his research, Pavlov concluded that the critical element in the acquisition of a learned association is that the stimuli occur together in time, a bond referred to as *contiguity*. Subsequent research has shown that the strongest conditioning actually occurs when there is a very brief delay between the CS and the US. Thus you will develop a stronger conditioned response to a piece of music if it comes just before a scary scene than if it occurs during or after the scary scene: The music's role in predicting the frightening scene is an important part of the classical conditioning. The next time you watch a horror movie, pay attention to the way the music gets louder just before a scary part begins.

Once a behaviour is acquired, how long does it persist? For instance, what if the animal seeks out the tasty plants every time it rains, but the plants stop appearing? Animals sometimes have to learn when associations are no longer adaptive. Normally, after standard Pavlovian conditioning, the metronome (CS) leads to salivation (CR) because the animal learns to associate the metronome with the food (US). If the metronome is presented many times and food does not arrive, the animal learns that the metronome is no longer a good predictor of food, and therefore the salivary response gradually disappears. This process is known as **extinction**. The conditioned response is *extinguished* when the conditioned stimulus no longer predicts the unconditioned stimulus (**FIGURE 6.4**).

But suppose the delicious plant blooms only during a certain time of year. The adaptive response is to check back once in a while to see if the plant blooms after rain. In the lab, an analogous situation occurs when the conditioned stimulus is presented a long time after extinction. Sounding the metronome will once again produce the conditioned response of salivation (see Figure 6.4). Such **spontaneous recovery**, in which the extinguished CS again produces a CR, is temporary and will fade quickly unless the CS is again paired with the US. Even a single pairing of the CS with the US will re-establish the CR, which will then again diminish if CS-US pairings do not continue. Thus extinction inhibits



**FIGURE 6.4** Extinction and Spontaneous Recovery

(reduces the strength of) the associative bond but does not eliminate it. Extinction is a form of learning that overwrites the previous association; what is learned is that the original association no longer holds true (i.e., the metronome no longer signals that it will be followed by meat; Bouton, 1994; Bouton, Westbrook, Corcoran, & Maren, 2006).

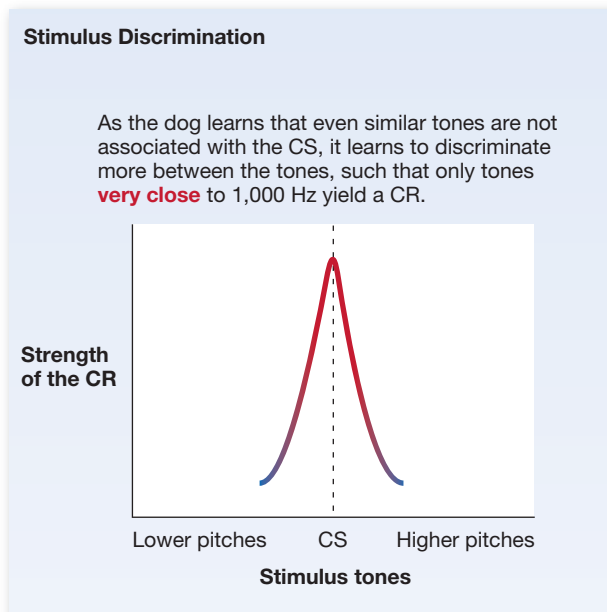
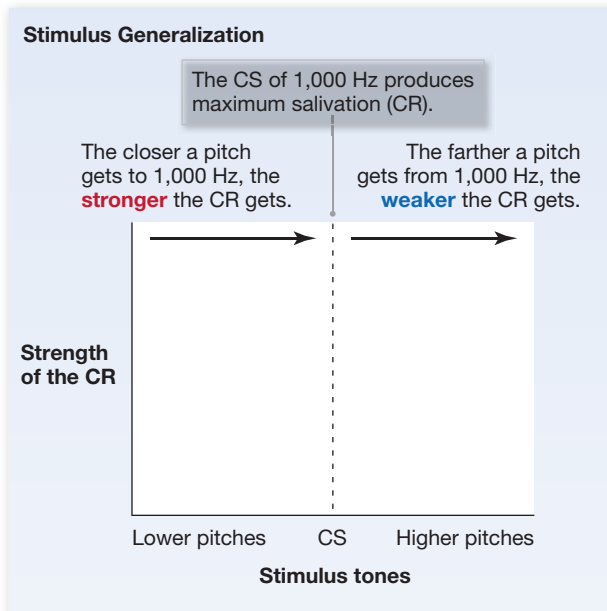
### GENERALIZATION, DISCRIMINATION, AND SECOND-ORDER CONDITIONING

In any learning situation, hundreds of possible stimuli can be associated with the unconditioned stimulus to produce the conditioned response. How does the brain determine which stimulus is—or which stimuli are—relevant? For instance, suppose we classically condition a dog so that it salivates (CR) when it hears a 1,000-hertz (Hz) tone (CS). After the CR is established, tones similar to 1,000 Hz will also produce salivation, but the farther the tones are from 1,000 Hz, the less the dog will salivate. **Stimulus generalization** occurs when stimuli similar but not identical to the CS produce the CR. Generalization is adaptive because in nature the CS is seldom experienced repeatedly in an identical fashion. Slight differences in variables, such as background noise, temperature, and lighting, lead to slightly different perceptions of the CS, so animals learn to respond to variations in the CS.

Of course, generalization has limits. Sometimes it is important for animals to distinguish among similar stimuli. For instance, two plant species might look similar, but one might be poisonous. In **stimulus discrimination**, animals learn to differentiate between two similar stimuli if one is consistently associated with the

**stimulus generalization** Occurs when stimuli that are similar but not identical to the conditioned stimulus produce the conditioned response.

**stimulus discrimination** A differentiation between two similar stimuli when only one of them is consistently associated with the unconditioned stimulus.



**FIGURE 6.5** Stimulus Generalization and Stimulus Discrimination

**phobia** An acquired fear that is out of proportion to the real threat of an object or of a situation.

unconditioned stimulus and the other is not (**FIGURE 6.5**). Pavlov and his students demonstrated, for example, that dogs can learn to make very fine distinctions between similar stimuli, such as subtle differences in shades of grey.

Sometimes a conditioned stimulus becomes directly associated not with an unconditioned stimulus but rather with other stimuli associated with the US, a phenomenon known as *second-order conditioning*. In one of Pavlov's early studies, a CS-US bond was formed between a tone and food so that the tone (CS) led to salivation (CR). In a second training session, a black square was repeatedly presented at the same time as the tone. There was no US (no presentation of the meat) during this phase of the study. After a few trials, the black square was presented alone, and it also produced salivation. Second-order conditioning helps account for the complexity of learned associations, especially in people. For instance, money is usually just paper or cheap metal, but it means something entirely different. People's association between that paper or that metal and what it can buy makes them want to have the money. As discussed below, second-order conditioning makes money feel rewarding for those who receive it or wish to receive it. Similarly, advertisers often hire popular celebrities to endorse products, because when people associate familiar, famous, and/or powerful figures with particular brands, they generally develop positive attitudes about those brands (**FIGURE 6.6**). Even though second-order conditioning powerfully influences many of our beliefs and attitudes, most of it occurs implicitly, without our awareness or intention.

## Phobias and Addictions Have Learned Components

Classical conditioning helps explain many behavioural phenomena, including phobias and addictions.

**PHOBIAS AND THEIR TREATMENT** A **phobia** is an acquired fear out of proportion to the real threat (phobias are discussed further in Chapter 14, "Psychological Disorders"). Common phobias include the fears of heights, of dogs, of insects, of snakes, and of the dark. According to classical-conditioning theory, phobias develop through the generalization of a fear experience, as when a person stung by a wasp develops a fear of all flying insects.

Animals can be classically conditioned to fear neutral objects, a process known as *fear conditioning*. For example, if an animal repeatedly is presented with a flash of light followed each time by a moderately painful electric shock, that animal soon will display physiological and behavioural responses indicating fear, such as change in heart rate, whenever it sees a flash of light. As discussed later in this chapter, psychological scientists now know a great deal about the biological basis of fear conditioning. Since the 1990s, researchers have made enormous progress in understanding how the brain learns to fear an object or a situation, how such a learned fear can help an animal learn to avoid danger, and how the experience of fear can strengthen learning for important events. The most important brain structure for fear conditioning is the amygdala (see Figure 3.24); without the amygdala, fear conditioning will not happen.

An early case study demonstrating the role of classical conditioning in the development of phobias was John B. Watson's teaching of an infant named Albert B. to fear neutral objects. It is important to note Watson's motives for conditioning "Little Albert." At the time, 1919, the prominent theory of phobia was based on Freudian ideas about unconscious repressed sexual desires. Believing that Freudian ideas were unscientific and unnecessarily complex, Watson proposed that phobias could be explained by simple learning principles, such as classical conditioning. To test his hypothesis, Watson devised a learning study. He asked a woman he knew to let him use her son, Albert B., in the study. Because this child was emotionally stable, Watson believed the experiment would cause him little harm. When Albert was nine months old, Watson and his lab assistant, Rosalie Rayner, presented him with various neutral objects, including a white rat, a rabbit, a dog, a monkey, costume masks, and a ball of white wool. Albert showed a natural curiosity regarding these items, but displayed no overt emotional responses.

When Albert was eleven months old, Watson and Rayner began the conditioning trials. This time, as they presented the white rat and Albert reached for it, Watson smashed a hammer into an iron bar, producing a loud clanging sound. The sound scared the child, who immediately withdrew and hid his face. Watson did this a few more times at intervals of five days until Albert would whimper and cringe when the rat was presented alone. Thus the US (smashing sound) led to a UR (fear), and eventually the pairing of the CS (rat) and US (smashing sound) led to the rat producing fear (CR) on its own. The fear response generalized to other stimuli that Watson had presented along with the rat at the initial meeting, and Albert eventually became frightened of them all, including the rabbit and the ball of wool. Even a Santa Claus with a white beard produced a fear response. Thus classical conditioning was shown to be an effective method of inducing phobia (FIGURE 6.7).

Watson had planned to conduct extinction trials to remove the learned phobias, but Albert's mother removed him from the study before Watson could conduct those trials. For many years, no one seemed to know what had become of Little Albert. His fate was one of psychology's great mysteries. Finally, an investigative team led by the psychologist Hall Beck uncovered evidence that Little Albert was actually Douglas Merritte. Merritte died at age six, likely of meningitis (a brain infection; Beck, Levinson, & Irons, 2009). Watson's conditioning of Albert has long been criticized as unethical, and nowadays an ethics committee likely would not approve such a study. In his detailed plans for the reconditioning, however, Watson described a method of continually presenting the feared items to Albert paired with more pleasant things, such as candy. Such classical-conditioning techniques have since proven valuable for developing very effective behavioural therapies to treat phobias. For instance, exposing people to small doses of the feared stimulus while having them engage in a pleasurable task, a technique called *counterconditioning*, can help people overcome a fear. The behavioural therapist Joseph Wolpe has developed a formal treatment based on counterconditioning, *systematic desensitization* (Wolpe, 1997): After patients are taught how to relax their muscles, they are asked to imagine the feared object or situation while continuing to use the relaxation exercises. Eventually, the patients are exposed to the feared stimulus while they are relaxing. The general idea is that the  $CS \rightarrow CR_1$  (fear) connection can be broken by developing a  $CS \rightarrow CR_2$  (relaxation) connection. As discussed in Chapter 15, it is now believed that repeated exposure to the feared stimulus is more important than relaxation in breaking the fear connection.



**FIGURE 6.6 Second-Order Conditioning**  
Advertisers hope to influence attitudes and behaviour by pairing popular celebrities with products, such as the soccer star David Beckham with this cologne.

## FIGURE 6.7 Scientific Method: Watson's "Little Albert" Experiment

**Hypothesis:** Phobias can be explained by classical conditioning.

**Research Method:**

- 1 Little Albert was presented with neutral objects, such as a white rat and costume masks, that provoked a neutral response.
- 2 During conditioning trials, when Albert reached for the white rat (CS) a loud clanging sound (US) scared him (UR).



**Results:** Eventually, the pairing of the rat (CS) and the clanging sound (US) led to the rat producing fear (CR) on its own. The fear response generalized to other stimuli presented with the rat initially, such as the costume masks.



**Conclusion:** Classical conditioning can cause participants to fear neutral objects.



### FIGURE 6.8 Conditioned Addiction

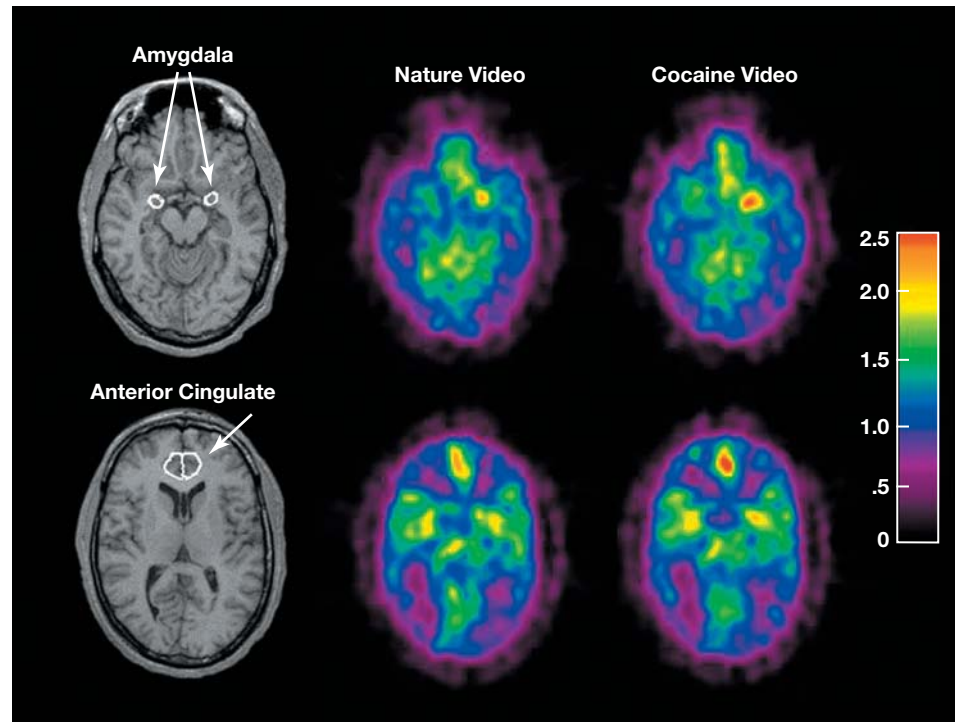
The Toronto-born former teen idol Corey Haim (right, with fellow actor Corey Feldman) died in March 2010, at age 38, after a long battle with drug addiction. According to media accounts, Haim began using drugs when he was 16, and despite several attempts at rehabilitation he continued to abuse drugs until his death. The direct cause of death was pneumonia, but Haim's long-term addiction likely sabotaged his career and his physical health.

**DRUG ADDICTION** Classical conditioning also plays an important role in drug addiction. Conditioned drug effects are common and demonstrate conditioning's power. For example, the smell of coffee can become a conditioned stimulus, one that leads coffee drinkers to feel activated and aroused as though they have actually consumed caffeine. Likewise, for heroin addicts, the sight of the needle and the feeling when it is inserted into the skin become a CS, so addicts sometimes inject themselves with water to reduce their cravings when heroin is unavailable. Sometimes, the sight of a straight-edge razor blade, which is often used to "cut" heroin, can briefly increase drug addicts' cravings. When former heroin addicts are exposed to environmental cues associated with their drug use, they often experience cravings (Siegel, 2005). Not satisfying these cravings can lead the addict to experience *withdrawal*, the unpleasant state of tension and anxiety that occurs when addicts stop using drugs. Addicts who quit using drugs in treatment centres often relapse when they return to their old environments because they experience conditioned craving (FIGURE 6.8).

In the laboratory, presenting heroin addicts or cocaine addicts with cues associated with drug ingestion leads to cravings and various physiological responses associated with withdrawal, such as changes in heart rate and blood pressure. Brain imaging studies have found that such cues lead to activation of the prefrontal cortex and various regions of the limbic system, areas of the brain involved in the experience of reward (Volkow et al., 2008). Seeing a tantalizing food item when you are hungry activates these same brain regions, as you anticipate enjoying your tasty meal. In the same way, the sight of drug cues produces an expectation that

the drug high will follow (FIGURE 6.9). According to the McMaster University psychologist Shepard Siegel (2005), it is therefore important that treatment for addiction includes exposing addicts to drug cues. Such exposure helps extinguish responses, in the brain and the rest of the body, to those cues. Thus the cues are prevented from triggering cravings in the future.

Siegel and his colleagues have also conducted research into the relationship between drug tolerance effects and situation. As discussed in Chapter 4, tolerance is a process by which addicts need more and more of a drug to experience the same effects. Siegel's research has shown that tolerance effects are greatest when the drug is taken in the same location as previous drug use occurred in, presumably because the body has learned to expect the drug in that location and then to compensate for the drug, such as by altering neurochemistry or physiology to metabolize it. For example, university students show greater tolerance to alcohol when it is provided with familiar cues (e.g., a drink that looks and tastes like beer) than when the same amount of alcohol is provided in a novel form (e.g., a blue, peppermint-flavoured drink; Siegel, Baptista, Kim, McDonald, & Weise-Kelly, 2000). Tolerance can be so great that addicts regularly use drug doses that would be fatal for the inexperienced user. Conversely, Siegel's findings imply that if addicts take their usual large doses in novel settings, they are more likely to overdose, because their bodies will not respond sufficiently to compensate for the drugs (Siegel, 1984; Siegel, Hinson, Krank, & McCully, 1982).



**FIGURE 6.9** PET Scans Showing Activation of Limbic System Structures  
Cocaine addicts were shown videos of nature scenes and of cocaine cues. The cocaine-related videos sparked activation in brain regions associated with reward, such as the anterior cingulate and the amygdala. These areas would not have been activated by nature scenes alone. (Areas with greatest activation are shown in red.)

## Classical Conditioning Involves More Than Events Occurring at the Same Time

Pavlov's original explanation for classical conditioning was that any two events presented in contiguity would produce a learned association. Pavlov and his followers believed that the association's strength was determined by factors such as the intensity of the conditioned and unconditioned stimuli, such that greater intensity would increase learning. (A louder metronome or larger piece of meat would produce stronger associations than a softer metronome or smaller piece of meat.) In the mid-1960s, a number of challenges to Pavlov's theory suggested that some conditioned stimuli would more likely produce learning than others and that contiguity was not sufficient to create CS-US associations.

**EVOLUTIONARY SIGNIFICANCE** According to Pavlov, any object or phenomenon could be converted into a conditioned stimulus during conditioning trials. Thus, for example, any light, tone, colour, or odour could be associated with any unconditioned stimulus (e.g., a piece of meat or a loud sound). Apparently, however, not all stimuli are equally effective in producing learning. Research conducted by the American psychologist John Garcia and his colleagues showed that certain pairings of stimuli



(a)



(b)

**FIGURE 6.10** **Conditioned Food Aversion in Animals** (a) After eating a monarch butterfly, (b) this blue jay vomited and thus learned to avoid eating anything that looks like the butterfly.

are more likely to become associated than others. For instance, when animals receive nonlethal amounts of poison in their food that make them ill, they quickly learn to avoid the tastes or smells associated with the food (Garcia & Koelling, 1966).

Likewise, most people can recall a time when they ate a particular food and then became ill with nausea, stomach upset, and vomiting. Whether or not the food caused the illness, even if the illness clearly was caused by a virus or some other condition, most people respond to this sequence of events with a *conditioned food aversion*, especially if the food was not part of the person's usual diet. The association between eating a novel food and getting sick, even when the illness occurs hours after eating, is so strong that a food aversion can be formed in one trial (**FIGURE 6.10**). Some people cannot stand even the smell of a food they associate with a stomach-related illness.

Conditioned food aversions are easy to produce with smell or taste, but they are very difficult to produce with light or sound. This difference makes sense, since smell and taste are the main cues that guide animals' eating behaviours. From an evolutionary viewpoint, animals that quickly associate a certain flavour with illness, and therefore avoid that flavour, will be more successful—that is, likely to survive and pass along their genes.

Research has shown that monkeys can more easily be conditioned to fear snakes than to fear objects such as flowers or rabbits (Cook & Mineka, 1989). The American psychologist Martin Seligman (1970) has argued that animals are genetically programmed to fear specific objects; he refers to this programming as *biological preparedness*. Preparedness helps explain why animals tend to fear potentially dangerous things (e.g., snakes, fire, heights) rather than objects that pose little threat (e.g., flowers, shoes, babies). Also, when people participate in conditioning experiments in which aversive stimuli are paired with members of their own racial group or members of a different racial group, they more easily associate the negative stimuli with outgroup members (Olsson, Ebert, Banaji, & Phelps, 2005). This finding indicates that people might be predisposed to wariness of outgroup members, presumably since outgroup members have been more dangerous over the course of human evolution. This tendency has sometimes been exploited to create or enhance prejudice toward out-groups during wars and other intergroup conflicts. For example, as the Nazis prepared for and conducted their extermination of Jews during World War II, they created films in which Jews' faces morphed into those of rats crawling in filth. By showing these images to the German population, the Nazis aimed to condition a national repulsion response to facial features associated with being Jewish. (Videos of these films are available for viewing at the Museum of Tolerance, in Los Angeles, California.)

At the most general level, contemporary researchers are interested in how classical conditioning helps animals learn adaptive responses (Hollis, 1997; Shettleworth, 2001). The adaptive value of a particular response varies according to the animal's evolutionary history. For example, taste aversions are easy to condition in rats but difficult to condition in birds because in selecting food, rats rely more on taste and birds rely more on vision. Accordingly, birds quickly learn to avoid a visual cue they associate with illness. Different types of stimuli cause different reactions even within a species. Rats freeze and startle if a CS is auditory, but rise on their hind legs if the CS is visual (Holland, 1977). Such differences in learned adaptive responses may reflect the meanings of, and potential dangers associated with, auditory and visual stimuli in particular environments.

## Real World PSYCHOLOGY

**GENDER DIFFERENCES IN LEARNING** Behaviours we learn most easily are adaptive in an evolutionary sense, but how important are the principles of evolution in



understanding everyday aspects of human behaviour? One area that has generated considerable research and controversy is how differently men and women learn their ways around a given environment. The argument for expecting differences is that for most of human history people lived in hunter-gatherer societies, in which women gathered edible vegetation, usually returning home each day, and men travelled longer distances as they hunted for the animals that made up the protein portion of the societies' diets. In addition, the argument goes, since women spent much of their adult lives pregnant or nursing, they did not travel as much as men, and thus women generally did not develop the ability to learn their way through an environment as well as men did.

Researchers have revealed some differences in how females and males learn to navigate. Their studies suggest that when females learn a route, either from a map or from direct experience, they tend to rely on landmarks to find the way, whereas males more likely will attend to and keep track of the compass direction in which they are travelling (Lawton, 1994). Similarly, when adults learn a route from a map, males make fewer errors in getting to the destination, but females better recall landmarks along the way (Galea & Kimura, 1993). Research that compared maze route learning found that female university students were more likely to use a learning strategy that consisted of a series of turns (e.g., right, right, left, right) and male university students were more likely to use a "place" strategy that required keeping track of the general direction of a goal (Schmitzer-Torbert, 2007). Thus women will more likely use landmarks and memorize a series of terms when navigating through space; males will more likely keep track of cardinal directions (north, south, etc.). When the participants could use either strategy, the men learned the task more quickly, but with additional trials, the women's performances were identical to the men's.

#### CRITICAL THINKING SKILL

### Recognizing and Avoiding Inappropriate Association Effects in Reasoning

One basic principle in psychology is that if two events occur close together in time and/or space, people will form an association between them. This idea underlies conditioning—a person or animal is conditioned to expect that when one event occurs, the associated event will occur. Sometimes, this expectation is perfectly reasonable, but other times, a person's thinking is biased because someone else has deliberately exploited the natural tendency to make associations. Association techniques are widely used in the political arena, for example, especially to create *guilt by association*. A typical approach is to associate Person A, usually a friend or relative of a political candidate, with something bad. Person B, the candidate, is then associated with Person A. The inference is that Person B shares the same bad characteristics associated with Person A. Suppose you read in the newspaper that a mass murderer endorsed a parliamentary candidate. This endorsement could be detrimental to the candidate, even if he or she did not desire it and did nothing to promote it. Once you are aware of the deliberate use of guilt by association, you will find examples in every election. Read over the various charges leveled against political candidates, and you will find exactly this sort of (generally) faulty reasoning.

Guilt by association occurs in a wide range of contexts. If you have a friend or relative who belongs to a terrorist group, the negative associations



**(a)** **(b)**  
**FIGURE 6.11 Positive Associations and Political Gains** (a) Indira Gandhi, right, enjoyed great popularity as prime minister of India, partly because of her association with family members such as her father, Jawaharlal Nehru, a former prime minister and powerful figure in the Indian independence movement. (b) The U.K.'s Prince William enjoys great popularity. Here, he is greeted in Sydney, Australia, in January 2010, by a woman holding a picture of his beloved mother, Diana, the late Princess of Wales.

of belonging to a terrorist group may be associated with you. The association may be logical—perhaps you went to group meetings with your friend but did not join the group. Without additional evidence, however, the association will more likely be misleading.

Similarly, people can perceive virtue by association. If your brother or sister volunteers to build homes for the homeless, some of this virtue will likely be associated with you. Virtue by association is one reason political dynasties exist in many countries throughout the world. For example, the late Benazir Bhutto was twice elected prime minister of Pakistan, her popularity enhanced by her father's success as prime minister. Indira Gandhi served as prime minister of India for three consecutive terms, her popularity enhanced by the success of her political family, especially that of her father, Jawaharlal Nehru. In the U.K., many people reportedly would like Prince William to be the next head of the monarchy, perhaps because of the popularity of his mother Diana, the late Princess of Wales. In thinking about political candidates or heads of state—or even the people we meet in our everyday lives—we need to consider their individual characteristics and not assume they are similar to people they are related to or know (**FIGURE 6.11**).

**THE COGNITIVE PERSPECTIVE** Until the 1970s, most learning theorists were concerned only with observable stimuli and observable responses. Since then, learning theorists have placed a greater emphasis on trying to understand the mental processes that underlie conditioning. An important principle that has emerged from this work is that classical conditioning is a means by which animals come to *predict* the occurrence of events. Psychological scientists' increasing consideration of mental processes such as prediction and expectancy is called the *cognitive perspective* on learning (Hollis, 1997).

The psychologist Robert Rescorla (1966) conducted one of the first studies highlighting cognition's role in learning. He argued that for learning to take place, the conditioned stimulus must accurately predict the unconditioned stimulus. For instance, a stimulus that occurs *before* the US is more easily conditioned than one that comes *after* it. Even though the two are both contiguous presentations with

the US (close to it in time), the first stimulus is more easily learned because it predicts the US. Indeed, as mentioned above, across all conditioning situations, some delay between the CS and the US is optimal for learning. The length of delay varies depending on the natures of the conditioned and unconditioned stimuli. For instance, eyeblink conditioning occurs when a sound (CS) is associated with a puff of air blown into the eye (US), which leads to a blink. Optimal learning for eyeblink conditioning is measured in milliseconds. By contrast, conditioned food aversions often take many hours, since the ill effects of consuming poisons or food that has gone bad may not be felt for hours after eating.

The cognitive model of classical learning, published by Rescorla and his colleague Allan Wagner, profoundly changed our understanding of learning (Rescorla & Wagner, 1972). The **Rescorla-Wagner model** states that the strength of the CS-US association is determined by the extent to which the US is unexpected or surprising. The greater the surprise of the US, the more effort an organism puts into trying to understand its occurrence so that it can predict future occurrences. The result is greater classical conditioning of the event (CS) that predicted the US. Say you always use an electric can opener to open a can of dog food. Your dog associates the sound of the can opener (CS) with the appearance of food (US), so it wags its tail and runs around in circles when it hears that sound. Now say the electric can opener breaks and you replace it with a manual one. Without hearing the sound of the electric can opener, your dog receives food. According to Rescorla and Wagner, the unexpected appearance of the food (US) will cause your dog to attend to events in the environment that might have produced the food. Your dog soon will learn to associate being fed with your use of the new opener.

Consistent with the Rescorla-Wagner model, novel stimuli are more easily associated with the unconditioned stimulus than are familiar stimuli. For example, dogs can be conditioned more easily with smells novel to them (such as that of almonds) than with smells they know (that of dog biscuits, perhaps). Once learned, a conditioned stimulus can prevent the acquisition of a new conditioned stimulus, a phenomenon known as the *blocking effect*. For example, a dog that has learned that the smell of almonds (CS) is a good predictor of food (US) does not need to look for other predictors. Furthermore, a stimulus associated with a CS can act as an *occasion setter*, or trigger, for the CS (Schmajuk, Lamoureaux, & Holland, 1998). For example, a dog might learn that the smell of almonds predicts food when the smell is preceded by a sound or by a flash of light and not at other times. The sound or light indicates whether the association between the smell of almonds and food is active.

**Rescorla-Wagner model** A cognitive model of classical conditioning; it states that the strength of the CS-US association is determined by the extent to which the unconditioned stimulus is unexpected.

## SUMMING UP

### How Did the Behavioural Study of Learning Develop?

Behaviourism, founded by John B. Watson, focuses on observable aspects of learning. Ivan Pavlov developed the classical-conditioning theory to account for the learned association between neutral stimuli and reflexive behaviours. Conditioning occurs when the conditioned stimulus becomes associated with the unconditioned stimulus. For learning to occur, the conditioned stimulus needs to reliably predict the unconditioned stimulus, not simply be contiguous with it. The cognitive model that accounts for most conditioning phenomena is the Rescorla-Wagner model, which states that the amount of conditioning is determined by the extent to which the US is unexpected or surprising, with stronger effects when a novel or unusual CS is used in conditioning.

## ▶ MEASURING UP

1. Which of the following are true statements about conditioning? Check as many as apply.
  - a. Conditioning is one kind of learning.
  - b. Only nonhuman animals can be conditioned.
  - c. B. F. Skinner used rats and pigeons in most of his research because he was not concerned with human learning.
  - d. Conditioning usually involves the association of two events that occur close in time.
  - e. Conditioning does not meet the definitional criteria for learning because the association can be extinguished, or unlearned.
  - f. Learning results only from experiences.
  - g. Learning involves short-term changes in behaviour.
  - h. Classical and operant conditioning are the same.
  - i. Skinner came to appreciate the introspection methods used by his professors.
  - j. Differences between females' and males' strategies in virtual maze tasks have been used to argue for evolutionary influences on learning.
2. John B. Watson had planned to extinguish Little Albert's conditioned response to, for example, the rat. Which of the following techniques would have achieved that goal?
  - a. Repeatedly showing Little Albert the rat without making a loud sound.
  - b. Making a loud sound every time a different and unrelated object was presented.
  - c. Teaching Little Albert to strike the bar so he could make the loud sound.
  - d. Repeatedly making a loud sound when related objects, such as the ball of wool, were presented.

### LEARNING OBJECTIVES

List the similarities and differences between operant and classical conditioning.

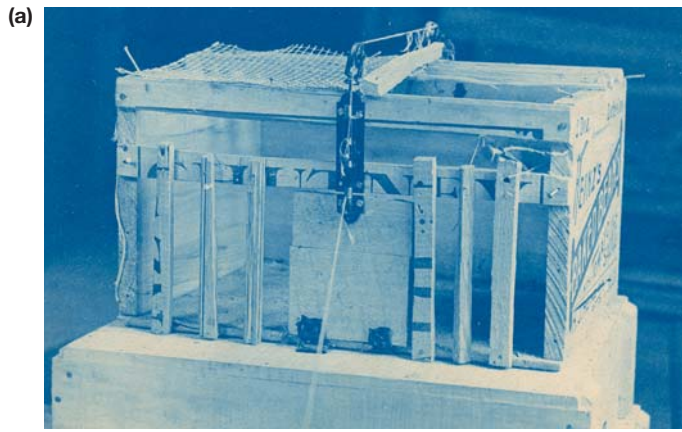
Explain how variable and ratio schedules of reinforcement combine with positive reinforcement, negative reinforcement, and punishment, to affect behaviour.

**operant conditioning, or instrumental conditioning** A learning process in which the consequences of an action determine the likelihood that it will be performed in the future.

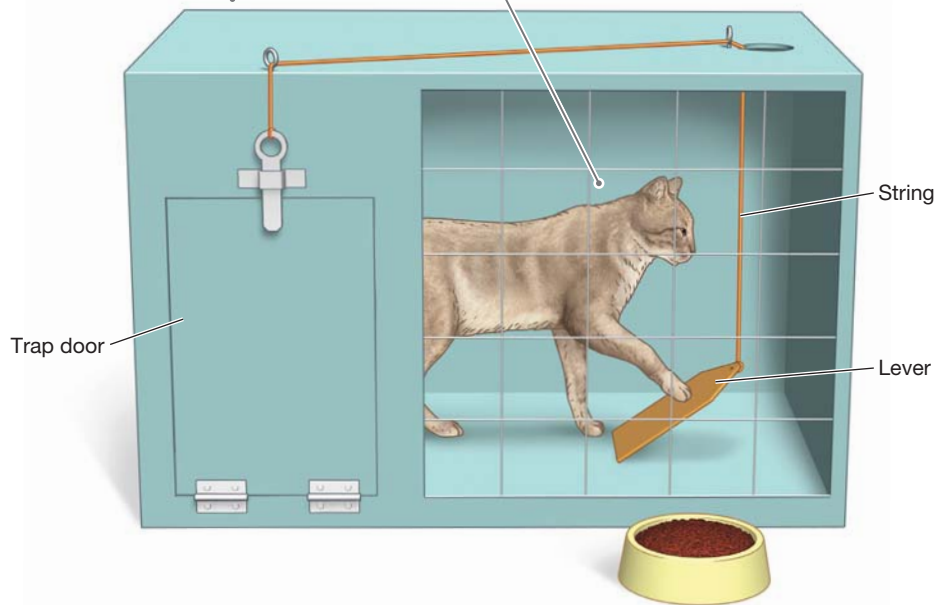
## How Does Operant Conditioning Differ from Classical Conditioning?

Classical conditioning is a relatively passive process in which a person or animal associates events that occur together in time, regardless of what the person or animal does beyond that. This form of conditioning does not account for the many times that one of the events occurs because the person or animal has taken some action. Our behaviours often represent means to particular ends. We buy food to eat it, we study to get good grades, we work to receive money, and so on. Thus many of our actions are *instrumental*—done for a purpose. We learn that behaving in certain ways leads to rewards, and we learn that not behaving in other ways keeps us from punishment; these processes are called **operant conditioning, or instrumental conditioning**. B. F. Skinner, the psychologist most closely associated with this type of learning, selected the term *operant* to express the idea that animals operate on their environments to produce effects. Operant conditioning is the learning process in which an action's consequences determine the likelihood that the action will be performed in the future.

The study of operant conditioning began in the basement of the Harvard psychologist William James's house in Cambridge, Massachusetts, in the late nineteenth century. A young graduate student working with James, Edward Thorndike, had been influenced by Darwin and was studying whether nonhuman animals showed signs of intelligence. As part of his research, Thorndike built a *puzzle box*, a small cage with a trap door (**FIGURE 6.12A**). The trap door would open if the animal inside



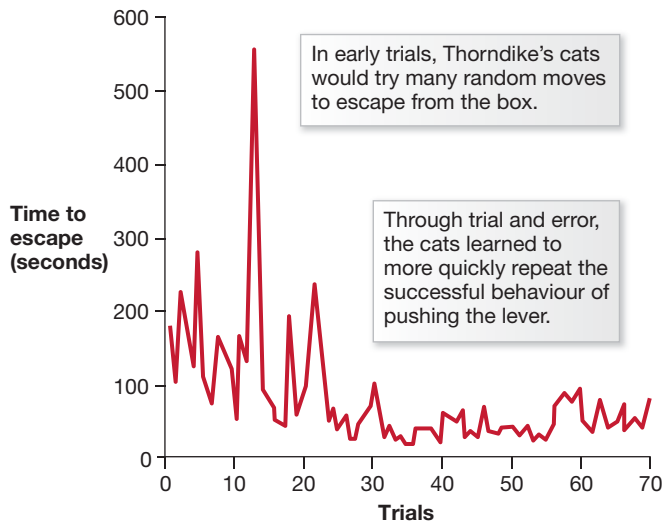
- (b)
- 1 The cat is placed in the box, and food is placed outside where the cat can see it.
  - 2 After several attempts to get out, the cat accidentally presses the lever, the door opens, and the cat eats.
  - 3 The cat is put back in the box and more quickly presses the lever to get out.



**FIGURE 6.12 Thorndike's Puzzle Box**  
Thorndike used a primitive puzzle box, such as the one depicted here, to assess learning in animals.

performed a specific action, such as pulling a string. Thorndike placed food-deprived animals, initially chickens, inside the puzzle box to see if they could figure out how to escape. When Thorndike moved to Columbia University to complete his Ph.D., he switched from using chickens to using cats in his studies. To motivate the cats, he would place food just outside the box. When a cat was first placed in the box, it usually attempted to escape through numerous nonproductive behaviours. After 5 to 10 minutes of struggling, the cat would *accidentally* pull the string, and the door would open. Thorndike would then return the cat to the box and repeat the trial. Thorndike found that the cat would pull the string more quickly on each subsequent trial, until it soon learned to escape from the puzzle box within seconds (**FIGURE 6.12B**). From this line of research, Thorndike developed a general theory of learning, the **law of effect**, which states that any behaviour leading to a “satisfying state of affairs” will more likely occur again, while any behaviour leading to an “annoying state of affairs” will less likely occur again (**FIGURE 6.13**).

**law of effect** Thorndike's general theory of learning: Any behaviour that leads to a “satisfying state of affairs” will more likely occur again, and any behaviour that leads to an “annoying state of affairs” will less likely recur.



**FIGURE 6.13 Law of Effect** By studying cats' attempts to escape from a puzzle box, Thorndike was able to formulate his general theory of learning.

**reinforcer** A stimulus that follows a response and increases the likelihood that the response will be repeated.

**shaping** A process of operant conditioning; it involves reinforcing behaviours that are increasingly similar to the desired behaviour.

**FIGURE 6.14 Skinner Box**  
**(a)** B. F. Skinner and one of his subjects demonstrate **(b)** the Skinner box.



## Reinforcement Increases Behaviour

Thirty years after Thorndike, another Harvard graduate student in psychology, B. F. Skinner, developed a more formal learning theory based on the law of effect. As discussed at the beginning of this chapter, Skinner had been greatly influenced by John B. Watson and shared his philosophy of behaviourism. He therefore objected to the subjective aspects of Thorndike's law of effect: States of "satisfaction" are not observable empirically. Skinner coined the term *reinforcer* to describe an event that produces a learned response. A **reinforcer** is a stimulus that occurs after a response and increases the likelihood that the response will be repeated. Skinner believed that behaviour—studying, eating, driving on the proper side of the road, and so on—occurs because it has been reinforced.

**THE SKINNER BOX** To assess operant conditioning, Skinner developed a simple device, a small chamber or cage in which one lever or response key is connected to a food supply, another to a water supply. An animal, usually a rat or pigeon, is placed in the chamber or cage; it learns to press one lever or key to receive food, the other lever or key to receive water. In his earlier research, Skinner had used a maze in which a rat had to take a specific turn to get access to the reinforcer, usually a small piece of food in the goal box. After the rat completed a trial, Skinner had to return the rat to the maze's beginning. He developed the *operant chamber*, as he called it, basically because he got tired of fetching rats. With the device—which came to be known as the *Skinner box*, although he never used that term—he could expose rats or pigeons to repeated conditioning trials without having to do anything but observe (**FIGURE 6.14**). Skinner later built mechanical recording devices that allowed the experimenter to conduct trials without being present.

**SHAPING** When performing operant conditioning, you cannot provide the reinforcer until the person or animal displays the appropriate response. An animal inside the Skinner box has so little to do that it typically presses the lever or key sooner rather than later. One major problem with operant conditioning outside the Skinner box is that the same animal might take a while to perform the action you are looking for. Rather than wait for the animal to spontaneously perform the action, you can use an operant-conditioning technique to teach the animal to do so. This powerful process, **shaping**, involves reinforcing behaviours that are increasingly similar to the desired behaviour. Suppose you are trying to teach your dog to roll over. You initially reward your dog for any behaviour that even slightly

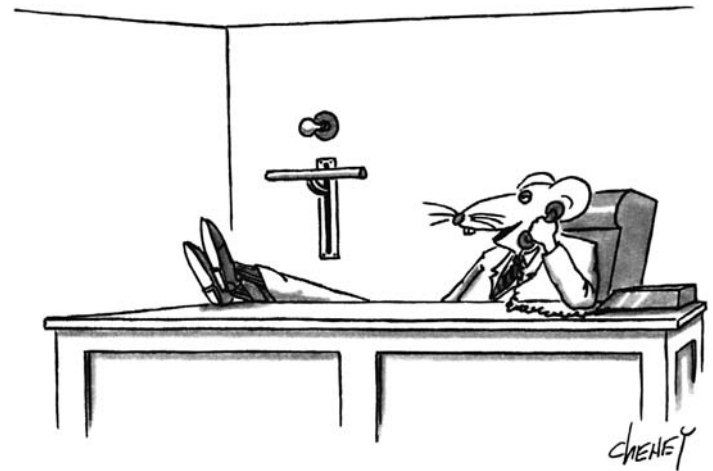
resembles rolling over, such as lying down. Once this behaviour is established, you reinforce behaviours more selectively. Reinforcing *successive approximations* eventually produces the desired behaviour by teaching the animal to discriminate which behaviour is being reinforced. Shaping has been used to condition animals to perform amazing feats: pigeons playing table tennis, dogs playing the piano, pigs doing housework such as picking up clothes and vacuuming, and so on (FIGURE 6.15). Shaping has also been used to teach appropriate social skills to mentally ill people; to teach language to children with autism; and to teach basic skills, such as dressing themselves, to mentally retarded individuals. More generally, parents and educators often use shaping to encourage appropriate behaviour in children, such as praising children for their initial—often illegible—attempts at handwriting.

**REINFORCERS CAN BE CONDITIONED** The most obvious reinforcers are those necessary for survival, such as food or water. Those that satisfy biological needs are called *primary reinforcers*. From an evolutionary standpoint, the learning value of primary reinforcers makes a great deal of sense, since organisms that repeatedly perform behaviours reinforced by food and water are more likely to survive and pass along their genes. But many apparent reinforcers do not directly satisfy biological needs. For example, a compliment, money, or an *A* on a paper can be reinforcing. Events or objects that serve as reinforcers but do not satisfy biological needs are called *secondary reinforcers*. These reinforcers are established through classical conditioning, as described earlier in this chapter: We learn to associate a neutral stimulus, such as money (CS), with rewards such as food, security, and power (US). Money is really only pieces of metal or of paper, but these and other neutral objects become meaningful through their associations with unconditioned stimuli.

**REINFORCER POTENCY** Some reinforcers are more powerful than others. An integrative theory of reinforcement was proposed by the American psychologist David Premack, who theorized that a reinforcer's value could be determined by the amount of time an organism engages in a specific associated behaviour when free to do anything. For instance, most children would choose to spend more time eating ice cream than eating spinach, so ice cream appears to be more reinforcing for children. One great advantage of Premack's theory is that it can account for differences in individuals' values. For people who prefer spinach to ice cream, spinach serves as a more potent reinforcer. A logical extension of Premack's theory, the *Premack principle*, is that a more valued activity can be used to reinforce the performance of a less valued activity. Parents use the Premack principle all the time: "Eat your spinach and then you'll get dessert," "Finish your homework and then you can go out," and so on.

## Both Reinforcement and Punishment Can Be Positive or Negative

Reinforcement and punishment have the opposite effects on behaviour. Whereas reinforcement increases a behaviour's probability, punishment decreases its probability. For example, feeding a rat after it presses a lever will increase the probability that the rat will press the lever; giving a rat an electric shock after it presses a lever



"Oh, not bad. The light comes on, I press the bar, they write me a check. How about you?"



**FIGURE 6.15 Shaping** Shaping can be used to train animals to perform extraordinary behaviours. Here, a trained dog water skis for a boat show.



**FIGURE 6.16 Punishment as a Deterrent** Mohamed Harkat was a deliveryman for Pizza Pizza in Canada for seven years, but the Canadian Security Intelligence Service contend that he was also an agent for the terrorist group al-Qaeda. He was imprisoned and then released in 2006, but he was put under house arrest and forced to wear an electronic tracking device on his ankle while fighting deportation.

**positive reinforcement** The increase in the probability of a behaviour's being repeated following the administration of a stimulus.

**negative reinforcement** The increase in the probability of a behaviour's being repeated through the removal of a stimulus.

**positive punishment** Punishment that occurs with the administration of a stimulus and thus decreases the probability of a behaviour's recurring.

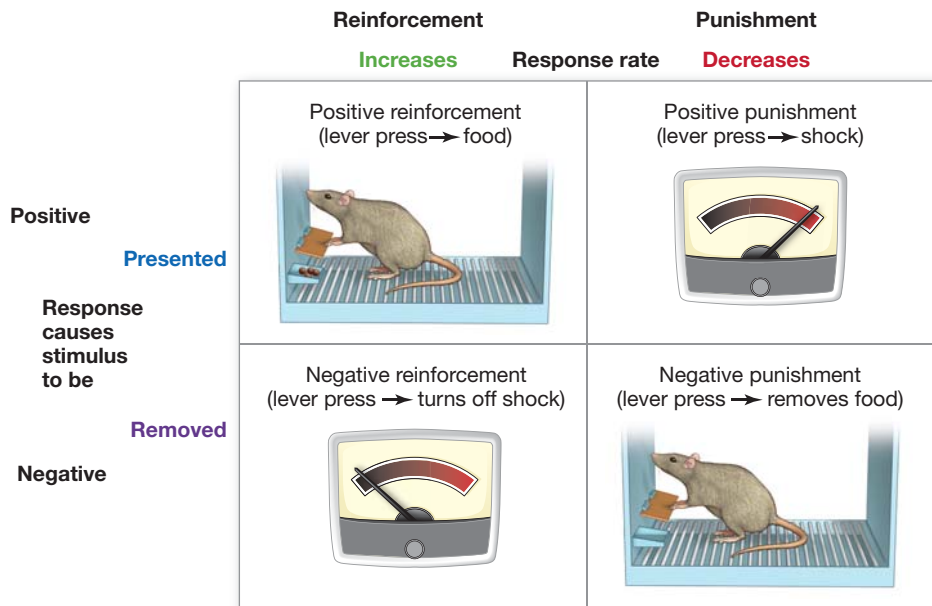
**negative punishment** Punishment that occurs with the removal of a stimulus and thus decreases the probability of a behaviour's recurring.

**FIGURE 6.17 Negative and Positive Reinforcement, Negative and Positive Punishment**

will decrease that action's probability. Both reinforcement and punishment can be positive or negative, depending on whether something is given or removed, not on whether any part of the process is good or bad.

**POSITIVE AND NEGATIVE REINFORCEMENT** Through the administration of a stimulus, **positive reinforcement** increases the probability that a behaviour will be repeated. Positive reinforcement sometimes involves *reward*. Rewarded behaviours increase in frequency, as when people work harder in response to praise or increased pay. In contrast, **negative reinforcement** increases behaviour through the *removal* of a stimulus. For instance, a rat is negatively reinforced when required to press a lever to turn off an electric shock. Negative reinforcement differs from punishment. If the rat were being punished, it would receive a shock *for* pressing the lever. The key point is that reinforcement—positive or negative—*increases* the likelihood of a behaviour, whereas punishment *decreases* the likelihood of a behaviour. Negative reinforcement is quite common in everyday life. You close the door to your room to shut out noise. You change the channel to avoid watching an awful program. In each case, you are trying to avoid or escape an unwanted stimulus, the negative reinforcer.

**POSITIVE AND NEGATIVE PUNISHMENT** Punishment reduces the probability that a behaviour will recur, but it can do so through positive or negative means. **Positive punishment** decreases the behaviour's probability through the administration of a stimulus. A rat's getting a shock for pressing a lever is an example of positive punishment. **Negative punishment** decreases the behaviour's probability through the removal of a pleasurable stimulus (**FIGURE 6.16**). Teens whose driving privileges are revoked for speeding may be less likely to speed the next time they get behind the wheel. However, although losing driving privileges is a form of negative punishment, getting a speeding ticket is a form of positive punishment. In thinking about these terms, which can be confusing, consider whether the behaviour is more likely to occur (reinforcement) or less likely to occur (punishment). A reinforcer or punisher is positive if something is applied and negative if something is removed or terminated. (For an overview of positive and negative kinds of both reinforcement and punishment, see **FIGURE 6.17**.)





**EFFECTIVENESS OF PARENTAL PUNISHMENT** To make their children behave, parents sometimes use punishment as a means of discipline. But many contemporary psychologists believe that punishment is often applied ineffectively and that it may have unintended and unwanted consequences. Research has shown that for punishment to be effective, it must be reasonable, unpleasant, and applied immediately so that the relationship between the unwanted behaviour and the punishment is clear (Goodall, 1984; O’Leary, 1995). But considerable potential exists for confusion. For example, sometimes punishment is applied after a desired action. If a student is punished after admitting to cheating on an exam, for example, the student may then associate the punishment with being honest rather than with the original offence, with the result that he or she learns not to tell the truth. As Skinner once pointed out, one thing people learn from punishment is how to avoid it; they learn not to get caught rather than how to behave appropriately.

Punishment can also lead to negative emotions, such as fear and anxiety, which may become associated, through classical conditioning, with the person who administers the punishment. A child may learn to fear a parent or teacher rather than stop the undesired behaviour, and this result may damage the long-term relationship between adult and child (Gershoff, 2002). In addition, punishment often fails to offset the behaviour’s reinforcing aspects. In real life, any behaviour can be reinforced in multiple ways. For instance, thumb-sucking may be reinforced because it makes a child feel good and provides relief from negative emotions and hunger. The threat of punishment may not be sufficient to offset such rewards, but it may reinforce the child’s secrecy about thumb-sucking. For these and other reasons, most psychologists agree with Skinner’s recommendation that reinforcement be used rather than punishment. A child complimented for being a good student will likely perform better academically than one punished for doing poorly. After all, reinforcing good behaviour tells the child what to do, whereas punishing the child for bad behaviour does not provide information about what the child should do to improve.

One form of punishment that most psychological scientists believe is especially ineffective is physical punishment, such as spanking. However, spanking is very common; 80 percent of Canadians report they have been spanked (MacMillan et al., 1999). As noted by Kazdin and Benjet (2003), beliefs about the appropriateness of spanking involve religious beliefs and cultural views, as well as legal issues. In 2004, the Supreme Court of Canada upheld a law that allows parents and teachers to spank children, at least those under age 12. Many countries (e.g., Austria, Denmark, Israel, and Italy) have banned corporal punishment in homes or schools, and even the United Nations has passed resolutions discouraging it. Some researchers have provided evidence of numerous negative outcomes associated with spanking, especially severe spanking (Bender et al., 2007). These problems include poor parent–child relations, weaker moral values, mental health problems, increased delinquency, and future child abuse. One concern is that physical punishment teaches the child that violence is appropriate behaviour for adults. (*Imitation learning* is discussed later in this chapter.) Although the extent to which mild forms of spanking cause problems is open to debate (Baumrind, Larzelere, & Cowan, 2002), the evidence indicates that other forms of punishment are more effective for decreasing unwanted behaviours (Kazdin & Benjet, 2003). Time outs, small fines, and grounding can effectively modify behaviour. Yet many psychologists believe that any method of punishment is less effective than providing positive reinforcement for “better” behaviours. By rewarding the behaviours they wish to see, parents are able to increase those behaviours while building more positive bonds with their children.

## Operant Conditioning Is Influenced by Schedules of Reinforcement

How often should a reinforcer be given? For fast learning, behaviour might be reinforced each time it occurs, a process known as **continuous reinforcement**. In the real world, behaviour is seldom reinforced continuously. Animals do not find food each time they look for it, and people do not receive praise each time they behave acceptably. Reinforcing behaviour intermittently, or **partial reinforcement**, is used more commonly. Partial reinforcement's effect on conditioning depends on the reinforcement schedule.

**continuous reinforcement** A type of learning in which the desired behaviour is reinforced each time it occurs.

**partial reinforcement** A type of learning in which behaviour is reinforced intermittently.

**ratio schedule** A schedule in which reinforcement is based on the number of times the behaviour occurs.

**interval schedule** A schedule in which reinforcement is available after a specific unit of time.

**fixed schedule** A schedule in which reinforcement is consistently provided after a specific number of occurrences or a specific amount of time.

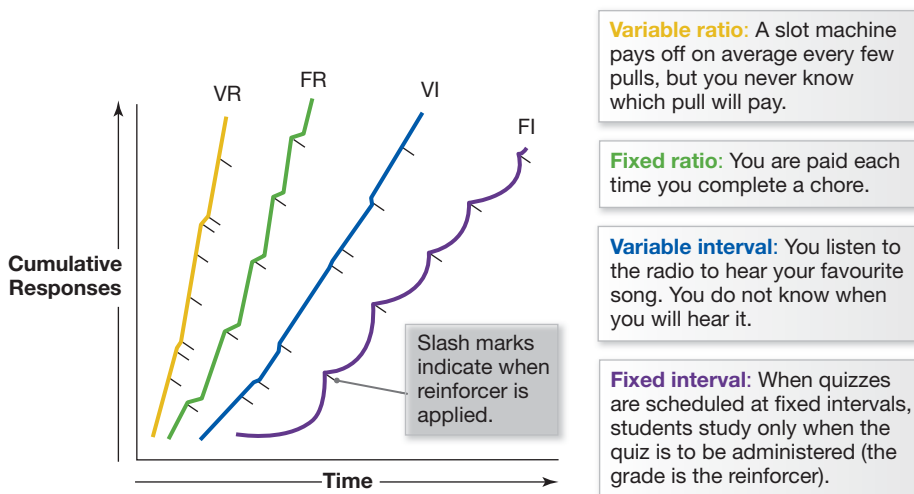
**variable schedule** A schedule in which reinforcement is applied at different rates or at different times.

**RATIO AND INTERVAL SCHEDULES** Partial reinforcement can be administered according to either the number of behavioural responses or the passage of time. For instance, factory workers can be paid by the piece (behavioural responses) or by the hour (passage of time). A **ratio schedule** is based on the number of times the behaviour occurs, as when a behaviour is reinforced on every third or tenth occurrence. An **interval schedule** is based on a specific unit of time, as when a behaviour is reinforced when it is performed every minute or hour. Ratio reinforcement generally leads to greater responding than does interval reinforcement. For example, factory workers paid by the piece are usually more productive than those paid by the hour, especially if the workers receive incentives for higher productivity.

**FIXED AND VARIABLE SCHEDULES** Partial reinforcement also can be given on a *fixed* or *variable* schedule. In a **fixed schedule**, the reinforcer consistently is given after a specific number of occurrences or after a specific amount of time. For example, whether factory workers are paid by the piece or by the hour, they usually are paid according to a fixed rate, earning the same for each piece or for each hour. The rate of reinforcement is entirely predictable. In a **variable schedule**, the reinforcer is given at different rates or at different times. The responder does not know how many behaviours need to be performed or how much time needs to pass before reinforcement will occur. One example of variable reinforcement is when a salesperson receives a commission only when a customer agrees to purchase a product. (The patterns of behaviour typically observed under different schedules of reinforcement are illustrated in **FIGURE 6.18**.)

**BEHAVIOURAL PERSISTENCE** The schedule of reinforcement also affects the persistence of behaviour. Continuous reinforcement is highly effective for teaching a

**FIGURE 6.18 Behaviour and Reinforcement** The curves on this graph show a relative comparison of cumulative responses under different schedules of reinforcement over time. The steeper the line, the higher the response rate. Ratio reinforcement leads to the highest rate of response.



behaviour, but if the reinforcement is stopped, the behaviour extinguishes quickly. For instance, normally when you put money in a vending machine it gives you a product. If it fails to do so, you quickly will stop putting your money into it. By contrast, at a casino you might drop a lot of money into a slot machine that rarely rewards you with a “win.” Such behaviour is not simply the result of an addiction to gambling. Rather, people put money in slot machines because the machines *sometimes* provide monetary rewards. Psychologists explain this persistent behaviour as the effect of a *variable-ratio schedule* of reinforcement.

The **partial-reinforcement extinction effect** refers to the greater persistence of behaviour under partial reinforcement than under continuous reinforcement. During continuous reinforcement, the learner easily can detect when reinforcement has stopped. But when the behaviour is reinforced only some of the time, the learner needs to repeat the behaviour comparatively more times to detect the absence of reinforcement. Thus the less frequent the reinforcement during training, the greater the resistance to extinction. Conditioning a behaviour so that it persists involves reinforcing it continuously during early acquisition and then slowly changing to partial reinforcement. Parents naturally follow this strategy in teaching behaviours to their children, as in toilet training.

**BEHAVIOUR MODIFICATION** **Behaviour modification** is the use of operant-conditioning techniques to eliminate unwanted behaviours and replace them with desirable ones. The general rationale behind behaviour modification is that most unwanted behaviours are learned and therefore can be unlearned (**FIGURE 6.19**). Parents, teachers, and animal trainers use conditioning strategies widely. People can be taught, for example, to be more productive at work, to save energy, and to drive more safely. Children with profound learning disabilities can be trained to communicate and to interact. As discussed in Chapter 15, operant techniques are also effective for treating many psychological conditions, such as depression and anxiety disorders.

Another widespread behaviour modification method draws on the principles of secondary reinforcement. Chimpanzees can be trained to perform tasks in exchange for tokens, which they can later trade for food. The tokens thus reinforce behaviour, and the chimps work as hard to obtain the tokens as they work to obtain food. Using similar principles, prisons, mental hospitals, schools, and classrooms often use *token economies*, in which people earn tokens for completing tasks and lose tokens for behaving badly. The people can later trade their tokens for objects or privileges, rewards that not only reinforce good behaviour but also give participants a sense of control over their environment. So, for instance, teachers can provide tokens to students for obeying class rules, turning in homework on time, and helping others. At some future point, the tokens can be exchanged for rewards, such as fun activities or extra recess time. In mental hospitals, token economies can encourage good grooming and appropriate social behaviour and can discourage bizarre behaviour.

To see behaviour modification in action, select a target behaviour of your own you wish to change, such as swearing, not studying enough, not exercising enough, or watching too much television—anything, as long as it is specific and you have a realistic goal for changing it. Then monitor your activities to see how often you perform this behaviour—for example, how many hours per day you study productively. Simply noting the behaviour will likely move you toward your goal, since you will be more conscious of it, but keeping careful track will also allow you to assess your progress. By monitoring, you can also identify potential triggers of the unwanted behaviour. Knowing the triggers—such as time pressure or stress—will allow you to develop plans or strategies for dealing with them. Now you are ready to take charge. Pick a good reinforcer, something you really want that is reasonably attainable, such as seeing a movie, eating at a restaurant, or hanging out with friends. But remember:

#### **partial-reinforcement extinction effect**

The greater persistence of behaviour under partial reinforcement than under continuous reinforcement.

**behaviour modification** The use of operant-conditioning techniques to eliminate unwanted behaviours and replace them with desirable ones.



**FIGURE 6.19 Behaviour Modification**

Behaviour modification can come in many forms and from many sources. For example, the Canadian government has distributed these graphic depictions of the physical side effects of smoking. What kind of positive reinforcement might a public-service campaign use to help people stop smoking?

If you do not behave appropriately, you do not get the reinforcer! Over time, as you successfully change the behaviour, phase out the reinforcer so you are performing the behaviour out of habit. Once you are used to exercising regularly, for example, you will do it regularly, and it may even become reinforcing on its own. Give it a try—you might amaze yourself with the power of behaviour modification.

## Biology and Cognition Influence Operant Conditioning

Behaviourists such as B. F. Skinner believed that all behaviour could be explained by straightforward conditioning principles. Recall from the opening of this chapter that Skinner's *Walden Two* describes a utopia in which all of society's problems are solved through operant conditioning. In reality, however, reinforcement schedules explain only a certain amount of human behaviour. Biology constrains learning, and reinforcement does not always have to be present for learning to take place.

**BIOLOGICAL CONSTRAINTS** Although behaviourists believed that any behaviour could be shaped through reinforcement, we now know that animals have a hard time learning behaviours that run counter to their evolutionary adaptation. A good example of biological constraints was obtained by Marian and Keller Breland, an American husband-and-wife team of psychologists who used operant-conditioning techniques to train animals for commercials (Breland & Breland, 1961). Many of their animals refused to perform certain tasks they had been taught. For instance, a raccoon learned to place coins in a piggy bank, but eventually refused to perform this task, instead standing over the bank and briskly rubbing the coins in its paws. The rubbing behaviour was not reinforced; it actually delayed reinforcement. One explanation for the raccoon's behaviour is that the task was incompatible with innate adaptive behaviours. The raccoon associated the coin with food and treated it the same way: Rubbing food between the paws is hard-wired for raccoons (**FIGURE 6.20**). Along similar lines, pigeons can be trained to peck at keys to obtain food or secondary reinforcers, but it is difficult to get them to peck at keys to avoid electric shock. However, they can learn to avoid shock by flapping their wings because wing flapping is their natural means of escape. The psychologist Robert Bolles has argued that animals have built-in defence reactions to threatening stimuli (1970). Conditioning is most effective when the association between the behavioural response and the reinforcement is similar to the animal's built-in predispositions.



**FIGURE 6.20 Biological Constraints** Animals have a hard time learning behaviours that run counter to their evolutionary adaptation. For example, raccoons are hard-wired to rub food between their paws, as this raccoon is doing; they have trouble learning *not* to rub objects.

From the evolutionary perspective, the brain is a compilation of domain-specific modules, each responsible for different cognitive functions. Thus learning results not from general learning mechanisms but from many unique mechanisms that solve individual adaptive problems (Rozin & Kalat, 1971; Shettleworth, 2001). As the evolutionary psychologist Randy Gallistel (2000) argues, just as lungs are adapted for breathing and ears are adapted for hearing—no one would argue that lungs can be used to hear or ears can be used to breathe—so various learning mechanisms have evolved to solve specific problems. Consider, says Gallistel, an ant that leaves its nest to forage for food. Typically, the ant takes a circuitous path until it finds food, at which point it takes a direct path back to the nest, even over unfamiliar territory. No traditional model of learning accounts for how the ant calculates that direct path. The ant has never been rewarded for following this path, nor does it have a classically conditioned association between environmental objects and the path. Instead, the ant is guided by mental processes that compute small changes in distance and direction. These mental processes occur because, through adaptation, the ant's ancestors “learned” (became hard-wired) to find that direct path and thus not risk losing the food on a circuitous journey home. Gallistel's point is that learning consists of specialized mechanisms (rather than universal mechanisms) that solve the adaptive problems animals face in their environments.

**ACQUISITION/PERFORMANCE DISTINCTION** Another challenge to the idea that reinforcement is responsible for all behaviour is that learning can take place without reinforcement. Edward Tolman, an early cognitive theorist, argued that reinforcement has more impact on performance than on learning. At the time, Tolman was conducting experiments in which rats had to learn to run through complex mazes to obtain food. Tolman believed that the rats developed **cognitive maps**, in this case spatial representations of the mazes, that helped them learn to find the food quickly. To test his theory, Tolman and his students studied three groups of rats whose task was to travel through a maze to a “goal box” containing the reinforcer, usually food. The first group received no reinforcement—rats found no food in the box—and simply wandered through the maze on each trial. The second group received reinforcement on every trial and learned to find the goal box quickly. The third group, critically, started receiving reinforcement only after the first 10 trials, at which point it showed an amazingly fast learning curve and immediately caught up to the group that had been continuously reinforced. This result implies that the rats had learned a cognitive map of the maze and used it when the reinforcement began. Tolman’s term **latent learning** refers to learning that takes place without reinforcement (FIGURE 6.21).

**cognitive map** A visual/spatial mental representation of an environment.

**latent learning** Learning that takes place in the absence of reinforcement.

FIGURE 6.21 Scientific Method: Tolman’s Study of Latent Learning

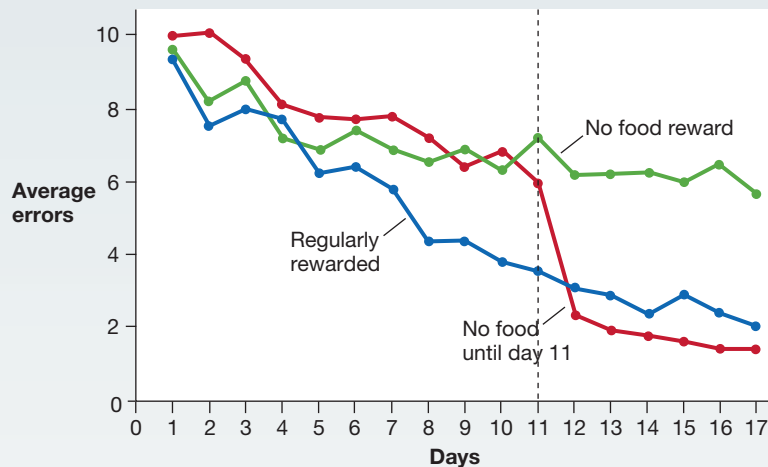
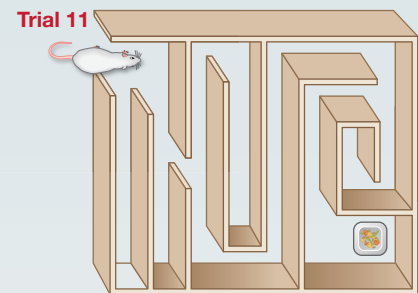
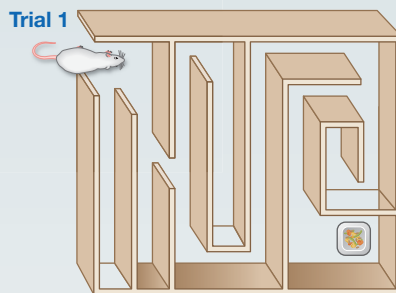
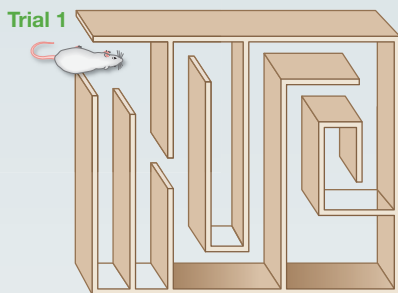
**Hypothesis:** Reinforcement has more impact on performance than on learning.

**Research Method:**

1 One group of rats is put through trials running in a maze with a goal box that never has any food reward as reinforcement.

2 A second group of rats is put through trials in a maze with a goal box that always has food reinforcement.

3 A third group of rats is put through trials in a maze with a goal box that has food reinforcement only after the first 10 trials.



**Results:** Rats that were regularly reinforced for correctly running through a maze (blue) showed improved performance over time compared to rats that did not receive reinforcement (green). Rats that were not reinforced for the first 10 trials but were reinforced thereafter showed an immediate change in performance (red). Note that between days 11 and 12 the red group’s average number of errors decreased dramatically.

**Conclusion:** Rats may learn a path through a maze but not reveal their learning, which is called latent learning, until it is reinforced. There is a distinction between acquisition and performance.

Another form of learning that takes place without reinforcement is *insight learning*—a form of problem solving in which a solution suddenly emerges after either a period of inaction or contemplation of the problem. (On problem solving, see Chapter 8, “Thinking and Intelligence.”) You probably have had this sort of experience, in which you mull over a problem for a while and then suddenly know the answer. The presence of reinforcement does not adequately explain insight learning, but it predicts whether the behaviour is subsequently repeated.

## Real World PSYCHOLOGY

### The Value of Reinforcement Follows Economic Principles

A relatively new approach to understanding operant conditioning considers reinforcement’s value in the context of basic economic principles, such as supply and demand. That which is in short supply typically is valued more and therefore is a more potent reinforcer. Sometimes the economic considerations are more complicated. Which would you prefer, \$100 today or \$1,000 next year? Although the larger payment might appear to be more reinforcing, its value is discounted because of the significant delay before you receive it. But if you really need money right now, waiting has additional costs. Indeed, adults with lower incomes discount future payments more steeply than do those with higher incomes (Green, Myerson, Lichtman, Rosen, & Fry, 1996). At the heart of the behavioural economics approach are two ideas: that people and other animals often need to choose between reinforcers, and that a particular reinforcer’s worth is affected by the likelihood of its payoff and how long that payoff might take. This approach has provided insights into various behaviours, especially those associated with addiction. The University of Vermont psychologist Warren Bickel and his colleagues (1999; Madden, Petry, Badger, & Bickel, 1997) found that smokers and heroin addicts discounted future rewards more greatly than did nonaddicts, a tendency that may contribute to their problems with impulsivity and self-control (Bickel et al., 2007). (The issue of delaying immediate gratification to obtain long-term rewards is discussed more fully in Chapter 9, “Motivation and Emotion.”)

Behavioural choice is also implicated in studies of animal foraging. Where animals choose to eat depends on the likelihood that food will be present, the energy costs associated with obtaining the food, and the risks associated with predators (Shettleworth, 2001). Should an animal eat all the berries in one patch and then search for a new patch, or should it save some berries for later while it searches (since the new patch might take a while to find)? Researchers who study animals in their natural habitats find that animals are highly sensitive to the relative rates of reinforcement among different patches and will sometimes take risks in finding food. The time an animal spends eating in one patch will be influenced by the rate of reinforcement, the relative rate of reinforcement in other patches, and the time it might take to travel to those other patches. *Optimal foraging theory* describes how animals in the wild choose their own reinforcement schedules.

Consider an animal faced with the choice of feeding from two locations: Both have the same average amount of food, but one is much more variable, sometimes having no food and sometimes having a lot. If the animal is facing starvation, its best chance for survival is to follow the apparently risky strategy of foraging in the more highly variable location, because if the consistent site has no food on one day it is likely not to have food the next day. Animals also learn to vary how they eat according to the likelihood of being attacked by predators. Research at the University of Lethbridge in Alberta has shown that rats, especially when food deprived, eat especially quickly in the dark (Wishaw, Drigenberg, & Comery, 1992). Although eating quickly is optimal for consuming large amounts of food, it is not optimal for digestion. When in the light, where they are better able to detect predators, rats eat more

slowly, but they frequently scan the environment to check for danger. Such variations reflect the fact that even a simple behaviour such as eating requires a number of calculations to detect the costs and benefits associated with different behavioural options. Animals' choices reflect specialized learning capacities adaptive to their environments.

## SUMMING UP

### How Does Operant Conditioning Differ from Classical Conditioning?

Whereas classical conditioning involves the learned association between two events, operant conditioning involves the learned association between a behaviour and its consequences. B. F. Skinner developed the concept of operant conditioning to explain why some behaviours are repeated and others are not. Reinforcement increases a behaviour's likelihood of being repeated, whereas punishment reduces that likelihood. If a reinforcer increases a behaviour when presented, it is a positive reinforcer; if it increases the behaviour when removed, it is a negative reinforcer. Although Skinner was confident that operant conditioning could ultimately explain all behaviour, his theories have faced a number of challenges. Chief among these are that it is difficult to change instinctive behaviours and that learning can take place without reinforcement. Modern learning theorists recognize cognitive processes' influence on behaviour and biology's constraints on it. Models based on economic theory have become increasingly useful for understanding how animals choose among reinforcers.

## MEASURING UP

1. Indicate whether each of the following people and phenomena is related to operant conditioning or classical conditioning.
  - a. Ivan Pavlov
  - b. B. F. Skinner
  - c. behaviour modification
  - d. A behaviour is associated with its consequences.
  - e. Two events that occur close together in time are associated.
  - f. used to train animals to perform tricks and useful tasks
  - g. Premack principle
  - h. Punishment's effects are explained by this type of conditioning.
2. Suppose a mother is trying to get her eight-year-old to stop cursing. Each time the child curses, the mother waits until the child's father is present before spanking the child. Select the better answers:
  - a. The time interval between the cursing and the punishment is  
\_\_\_ too long for optimal learning.  
\_\_\_ fine as long as the punishment is administered on the same day as the cursing.
  - b. One likely outcome to the continued use of this punishment is  
\_\_\_ the child will curse at times he or she is unlikely to be caught.  
\_\_\_ the child will gradually extinguish the cursing response.
  - c. Generalization is likely to occur such that  
\_\_\_ the child curses only when the father is at work.  
\_\_\_ the child comes to fear the father and mother.
  - d. What is the child likely to learn?  
\_\_\_ Do not get caught cursing.  
\_\_\_ Cursing is a nasty behaviour that must be stopped.
  - e. A more effective approach would be to  
\_\_\_ spank the child as soon as the cursing occurs.  
\_\_\_ provide rewards for not cursing.

### LEARNING OBJECTIVES

Provide an example of culture's effect on learning.

Describe Bandura's Bobo doll study and explain its significance.

Discuss mirror neurons' role in learning.

## How Does Watching Others Affect Learning?

Suppose you were teaching someone to fly an airplane. How might you apply the learning principles discussed in this chapter to accomplish your goal? Obviously, reinforcing arbitrary correct behaviours would be a disastrous way to train an aspiring pilot. Similarly, teaching someone to play football, eat with chopsticks, or perform complex dance steps requires more than simple reinforcement. We learn many behaviours not by doing them but by observing others doing them. We learn social etiquette through observation, for example. We sometimes learn to be anxious in particular situations by seeing that other people are anxious. We often acquire attitudes about politics, religion, people, objects, and so on, from outside sources, such as parents, peers, teachers, and the media.

### Learning Can Be Passed On through Cultural Transmission

Although all humans belong to the same species and share the vast majority of genes, around the world there is enormous cultural diversity in what people think and how they behave. Would you be the same person if you had been raised in a small village in China, or in the jungles of South America, or in the mountains of Afghanistan? Probably not, since your religious beliefs, your values, and even your musical tastes are shaped by the culture in which you are raised. The term that evolutionary psychologists use for transmitted cultural knowledge is *meme*. **Memes** are analogous to genes, in that they are selectively passed on from one generation to the next, though some, such as fads, die out quite quickly.

One good example of the cultural transmission of knowledge is the case of Imo the monkey. In the 1950s, researchers who were studying monkeys in Japan threw some sweet potatoes onto a sandy beach for the monkeys there to eat. Imo developed the habit of washing her sweet potatoes in the ocean to get the sand off. After a while, other monkeys copied Imo, and eventually many the monkeys were washing their potatoes before eating them. Through social learning, this behaviour has continued to be passed along from one generation to the next, and monkeys there still wash their potatoes (Dugatkin, 2004; **FIGURE 6.22**). Unlike natural selection, which typically occurs slowly over thousands of years, memes can spread quickly, as in the worldwide adoption of the Internet. Although memes can be conditioned through association or reinforcement, many memes are learned by watching others' behaviour.



**FIGURE 6.22 Memes** In the 1950s, Imo developed and unwittingly passed along to her fellow monkeys the meme, or cultural knowledge, of washing sweet potatoes in the ocean. The descendants of these sweet potato-washing macaques continue the behaviour, as shown here.

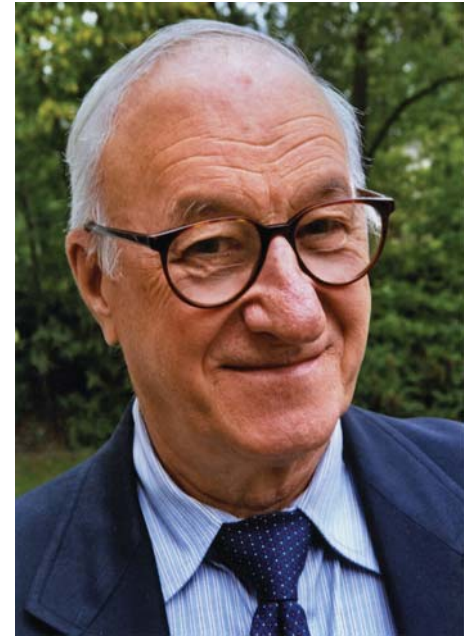
**CULTURAL BELIEFS ABOUT LEARNING** Children's levels of achievement sometimes differ widely across cultures. For example, Asian children often perform better in school than their North American and European peers, especially in math and science (Stevenson & Stigler, 1992). Many explanations of this "learning gap" have been proposed (some of which will be considered in more detail in the next chapter). One prominent theory is that Asians and Westerners have somewhat different understandings of learning and that these differences affect the motivation to learn and learning behaviours. According to Li (2003), the Chinese regard knowledge as "something that is indispensable to their personal lives," a notion rooted in the Confucian understanding of learning. By contrast, Li found that samples of Western learners view the ability to learn as something relatively enduring that exists within the learner—some people can learn well, and others cannot. The Asian view is seen as more adaptive because it is consistent with the notion that we can all learn if we work hard. For Asians, learning is an incremental process, and a good foundation makes later learning easier.



## Learning Can Occur through Observation

**Observational learning**, the acquisition or modification of a behaviour after exposure to at least one performance of that behaviour, is a powerful adaptive tool for humans and other animals. Offspring can learn basic skills by watching adults perform those skills, they can learn which things are safe to eat by watching what adults eat, and they can learn to fear dangerous objects and dangerous situations by watching adults avoid those objects and situations. Children even acquire beliefs through observation. Young children are sponges, absorbing everything that goes on around them. They learn by watching as much as by doing.

**BANDURA'S OBSERVATIONAL STUDIES** The most thorough work on observational learning was conducted in the 1960s by the Canadian psychologist Albert Bandura (FIGURE 6.23). In a now-classic series of studies, Bandura showed preschool children a film of an adult playing with a large inflatable doll called Bobo. In the film, the adult either played quietly with Bobo or attacked the doll furiously, whacking it with a mallet, punching it in the nose, and kicking it around the room. When the children were later allowed to play with a number of toys, including the Bobo doll, those who had seen the more aggressive display were more than twice as likely to act aggressively toward the doll (Bandura, Ross, & Ross, 1961). These results suggest that exposing children to media violence may encourage them to act aggressively (FIGURE 6.24).



**FIGURE 6.23 Albert Bandura** Born in Alberta, Bandura conducted important research showing that people could learn through observation.

### FIGURE 6.24 Scientific Method: Bandura's Bobo Doll Studies

**Hypothesis:** Children can acquire behaviours through observation.

**Research Method:**

- 1 Two groups of preschool children were shown a film of an adult playing with a large inflatable doll called Bobo.
- 2 One group saw the adult play quietly with the doll (activity not shown below).
- 3 The other group saw the adult attack the doll (activity shown in top row below).



**Result:** When children were allowed to play with the doll later, those who had seen the aggressive display were more than twice as likely to act aggressively toward the doll.

**Conclusion:** Exposing children to violence may encourage them to act aggressively.

**observational learning** Learning that occurs when behaviours are acquired or modified following exposure to others performing the behaviour.

### FIGURE 6.25 Scientific Method: Fear Response in Rhesus Monkeys

**Hypothesis:** Monkeys can develop phobias about snakes by observing other monkeys reacting fearfully to snakes.

#### Research Method:

- 1 Two sets of monkeys, one reared in the laboratory and one reared in the wild, had to reach past a clear box to get food.
- 2 When the clear box contained a snake, the laboratory-reared monkeys reached across the box, but the wild-reared monkeys refused to reach across the box.



**Results:** After watching wild-reared monkeys react, laboratory-reared monkeys no longer reached across the box.

**Conclusion:** Fears can be learned through observation.

**SOCIAL LEARNING OF FEAR** The psychologist Susan Mineka noticed that monkeys raised in laboratories do not fear snakes, whereas monkeys raised in the wild fear snakes intensely. She set out to explore whether monkeys, by observing other monkeys reacting fearfully to snakes, could develop a phobia of snakes. Mineka and her colleagues set up an experiment with two groups of rhesus monkeys, one group reared in the laboratory and one group reared in the wild. To obtain food, the monkeys were required to reach beyond a clear box that contained either a snake or a neutral object. When a snake was in the box, the wild-reared monkeys not only did not touch the food but also showed signs of distress, such as clinging to their cages and making threatening faces. The laboratory-raised monkeys reached past the box even if it contained a snake, and they showed no overt signs of fear. The researchers then showed the laboratory-raised monkeys the wild monkeys' fearful response, to see if it would affect the laboratory monkeys' reactions to the snake. The laboratory monkeys quickly developed a fear of the snakes, and this fear was maintained over a three-month period (Mineka, Davidson, Cook, & Keir, 1984; **FIGURE 6.25**). Humans too can learn to fear particular stimuli by observing others, as when people become afraid of travelling to a specific neighborhood after watching news video of a person being assaulted there. In fact, people can learn to fear particular things simply by hearing that the things are dangerous. Thus social forces play an important role in the learning of fear (Olsson & Phelps, 2007).

**TEACHING THROUGH DEMONSTRATION** Because humans can learn through observation, they can be taught many complex skills through demonstration. For instance, parents use slow and exaggerated motions to show their children how to tie their shoes. Although the idea is somewhat controversial, some nonhuman animals appear to teach their offspring certain skills through demonstration (Caro & Hauser, 1992). For instance, cheetah mothers appear to facilitate the stages in which their young learn to hunt. At first, the mothers kill their prey. Later, they simply knock down the prey and let their cubs kill it, or they injure the prey to make it easier for the cubs to knock down and kill.

**modelling** The imitation of behaviour through observational learning.



**FIGURE 6.26 Modelling** Babies frequently imitate expressions and behaviours.

## Animals and Humans Imitate Others

Human and nonhuman animals readily imitate others' actions. In one study, pigeons observed other pigeons receiving reinforcement, namely food, for stepping on a bar attached to a feeder or pecking at the feeder. When the observing pigeons were placed before the feeder, they tended to use whichever technique they had seen (Zentall, Sutton, & Sherburne, 1996). Within a few days (or even hours) of birth, human newborns will imitate facial expressions, and they will continue to imitate gestures and other actions as they mature (**FIGURE 6.26**)—just like the monkeys, discussed above, who copied Imo the monkey's potato washing.

The imitation of observed behaviour is commonly called **modelling**, in that humans or other animals reproduce the behaviours of *models*—those being observed. Modelling in humans is influenced by numerous factors. Generally, we will more likely imitate the actions of models who are attractive, have high status, and are somewhat similar to ourselves. In addition, modelling will be effective only if the observer is physically capable of imitating the behaviour. Simply watching Olympic bronze medal winner Joannie Rochette land a triple lutz does not mean we could do so if we laced up a pair of skates.

Models' influences on behaviour often occur implicitly, without our being aware that our behaviours are being altered. People might not want to admit that they

have changed their ways of speaking or dressing to resemble those of celebrities, but overwhelming evidence says that we imitate what we see in others, especially those we admire. Adolescents whose favorite actors smoke in movies are much more likely to smoke (Tickle, Sargent, Dalton, Beach, & Heatherton, 2001; see **FIGURE 6.27**), and the more smoking that adolescents observe in movies, the more positive their attitudes about smoking become and the more likely they are to begin smoking (Sargent et al., 2005). These effects are strongest among children whose parents do not smoke, perhaps because what such children learn about smoking comes completely through the media, which tend to glamorize the habit. Movies, for example, often present smokers as attractive, healthy, and wealthy, not like the typical smoker. Adolescents do not generally decide to smoke after watching one movie's glamorous depiction of smoking. Rather, images of smokers as mature, cool, sexy—things adolescents want to be—shape adolescents' attitudes about smoking and subsequently lead to imitation. As adolescent viewers learn to associate smoking with people they admire, they incorporate the general message that smoking is desirable.

**VICARIOUS REINFORCEMENT** Another factor that determines whether observers imitate a model is whether the model is reinforced for performing the behaviour. In one study, Bandura and his colleagues showed children a film of an adult aggressively playing with a Bobo doll, but this time the film ended in one of three different ways (Bandura, Ross, & Ross, 1963). In the first version, a control condition, the adult experienced no consequences for the aggressive behaviour. In the second version, the adult was rewarded for the behaviour with candy and praise. In the third version, the adult was punished for the behaviour by being both spanked and verbally reprimanded. When subsequently allowed to play with the Bobo doll, the children who observed the model being rewarded were much more likely to be aggressive toward the doll than were children in the control group. In contrast, those who saw the model being punished were less likely to be aggressive than were those in the control group. These findings do not mean that the less aggressive children did not learn the behaviour. Later, all the children were offered small gifts to perform the model's actions and performed them reliably. A key distinction in learning is between the *acquisition* of a behaviour and its *performance*. Here, all the children learned the behaviour, but only those who saw the model being rewarded performed the behaviour. **Vicarious learning** occurs when people learn about an action's consequences by observing others being rewarded or punished for performing the action.

**MIRROR NEURONS** What happens in the brain during imitation learning? An intriguing study from Italy found that, when a monkey observes another monkey reaching for an object, **mirror neurons** in the observing monkey's brain become activated (Rizzolatti, Fadiga, Gallese, & Fogassi, 1996). These same (mirror) neurons would be activated if the observing monkey performed the behaviour. Mirror neurons are especially likely to become activated when a monkey observes the target monkey engaging in movement that has some goal, such as reaching to grasp an object. Neither the sight of the object alone nor the sight of the target monkey at rest leads to activation of these mirror neurons.

Brain imaging techniques have identified similar mirror neurons in humans (Rizzolatti & Craighero, 2004). Thus every time you observe another person engaging in an action, similar neural circuits are firing both in your brain and in the other person's. Mirror neurons' function is currently open to debate. This system may serve as the basis of imitation learning, but mirror neurons' firing in the observer's



**FIGURE 6.27 Thank You for Smoking** The director Jason Reitman (**left**) and the actor Cameron Bright pose for the press with candy cigarettes in their mouths at the premiere of their 2005 movie. Though they are not actually smoking, the image is striking. Bright looks to be a happy and successful 13-year-old movie star with a cigarette in his mouth, proudly displaying it for the cameras. What affect might this image have on other teenagers?

**vicarious learning** Learning that occurs when people learn the consequences of an action by observing others being rewarded or punished for performing the action.

**mirror neurons** Neurons that are activated during observation of others performing an action.

brain does not always lead to imitative behaviour in the observer. Therefore, some theorists speculate, mirror neurons may help us explain and predict others' behaviour. In other words, mirror neurons may allow us to step into the shoes of people we observe so we can better understand those people's actions. One speculation is that mirror neurons are the neural basis for empathy, the emotional response of feeling what other people are experiencing.

Humans also have mirror neurons for mouth movements, and these are stimulated when observers see a mouth move in a way typical of chewing or speaking (Ferrari, Gallese, Rizzolatti, & Fogassi, 2003). This phenomenon has led to speculation that mirror neurons are important not only for imitation learning but also for humans' ability to communicate through language. Mirror neurons may be a brain system that creates a link between the sender and receiver of a message. Rizzolatti and Arbib (1998) have proposed that the mirror neuron system evolved to allow language. Their theory relies on the idea that speech evolved mainly from gestures, and indeed people readily understand many nonverbal behaviours, such as waving or thrusting a fist in the air. If their theory is true, speech sounds came to represent gestures. Indeed, evidence indicates that listening to sentences that describe actions activates the same brain regions active when those actions are observed (Tettamanti et al., 2005). Even reading words that represent actions leads to brain activity in relevant motor regions, as when the word *lick* activates brain regions that control tongue movements (Hauk, Johnsrude, & Pulvermüller, 2004).

## Real World PSYCHOLOGY

**MEDIA AND VIOLENCE** On average, a television in North America is on for five or six hours per day, and young children often spend more time watching television than doing any other activity, including schoolwork (Roberts, 2000). Worldwide, children consume an average of three hours per day of screen media—television, movies, and video games (Groebel, 1998). The most popular media contain considerable amounts of violence (Carnagey, Anderson, & Bartholow, 2007). Saturday morning cartoons, watched by the majority of children, average 20 aggressively violent acts per hour, whereas prime-time TV shows average only five (National Television Violence Study, 1997, 1998).

Media violence has been found to increase the likelihood of short- and long-term aggressive and violent behaviour (Anderson et al., 2003). In one study, after children played a violent video game for only 20 minutes, they were less physiologically aroused by scenes of real violence; in other words, they had become desensitized to violence, showing fewer helping behaviours and increased aggression (Carnagey, Anderson, & Bushman, 2007). In another study, Leonard Eron and his colleagues found that TV viewing habits at age 8 predicted, for age 30, amounts of both violent behaviour and criminal activity (Eron, 1987). A 2002 meta-analysis of studies involving media violence effects—taking into account laboratory experiments, field experiments, cross-sectional correlational studies, and longitudinal studies—showed that exposure to violent media increases the likelihood of aggression (Gentile, Saleem, & Anderson, 2007). The average effect size (the magnitude of the association between independent and dependent variables), determined by statistically averaging across the hundreds of studies, is nearly as large as that linking smoking and cancer, and is larger than the effect size for condom nonuse and HIV transmission or for children's lead exposure and their IQs (Bushman & Anderson, 2001).

A number of problems exist, however, with the studies on this topic. The University of Toronto social psychologist Jonathan Freedman (1984) notes that many of the so-called aggressive behaviours displayed by children could be interpreted as playful rather than aggressive. A more serious concern is whether the studies generalize to the real world. Viewing a violent film clip in a lab is unlike watching TV in one's living room.

Do people learn violent behaviour through the media? As discussed above, the research says yes, but the evidence remains controversial (FIGURE 6.28). The neuroscience philosopher from the University of Bristol Susan Hurley (2004) calls attention to current work, in the cognitive sciences, about imitation and mirror neurons. This research shows that in addition to learning through conscious imitative behaviour, humans imitate behaviour automatically and unconsciously—they are not always aware of the cues that influence their actions. Violent behaviour is subject to these unconscious imitative tendencies. Hurley suggests that the importance for individuals and the social significance of imitative behaviour are greatly underappreciated. People have difficulty recognizing that they are ruled to a large extent by unconscious and automatic behaviour because this notion threatens their beliefs about personal autonomy and conscious control. The less aware people are of the influences on their behaviour, including their violent behaviour, the less they are able to control the extent of these influences.

Given these findings, should there be a public policy limiting violent media? Opponents to such regulation argue that it would tamper with freedom of speech, one of the fundamental beliefs of a liberal society. Even speech that can harm others is protected on the basis of truth, democracy, and autonomy. But as Hurley points out, not all speech is protected: You are not allowed to shout “Fire!” in a theatre or make loud noises where there is avalanche danger. Hurley argues that violent entertainment does not deserve protection under freedom of speech, since its effects feed unconscious, automatic responses. It therefore cannot be rationalized by audience autonomy—or even by speaker autonomy because of the producers’ primarily commercial motives. If “violent entertainment produces through automatic processes significant harm to others as a result of increased levels of violent behavior across the



**FIGURE 6.28 Media and Violent Behaviour** Many scientists see a direct correlation between exposure to violent media (such as this video game) and aggressive behaviour. Still, correlation does not prove causation (see Chapter 2, “Research Methodology”).

population of viewers,” Hurley argues, “prevention of such harm to third parties provides a strong reason (or ‘compelling interest’) for liberal government to interfere with violent entertainment (2006, p. 320).”

Should depictions of violence be banned even if they affect only some people? What might parents do if they are concerned about what their children watch? Are we obligated to protect people from the results of violent media? If so, what is the best way to do so? Who should rate the violent content of television shows, of films, and of video games? How should citizens be informed so they can make informed choices about consuming media violence and letting their children consume it? Should the news media have guidelines to ensure the accurate reporting of scientific findings about media violence’s effects? Should the government require medical personnel to discuss media violence with parents or guardians, such as during children’s immunization visits?

The film clips used in studies are often brief and extremely violent, and the child watches them alone. In the real world, violent episodes are interspersed with non-violent material, and children often watch them with others, who may buffer the effect.

Even the longitudinal studies that assess childhood TV watching and later violent behaviour fail to prove satisfactorily that TV caused the behaviour. Extraneous variables, such as personality, poverty, or parental negligence, could have affected both TV viewing habits and violent tendencies. After all, not all of those who view violence on TV become aggressive later in life. Perhaps those who watch excessive amounts of TV, and therefore have fewer opportunities to develop social skills, act aggressively. Correlation does not prove causation (as discussed in Chapter 2, “Research Methodology”; see, for

example, “Critical Thinking Skill: Understanding the Limitations of Correlational Research and the Effect of Confounds”). Only through careful laboratory studies in which participants are randomly assigned to experimental conditions can we determine causality. Obviously, it is not practical to assign children randomly to experience different types of media, and it is ethically questionable to expose any children to violence if it might make them more aggressive.

Despite the problems with specific studies, most scientists see a direct relation between exposure to violence and aggressive behaviour. Indeed, a recent joint statement by professional groups representing psychologists and pediatricians concluded that a plethora of studies “point overwhelmingly to a causal connection between media violence and aggressive behavior in some children” (Joint Statement, 2000, p. 1).

How might media violence promote aggression in children? One possibility is that exposure to massive amounts of violence in movies, which misrepresent the prevalence of violence in real life, leads children to believe that violence is common and inevitable. Because in movies few people are punished for acting violently, children may come to believe that such behaviours are justified (Bushman & Huesmann, 2001). That is, the portrayal of violence in movies teaches children questionable social scripts for solving personal problems. By mentally rehearsing a violent scenario or observing the same violent scenario enacted many times and perhaps in different movies, a child might come to believe that engaging in brutality is an effective way to both solve problems and dispense with annoying people (Huesmann, 1998).

#### CRITICAL THINKING SKILL

### Avoiding the Association of Events with Other Events That Occur at the Same Time

Do you have a lucky charm? Do you wear your “good luck” socks every time you take an exam? Do you try to blow out the candles on your birthday cake in just one breath so that your silent wish will come true? The list of people’s superstitions is virtually endless. In North America and Europe, people avoid the number 13. In China, Japan, Korea, and Hawaii, they avoid 4. The basketball player Michael Jordan, a graduate from the University of North Carolina, always wore shorts with the North Carolina logo under his uniform for good luck. The hockey great Sidney Crosby will not call his mother on game day because he was injured the last three times he did so. Even pigeons *might* be superstitious. In conditioning pigeons’ pecking behaviour, Skinner found that, during each trial, a particular pigeon would swing its head in the same way before responding, while another would do a half turn before responding. The tendency to associate events that occur together in time is so strong that human and nonhuman animals sometimes associate chance events unrelated to reinforcements or punishments, if those events happen to occur close in time to reinforcers or punishment. People, and apparently other animals, have a strong need to understand what causes or predicts events. Their resulting associations can lead people, at least, to cling to superstitions. Most superstitions are harmless, but some can interfere with daily living, as when people stay in bed on the 4th or 13th of every month or refuse to get off on the 4th or 13th floor of a building. As a critical thinker, be aware of the tendency to associate events with other events that occur, perhaps simply by chance, at the same time (FIGURE 6.29).



**FIGURE 6.29 Think Critically: Superstitions** Common superstitions include the fear of black cats crossing your path and the prohibition against walking under ladders. But what could actually go wrong in the situations shown here?

## SUMMING UP

### How Does Watching Others Affect Learning?

Thanks to psychological research, we know that humans learn much of our behaviour by observing the behaviour of others. Children can learn language, social skills, and political attitudes from observing their parents, peers, and teachers, and adults teach complex skills, such as surgery and driving, by demonstration. Nonhuman animals also learn through observation—for example, which food is safe to eat and which objects should be feared. People imitate models that are attractive, high in status, and somewhat similar to themselves. Modelling is more likely to occur when the model has been rewarded for the behaviour and less likely to occur when the model has been punished. Vicarious conditioning influences whether a behaviour is performed but not whether it is learned. Mirror neurons, which fire when a behaviour is observed, may be the neural basis of imitation learning.

## MEASURING UP

1. How do cultural beliefs about learning affect human performance?
  - a. Cultures with the realistic view that some people do not have the ability to learn in some areas, such as math, produce happier students, who are realistic about their career choices.
  - b. Students from cultures that view learning as the result of persistence work harder and therefore achieve more than students from cultures with other beliefs.
  - c. Because all people are biologically prepared to learn some behaviours and concepts better than others, culture has very little effect on learning outcomes.
  - d. All cultures that use mild punishments to regulate behaviours produce anxious adults.
2. The critical finding from Bandura's Bobo doll research was that \_\_\_\_\_.
  - a. children exhibited more aggressive behaviours toward the doll after viewing an actor being rewarded for acting aggressively toward the doll than did children in the control condition
  - b. using a control group is vital
  - c. children learned to exhibit aggression toward the Bobo doll, behaviour later generalized to their own dolls
  - d. it allowed researchers to prove that watching violence on television causes children to become more violent
3. Mirror neurons \_\_\_\_\_.
  - a. fire when we are watching motor activity in other people
  - b. connect to sensory neurons, except in olfaction because little or no motion occurs when people smell an odour
  - c. are probably more important in learning a second language than in learning a first language
  - d. are among the smallest neurons in the human body

## What Is the Biological Basis of Learning?

Scientists have long believed that learning involves relatively permanent changes in the brain that result from exposure to environmental events. That is, your experience of the world changes your brain, and these changes reflect learning. Over the past few decades, psychological scientists have made numerous discoveries about the biological basis of learning. For instance, researchers have explored the brain processes that underlie reinforcement, demonstrating that similar brain activity occurs for most rewarding

**LEARNING OBJECTIVE**  
Describe the neural basis of learning.

experiences. Likewise, we now understand considerably more about how learning occurs at the neuronal level. The following section discusses the findings regarding learning's biological basis that have emerged through the methods of psychological science.

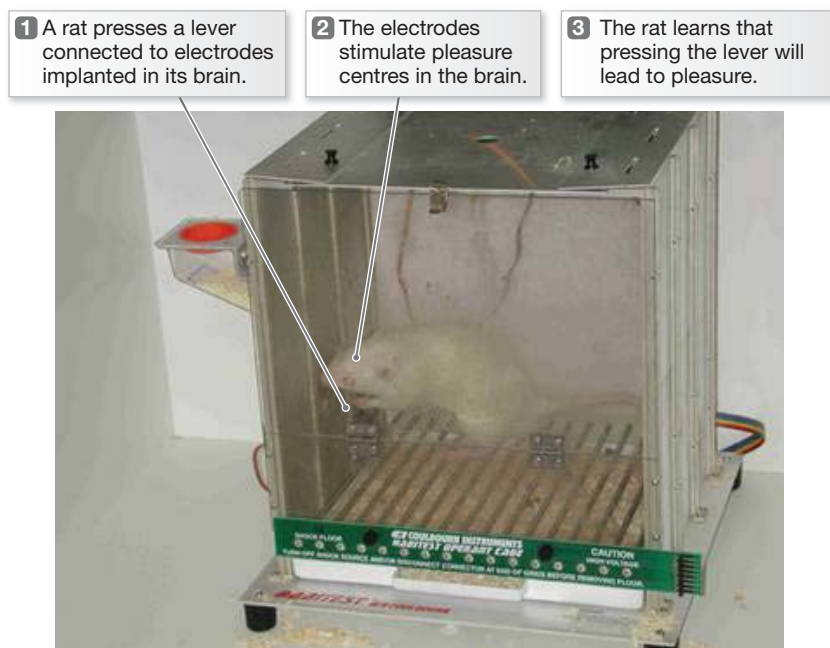
## Dopamine Activity Underlies Reinforcement

Although people often use the term *reward* as a synonym for positive reinforcement, Skinner and other traditional behaviourists defined reinforcement strictly in terms of *whether* it increased behaviour. They were relatively uninterested in *why* it increased behaviour. Indeed, they carefully avoided any speculation about whether subjective experiences had anything to do with behaviour, since they believed mental states were impossible to study empirically. Although the behaviourists avoided any reference to internal mental states, generally positive reinforcement works because it provides the subjective experience of pleasure. The neural basis of this reinforcement is the release of the neurotransmitter dopamine. As discussed in Chapter 3, dopamine is involved in motivation and emotion. Research over the past 50 years has shown that dopamine plays an important role in the experience of reward and is thus crucial for positive reinforcement (Wise & Rompre, 1989).

**PLEASURE CENTERS** One of the earliest discoveries pointing to neural mechanisms' role in reinforcement came about because of a small surgical error. In the early 1950s, Peter Milner and James Olds, researchers at McGill University, were testing whether electrical stimulation to a specific brain region would facilitate learning. To see whether the learning they observed was caused by brain activity or by the aversive qualities of the electrical stimulus, Olds and Milner administered electrical stimulation to rats' brains only while the rats were in one specific location in the cage. The logic was that if the application of electricity was aversive, the rats would selectively avoid that location. Fortunately for science, Milner and Olds administered each shock to the wrong part of the brain, and instead of avoiding the area of the cage associated with electrical stimulation, the rats quickly came back, apparently looking for more stimulation.

Olds and Milner then set up an experiment to see whether rats would press a lever to self-administer shock to specific sites in their brains, a procedure subsequently referred to as *intracranial self-stimulation (ICSS)* (FIGURE 6.30). The rats

**FIGURE 6.30** Intracranial Self-Stimulation (ICSS)

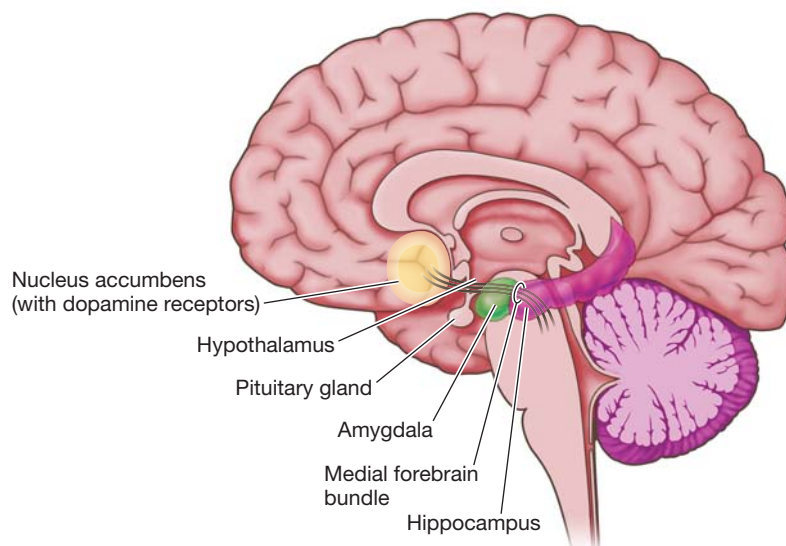




self-administered electricity to their brains with gusto, pressing the lever hundreds of times per hour (Olds & Milner, 1954). Olds and Milner referred to brain regions that support ICSS as *pleasure centres*. Although behaviourists objected to the term *pleasure*, ICSS was a powerful reinforcer. In one experiment, rats that had been on a near-starvation diet for ten days were given a choice between food and the opportunity to administer ICSS. They chose the electrical stimulation more than 80 percent of the time! Deprived rats also chose electrical stimulation over water or receptive sexual partners; they even crossed a painful electrified grid to receive ICSS. Rats will continue intracranial self-stimulation until they collapse from exhaustion. Monkeys tested in similar studies have been found to press a bar for electrical stimulation up to 8,000 times per hour (Olds, 1962).

Most psychologists believe that ICSS acts on the same brain regions as those activated by natural reinforcers, such as food, water, and sex. In rats, applying electrical stimulation to pleasure centres and then turning it off elicits naturally motivated behaviours, such as feeding, drinking, and copulating with an available partner. Also, depriving an animal of food or of water leads to increased ICSS, a finding taken to indicate that the animal is trying to obtain the same reward experience it would obtain from drinking water or eating. Finally, the neural mechanisms underlying both ICSS and natural reward appear to use the same neurotransmitter system, namely, dopamine. This evidence suggests that dopamine serves as the neurochemical basis of positive reinforcement in operant conditioning. For instance, ICSS activates dopamine receptors; interfering with dopamine eliminates self-stimulation as well as naturally motivated behaviours, such as feeding, drinking, and copulating.

**NUCLEUS ACCUMBENS ACTIVATION** The nucleus accumbens is a subcortical brain region that is part of the limbic system. The experience of pleasure usually results from activation of dopamine neurons in the nucleus accumbens (FIGURE 6.31). For example, enjoying food depends on dopamine activity. Hungry rats given food experience an increased dopamine release in the nucleus accumbens, and the greater the hunger, the greater the dopamine release (Rolls, Burton, & Mora, 1980). Food tastes better when you are hungry, and water is more rewarding when you are thirsty, because more dopamine is released under deprived than nondeprived conditions. Even looking at funny



**FIGURE 6.31** Pleasure Centres of the Brain

cartoons activates the nucleus accumbens (Mobbs, Greicius, Abdel-Azim, Menon, & Reiss, 2003).

In operant conditioning, dopamine release sets a reinforcer's value. Drugs that block dopamine's effects disrupt operant conditioning. In one study, rats were taught to run a maze to receive electrical stimulation, but after being injected with a dopamine blocker, the rats would not run the maze until the electrical current was turned up (Stellar, Kelley, & Corbett, 1983). The blocker decreased the value of the reinforcement. Dopamine blockers are often given to individuals with *Tourette's syndrome*, a motor control disorder, to help them regulate their involuntary body movements. These individuals often have trouble staying on their drug regimens, however, because they feel the drugs prevent them from enjoying life. Conversely, as you might expect, drugs that enhance dopamine activation, such as cocaine and amphetamines, increase stimuli's reward value.

**SECONDARY REINFORCERS ALSO RELY ON DOPAMINE** Natural reinforcers appear to signal reward directly through the activation of dopamine receptors in the nucleus accumbens. But what about secondary reinforcers, such as money or good grades? Through a classical-conditioning process, neutral stimuli that at first fail to stimulate a dopamine release do so readily after being paired with unconditioned stimuli. In one study, monkeys were presented with a trap door that opened occasionally. The door opening did not activate dopamine activity. The experimenters then placed apples in the doorway, such that the monkeys associated the door opening with the unconditioned stimulus of eating a tasty food. After many conditioning trials, the door opening led on its own to increased activation of dopamine (Ljungberg, Apicella, & Schultz, 1992). Similarly, seeing a loved one, getting a good grade, or receiving a paycheck may be conditioned to produce dopamine activation. Money is an excellent example of a secondary reinforcer, as mentioned earlier, and anticipated monetary rewards have been found to activate dopamine systems (Knutson, Fong, Adams, Varner, & Hommer, 2001).



**FIGURE 6.32 Donald Hebb**  
Hebb proposed that learning results from changes in synaptic connections: *Cells that fire together wire together.*

### Habituation and Sensitization Are Simple Models of Learning

As noted above, learning involves relatively permanent changes in the brain that result from exposure to environmental events. The roots of this idea can be traced back to numerous scientists, including the German researcher Richard Semon, who in 1904 proposed that memories are stored through changes in the nervous system. Semon called the storage of learned material an *engram*, a term later popularized by the psychologist Karl Lashley. In 1948, the Canadian psychologist Donald Hebb at McGill University (**FIGURE 6.32**) proposed that learning results from alterations in synaptic connections. According to Hebb, when one neuron excites another, some change takes place such that the synapse between the two strengthens. Subsequently, one neuron's firing becomes increasingly likely to cause the other's firing. Most of the many interpretations of Hebb's postulate can be summed up as "cells that fire together wire together" (a concept discussed in Chapter 3, "Biological Foundations"). Hebb did not have the technology to examine whether his hypothesis was true, but his basic theory has proven correct.

What activity at the synapse leads to learning? One answer is found in research using simple invertebrates such as the *aplysia*, a small marine snail that eats seaweed (FIGURE 6.33). The *aplysia* is an excellent species to use to study learning because it has relatively few neurons, some of which are large enough to be seen without a microscope (Kandel, Schwartz, & Jessell, 1995). The American neurobiologist Eric Kandel and his colleagues have used the *aplysia* to study the neural basis of two types of simple learning: *habituation* and *sensitization*. As a result of this research, Kandel received a Nobel Prize for medicine in 2000.

**Habituation** is a decrease in behavioural response following repeated exposure to nonthreatening stimuli. When an animal encounters a novel stimulus, it pays attention to it, behaviour known as an *orienting response*. If the stimulus is neither harmful nor rewarding, the animal learns to ignore it. We constantly habituate to meaningless events around us. For instance, sit back and listen to the background sounds wherever you are. Perhaps you can hear a clock, or a computer fan, or your roommates playing music in the next room, but had you really noticed this noise before being directed to or had you habituated to it? Habituation can be demonstrated quite easily by repeatedly touching an *aplysia*. The first few touches cause it to withdraw its gills, but after about 10 touches it stops responding, and this lack of response lasts about two to three hours. Repeated habituation trials can lead to a state of habituation that lasts several weeks.

**Sensitization** is an increase in behavioural response following exposure to a threatening stimulus. For instance, imagine that while studying you smell burning. You will not likely habituate to this smell. You might focus even greater attention on your sense of smell to assess the possible threat of fire, and you will be highly vigilant for any indication of smoke or of flames. In general, sensitization leads to heightened responsiveness to other stimuli. Giving a strong electrical shock to an *aplysia*'s tail leads to sensitization. Following the shock, a mild touch anywhere on the body will cause the *aplysia* to withdraw its gills.

Kandel's research on *aplysia* has shown that alterations in the functioning of the synapse lead to habituation and sensitization. For both types of simple learning, presynaptic neurons alter their neurotransmitter release. A reduction in neurotransmitter release leads to habituation; an increase in neurotransmitter release leads to sensitization. Knowing the neural basis of simple learning gives us the building blocks to understand more complex learning processes.



**habituation** A decrease in behavioural response following repeated exposure to nonthreatening stimuli.

**sensitization** An increase in behavioural response following exposure to a threatening stimulus.

**FIGURE 6.33 Simple Model of Learning**  
The *aplysia*, a marine invertebrate, is used to study the neurochemical basis of learning.

## Long-Term Potentiation Is a Candidate for the Neural Basis of Learning

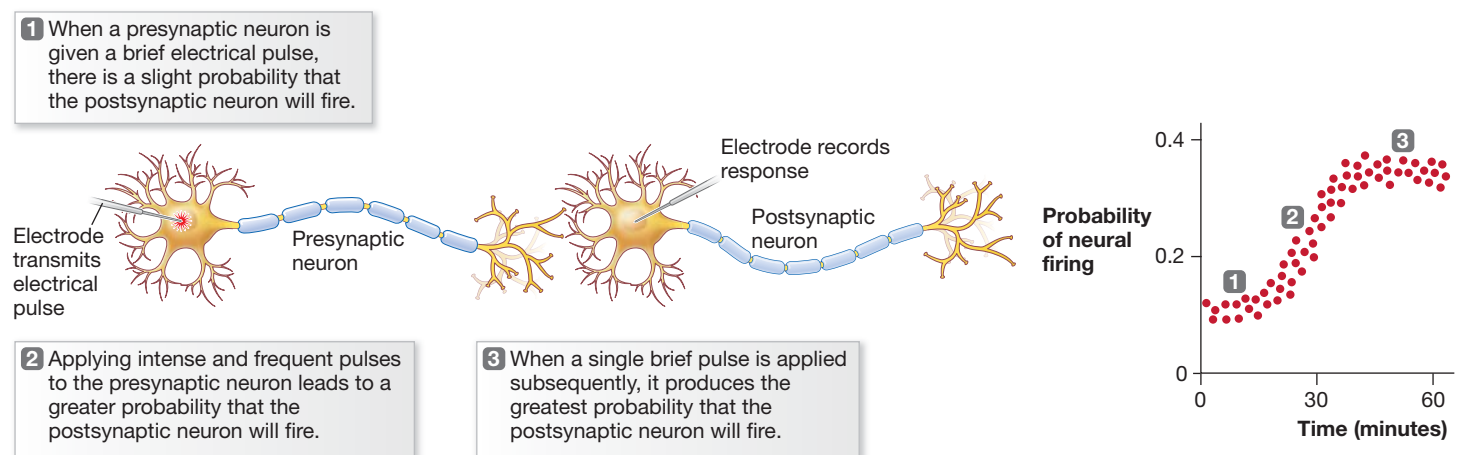
**long-term potentiation (LTP)** The strengthening of a synaptic connection so that postsynaptic neurons are more easily activated.

To understand learning in the brain, researchers have investigated *long-term potentiation*, a phenomenon first observed in a laboratory in Oslo, Norway, in the late 1960s. The word *potentiate* means to strengthen, to make something more potent. **Long-term potentiation (LTP)** is the strengthening of the synaptic connection so that postsynaptic neurons are more easily activated. To demonstrate LTP, researchers first establish the extent to which electrically stimulating one neuron leads to an action potential (the level of stimulation needed to activate or “fire,” discussed in Chapter 3, “Biological Foundations”) in a second neuron. They then provide intense electrical stimulation to the first neuron, perhaps giving it a hundred pulses of electricity in five seconds. Finally, a single electrical pulse is re-administered to measure the extent of the second neuron’s activation. LTP occurs when the intense electrical stimulation increases the likelihood that stimulating one neuron leads to an action potential in the second neuron (**FIGURE 6.34**). In aplysia, whereas habituation and sensitization are due to changes in neurotransmitter release from the presynaptic neuron, LTP results from changes in the postsynaptic neuron that make it more easily activated.

Numerous lines of evidence support the idea that LTP is the cellular basis for learning and memory (Beggs et al., 1999; Cooke & Bliss, 2006). For instance, LTP effects are most easily observed in brain sites known to be involved in learning and memory, such as the hippocampus. Moreover, the same drugs that improve memory also lead to increased LTP, and those that block memory also block LTP. Finally, behavioural conditioning produces neurochemical effects nearly identical to LTP.

The process of long-term potentiation also supports Hebb’s contention that learning results from a strengthening of synaptic connections between neurons that fire together. Hebb’s rule can be used to explain a variety of learning phenomena, including classical conditioning. Neurons that signal the unconditioned stimulus are active at the same time as those that signal the conditioned stimulus. Over repeated trials, the synapses that connect these two events become strengthened, so that when one fires, the other fires automatically, producing the conditioned response.

**FIGURE 6.34** Long-Term Potentiation (LTP)



**LTP AND THE NMDA RECEPTOR** Over the last decade, researchers have made considerable progress in understanding how LTP works. The *NMDA receptor* (a type of glutamate receptor) is required for it and has a special property: It opens only if a nearby neuron fires at the same time, a phenomenon supporting Hebb's rule ("cells that fire together wire together"). The finding that the NMDA receptor is involved in LTP led researchers to examine genetic processes that might influence learning. For instance, the neuroscientist *Joseph Tsien* modified genes in mice to make the genes' NMDA receptors more efficient. When tested in standard learning tasks, these transgenic mice performed amazingly well, learning novel tasks more quickly and showing increased fear conditioning (Tsien, 2000). The mice were such great learners that Tsien named them "Doogie mice," after the prime-time television character Doogie Howser, a boy doctor (**FIGURE 6.35**). Might we be able to modify human genes so that people learn more quickly? This fascinating question raises all sorts of ethical issues, but various pharmaceutical companies are exploring drugs that might enhance the learning process by manipulating gene expression or activating NMDA receptors. If successful, such treatments might prove valuable for treating patients with diseases such as Alzheimer's. This especially active area of research is increasing our understanding of how genes, neurotransmitters, and the environment interact to produce learning.



**FIGURE 6.35 Doogie Mice** In this learning and memory test, Doogie mice (such as the one pictured here) and regular mice were given the chance to familiarize themselves with two objects. One of the objects was then replaced with a novel object. This change was quickly recognized by the Doogie mice but not by the normal mice.

**FEAR CONDITIONING** Although LTP originally was observed in the hippocampus, recent evidence indicates that fear conditioning may induce LTP in the amygdala (Kim & Jung, 2006). In a typical fear conditioning study, a rat is classically conditioned to produce a fear response to an auditory tone: Electric shock follows the tone, and eventually the tone produces fear responses on its own, including specific physiological and behavioural reactions. One interesting response, *freezing*—standing still—is observed in many species, including humans. For example, as captured in video footage, for the first few seconds after the bomb exploded at the Atlanta Summer Olympics in 1996, most people froze in a crouch. Immediately keeping still might be a hard-wired response that helps animals deal with predators, which often are attracted by movement (LeDoux, 2002). Substantial evidence indicates that the amygdala is crucial for fear conditioning. If one particular part of the amygdala is removed, an animal is unable to learn that shock follows the tone (Davis, 1997). The New York University neuroscientist Joseph LeDoux and his students have demonstrated that auditory fear conditioning and LTP induction lead to similar changes in amygdala neurons, a finding that suggests fear conditioning might produce long-lasting learning through LTP induction (Rogan, Stäubli, & LeDoux, 1997; Sigurdsson, Doyère, Cain, & LeDoux, 2007).

As discussed above, fear learning can occur through observation, such as when monkeys learn to fear objects by seeing other monkeys fear those objects. The social learning of fear also likely relies on the amygdala. For instance, in one imaging study, research participants watched another person experience and display distress when receiving an electric shock paired with a conditioned stimulus. They subsequently were presented with the CS, though to ensure that all their

learning was vicarious they did not receive a shock. The investigators found heightened amygdala activity during observation and during the trials when the observing participants were presented with the CS (Olsson et al., 2007), a finding that suggests similar mechanisms are involved in conditioned and observational fear learning.

## **SUMMING UP**

### **What Is the Biological Basis of Learning?**

Researchers are rapidly identifying the neurophysiological basis of learning. Much of what has been learned supports Hebb's theory that neurons that fire together wire together. Kandel's work on aplysia has shown that habituation and sensitization, two simple forms of learning, occur through alteration in neurotransmitter release. The discovery of long-term potentiation shows that intense stimulation of neurons can strengthen synapses, increasing the likelihood that one neuron's activation will increase the firing of other neurons in the network. LTP occurs when NMDA receptors are stimulated by two nearby neurons. LTP in the amygdala appears to be important for fear learning.

## **MEASURING UP**

1. What can we learn from the superlearner Doogie mice?
  - a. NMDA receptors are important in producing learning.
  - b. A breed of extremely smart mice provides a good model for understanding how some people are able to become doctors at a young age.
  - c. Neurons that fire together wire together.
  - d. Animal models of human learning cannot account for mirror neurons' action.
2. What is the evidence that dopamine is a critical neurotransmitter for reinforcers' effects on behaviour?
  - a. The increased administration of self-stimulation suppresses dopamine release.
  - b. Rats will work continuously to deliver electrical stimulation to a portion of the brain that uses dopamine in its neural processes.
  - c. When rats press a lever to self-administer dopamine directly into the brain, they stop eating and drinking.
  - d. When rats receive dopamine, they increase the rate at which they deliver intracranial self-stimulation.

## CONCLUSION

Behaviourism has been a powerful force in psychological science since early in the twentieth century, when a shift from subjective to empirical methods established psychology as a science. A renewed interest in mental processes eventually led many to abandon strict behavioural principles, but basic conditioning and learning processes remain foundational to our understanding of both mind and behaviour. Psychological scientists use learning principles in studies across all levels of analysis, from synaptic connections in aplysia (biological) to the

cultural transmission of morals and of values (cultural). With all its competing theories and its sharing of ideas, the field of learning also serves as an excellent example of how psychological research is based on cumulative principles. We still see that dynamic in operation. The principles of classical and operant conditioning are basic methodologies used by all neuroscientists to study brain mechanisms. In turn, recent advances in neuroscience techniques resulting from the biological revolution have allowed for a more complete understanding of learning processes.

## CHAPTER SUMMARY

### How Did the Behavioural Study of Learning Develop?

- **Behavioural Responses Are Conditioned:** Pavlov established the principles of classical conditioning, a process that occurs when associations are made between two stimuli, such as the clicking of a metronome and a piece of meat. This type of learning is based on reflexes, such as the salivation that occurs in response to the meat. Acquisition, discrimination, generalization, and extinction are measured in classical conditioning. Some emotional responses are learned through conditioning.
- **Phobias and Addictions Have Learned Components:** Phobias are learned fear associations. Similarly, addiction involves a conditioned response, which can result in withdrawal symptoms at the mere sight of drug paraphernalia. Addiction also involves tolerance: the need for more of the particular drug, when that drug is administered in a familiar context, to get a high comparable to the one obtained earlier.
- **Classical Conditioning Involves More Than Events Occurring at the Same Time:** Not all stimuli are equally potent in producing conditioning. Animals are biologically prepared to make connections between stimuli that are potentially dangerous, such as learning to freeze when shock is administered. Animals are also predisposed to form predictions that enhance survival, such as judging the likelihood that food will continue to be available at one location.

### How Does Operant Conditioning Differ from Classical Conditioning?

- **Reinforcement Increases Behaviour:** A behaviour's positive consequences will likely strengthen it or make it more likely to occur. Shaping is a procedure in which successive approximations of a behaviour are reinforced, leading to the desired behaviour. Reinforcers may be primary (those that satisfy biological needs) or secondary (those that do not directly satisfy biological needs).
- **Both Reinforcement and Punishment Can Be Positive or Negative:** In either positive reinforcement or positive punishment, a stimulus is delivered after the animal responds. In negative reinforcement or negative punishment, a stimulus is removed after the animal responds. Positive and negative reinforcements increase a behaviour's likelihood; positive and negative punishments decrease a behaviour's likelihood.
- **Operant Conditioning Is Influenced by Schedules of Reinforcement:** Reinforcement can be delivered at either a fixed rate or a variable rate that depends on the number (ratio) or time (interval) of responses. A variable rate of reinforcement fosters resistance to extinction.

- **Biology and Cognition Influence Operant Conditioning:** An organism's biological makeup restricts the types of behaviours the organism can learn. Latent learning takes place without reinforcement. Such learning often is not performed until a reinforcer is introduced.
- **The Value of Reinforcement Follows Economic Principles:** In choosing between reinforcers, human and nonhuman animals consider the likelihood of obtaining each reward and the amount of time it might take to receive each one.

### How Does Watching Others Affect Learning?

- **Learning Can Be Passed On through Cultural Transmission:** Memes (knowledge transferred within a culture) are analogous to genes, in that behaviours are selectively passed on from generation to generation.
- **Learning Can Occur through Observation:** Observational learning is a powerful adaptive tool. Humans and other animals learn by watching others' behaviours and the consequences of those behaviours.
- **Animals and Humans Imitate Others:** Modelling occurs when one individual reproduces another individual's behaviour. Vicarious learning occurs as the result of one individual seeing another individual's behaviour reinforced or punished. Mirror neurons are activated when we watch a behaviour, just as when we actually perform the behaviour.

### What Is the Biological Basis of Learning?

- **Dopamine Activity Underlies Reinforcement:** The brain has specialized centres that produce pleasure when stimulated. Behaviours that activate these centres are reinforced. The nucleus accumbens (a part of the limbic system) has dopamine receptors, which are activated by pleasurable behaviours. Through conditioning, secondary reinforcers can also activate dopamine receptors. Drugs also increase activation, which can lead to addiction.
- **Habituation and Sensitization Are Simple Models of Learning:** Repeated exposure to a stimulus results in habituation, a decrease in behavioural response. Sensitization is an increase in behavioural response to a new threatening stimulus.
- **Long-Term Potentiation Is a Candidate for the Neural Basis of Learning:** Synaptic connections are strengthened when neurons fire together. This occurs in the hippocampus and, in fear responses, in the amygdala. The receptor NMDA is required for long-term potentiation. Genetically altered mice that had more efficient NMDA receptors were superlearners. LTP is also important for fear conditioning.

## KEY TERMS

acquisition, p. 248	extinction, p. 248	negative punishment, p. 262	phobia, p. 250	stimulus discrimination, p. 249
behaviour modification, p. 265	fixed schedule, p. 264	negative reinforcement, p. 262	positive punishment, p. 262	stimulus generalization, p. 249
classical conditioning, or Pavlovian conditioning, p. 246	habituation, p. 281	observational learning, p. 271	positive reinforcement, p. 262	unconditioned response (UR), p. 246
cognitive map, p. 267	interval schedule, p. 264	operant conditioning, or instrumental conditioning, p. 258	ratio schedule, p. 264	unconditioned stimulus (US), p. 247
conditioned response (CR), p. 247	latent learning, p. 267	partial reinforcement, p. 264	reinforcer, p. 260	variable schedule, p. 264
conditioned stimulus (CS), p. 247	law of effect, p. 259	partial-reinforcement extinction effect, p. 265	Rescorla-Wagner model, p. 257	vicarious learning, p. 273
continuous reinforcement, p. 264	learning, p. 245		sensitization, p. 281	
	long-term potentiation (LTP), p. 282		shaping, p. 260	
	meme, p. 270		spontaneous recovery, p. 248	
	mirror neurons, p. 273			
	modelling, p. 272			



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## ■ PRACTICE TEST

- Every night for a few weeks, you feed your pet rat while watching the evening news. Eventually, the rat learns to sit by its food dish when the news program's opening theme song plays. In this example of classical conditioning, what are the US, UR, CS, and CR?
- At a psychology lecture, each student receives 10 lemon wedges. The professor instructs the students to bite into a lemon wedge anytime a large blue dot appears within her slide presentation. Nearly every time the students bite into lemons, their mouths pucker. The 11th time a blue dot appears on the screen, many students' mouths pucker visibly. In this case, what are the US, UR, CS, and CR?
- A few minutes later in that same psychology lecture, the professor projects the image of a turquoise dot. How will the students likely respond to this image?
  - The students will not experience puckering responses, because the conditioned association has been extinguished.
  - The students will not experience puckering responses, because they are able to discriminate between the two dot colours.
  - The students will experience puckering responses, because of stimulus generalization.
- Which pairing of stimuli will most quickly create a learned association?
  - Eating a box of raisins and experiencing extreme nausea at the same time.
  - Eating a box of raisins and experiencing extreme nausea a few hours later.
  - Seeing clouds in the sky and experiencing a severe rain shower a few minutes later.
  - Seeing clouds in the sky and experiencing a severe rain shower a few hours later.
- Identify each statement as an example of negative punishment, positive punishment, negative reinforcement, or positive reinforcement.
  - Whenever a puppy barks, it gets its belly rubbed, so it barks more.
  - A professor directs all questions to the student who arrives late to class.
  - A person with a clean driving record receives a reduced insurance premium.
  - Your date arrives an hour late, and you refuse to speak for the rest of the evening.
- Match each scenario with one of the following reinforcement schedules: fixed ratio, variable ratio, fixed interval, variable interval.
  - You check your mailbox for mail at the same time every day.
  - Every once in a while, you receive exciting mail.
  - Every seventh newspaper you receive is loaded with coupons you want to use.
  - Every week, a boy buys packets of trading cards. Sometimes none of the packets includes a valuable card, but sometimes multiple packets hold valuable cards.
- Recently, Albert Bandura has employed serial television dramas to address global social issues such as illiteracy and overpopulation. He believes principles of social learning should apply when viewers observe fictional characters engaging in behaviours relevant to a particular issue. Based on what you have read about social learning, which of the following factors do Bandura and his collaborators likely consider when creating these shows? Select all that apply.
  - The culture's commonly held beliefs that might facilitate or impede social change.
  - Employing role models whom viewers likely will see as very different from themselves.
  - Demonstrating the positive outcomes associated with engaging in the desirable behaviour.
  - Employing positive role models (people engaged in the desirable behaviour).
  - Encouraging viewers to engage in behaviours they are not capable of imitating.
  - Demonstrating the costs associated with not engaging in the desirable behaviour.
  - Employing negative role models (people not engaged in the desirable behaviour).
- Hebb's postulate states that \_\_\_\_\_.
  - primary and secondary reinforcers rely on dopamine
  - cells that fire together wire together
  - orienting responses protect organisms
  - long-term potentiation is the basis for neural learning
- \_\_\_\_\_ is more closely associated with long-term potentiation than with reinforcement. Select as many as apply.
  - Dopamine
  - The hippocampus
  - NMDA
  - The nucleus accumbens

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## ■ PSYCHOLOGY AND SOCIETY

- A relative emails you about a reality show in which nannies help families modify the behaviours of out-of-control kids. He is amazed by the effectiveness of strategies such as time outs and sticker charts (e.g., placing a smiley face sticker on a poster each time a child clears his or her place after a meal). Your relative knows you are enrolled in a psychology course and wonders if you can explain why these strategies work. Drawing on your knowledge from this class, compose an email to your relative explaining the behavioural learning principles at work in these behaviour modification strategies.
- Create a public service announcement, in either print or video format, that could be used to inform parents about the consequences of exposure to media violence. Communicate to your audience why they should care about this issue, what psychological science tells us about the effects of exposure to violence in the media, and at least two concrete ways parents can reduce the impact on their children of exposure to media violence.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.





# Attention and Memory

IMAGINE WHAT YOUR WORLD WOULD BE LIKE if you lost the ability to remember new experiences. You would not be able to remember meeting people, or what you did last night, or even what you had for breakfast this morning. In a few minutes, you would not even remember having contemplated this problem. Such was the fate of H.M. He was one of the most famous people in memory research, yet until his death in 2008, we did not know his real name (Henry Molaison)

## How Does Attention Determine What Is Remembered?

- Visual Attention Is Selective and Serial
- Auditory Attention Allows Selective Listening
- Selective Attention Can Operate at Multiple Stages of Processing
- Critical Thinking Skill: Recognizing When “Change Blindness Blindness” May Be Occurring

## What Are the Basic Stages of Memory?

- Sensory Memory Is Brief
- Working Memory Is Active
- Long-Term Memory Is Relatively Permanent

## What Are the Different Long-Term Memory Systems?

- Explicit Memory Involves Conscious Effort
- Implicit Memory Occurs without Deliberate Effort
- Prospective Memory Is Remembering to Do Something

## How Is Information Organized in Long-Term Memory?

- Long-Term Storage Is Based on Meaning
- Schemas Provide an Organizational Framework
- Information Is Stored in Association Networks
- Retrieval Cues Provide Access to Long-Term Storage

## What Brain Processes Are Involved in Memory?

- There Has Been Intensive Effort to Identify Memory’s Physical Location
- The Medial Temporal Lobes Are Important for Consolidation of Declarative Memories
- The Frontal Lobes Are Involved in Many Aspects of Memory
- Neurochemistry Underlies Memory

## When Do People Forget?

- Transience Is Caused by Interference
- Blocking Is Temporary

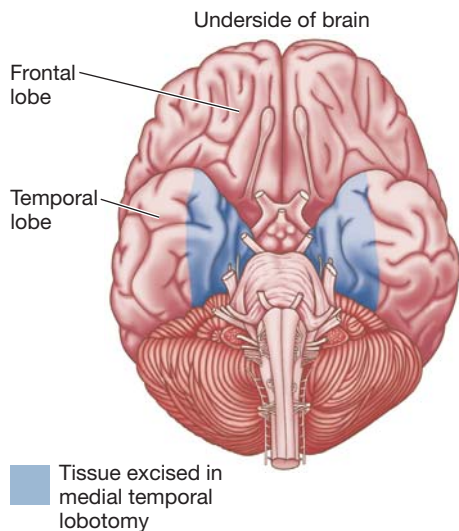
- Absentmindedness Results from Shallow Encoding
- Amnesia Is a Deficit in Long-Term Memory

## How Are Memories Distorted?

- Flashbulb Memories Can Be Wrong
- People Make Source Misattributions
- People Are Bad Eyewitnesses
- Critical Thinking Skill: Recognizing How the Fallibility of Human Memory Can Lead to Faulty Conclusions
- People Have False Memories
- Repressed Memories Are Controversial
- People Reconstruct Events to Be Consistent
- Neuroscience May Make It Possible to Distinguish between “True” and “False” Memories

## How Can We Improve Learning and Memory?

- Mnemonics Are Useful Strategies for Learning



**FIGURE 7.1 A Drawing of H.M.'s Brain**  
The portions of the medial temporal lobe that were removed from H.M.'s brain are indicated by the shaded regions.

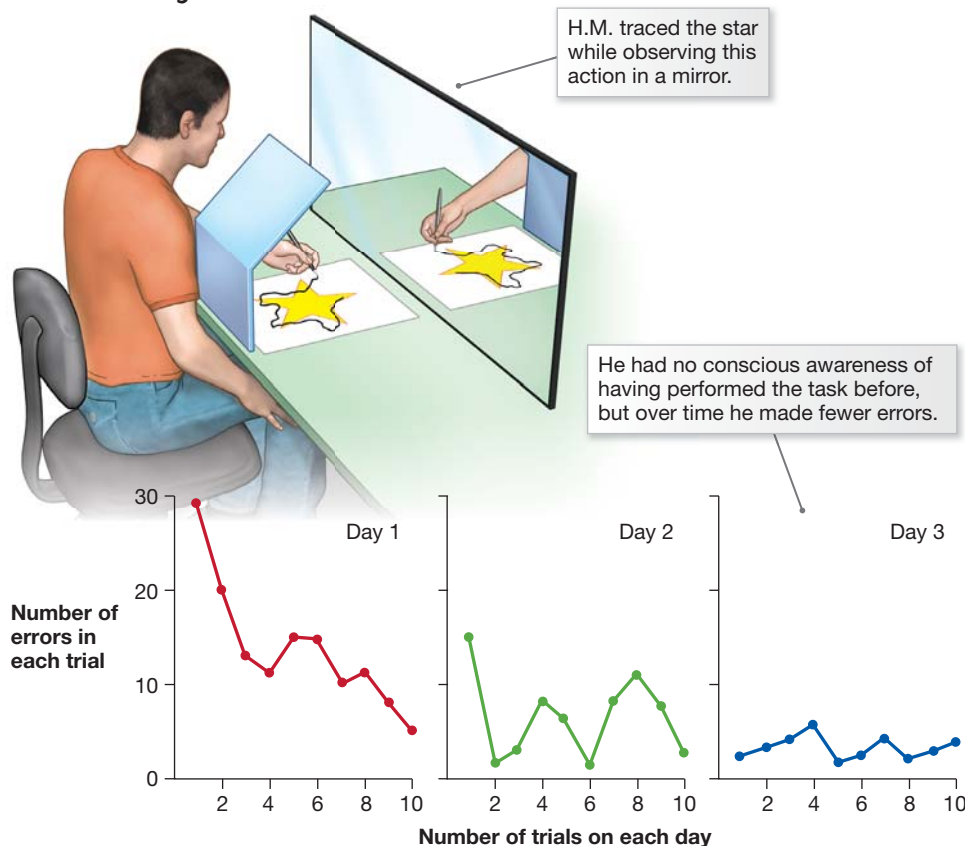
or what he looked like, because his privacy was guarded by the researchers who studied his memory. When H.M. was a young man, over 50 years ago, he suffered from severe epilepsy. Every day, he had several grand mal seizures, an affliction that made it impossible for him to lead a normal life. Seizures are uncontrolled random firings of groups of neurons, and they can spread across the brain; H.M.'s seizures originated in the temporal lobes and would spread from there. Because the anticonvulsive drugs available at that time could not control H.M.'s seizures, surgery was the only choice for treatment. The reasoning behind this surgery was that if the seizure-causing portion of his brain was removed, he would stop having seizures. In September 1953, H.M.'s doctors removed parts of his medial temporal lobes, including the hippocampus (FIGURE 7.1). The surgery quieted H.M.'s seizures, but had an unexpected and unfortunate side effect: H.M. lost the ability to form new long-term memories.

H.M.'s memory problems were profound. His world stopped in September 1953, when he was 27. He never knew the day of the week, what year it was, or his own age. However, he could tell you about his childhood, explain the rules of baseball, and describe members of his family, things he knew at the time of the surgery. According to the psychologists who tested him, his IQ was slightly above average, so his thinking abilities were fine. He could also hold a normal conversation as long as he was not distracted, but he forgot the conversation in a minute or less. That he could hold a conversation at all showed that his short-term memory was intact, since to grasp the meaning of spoken language a person needs to remember the words recently spoken (e.g., a sentence's beginning and end). But he lost every new memory he acquired through conversation, before that new memory could be transformed into a long-term memory. People who worked with H.M.—such as Brenda Milner, of McGill University, who has followed his case for over 40 years—had to introduce themselves to him every time they met. As H.M. put it, “Every day is alone in itself”; the quotation makes sense when you understand that H.M. remembered nothing from

minute to minute but knew that he remembered nothing.

Although he did not know it, H.M. learned some new things, most impressively new motor tasks. In one series of tests, he was required to trace the outline of a star while watching his hand in a mirror. Most people do poorly the first few times they try this difficult task. On each of three consecutive days, H.M. was asked to trace the star 10 times. His performance improved over the three days, an indication that he had retained some information about the task; on each day, however, H.M. could not recall ever performing the task previously (FIGURE 7.2). His ability to learn new motor skills allowed him to get a job at a factory, where he mounted cigarette lighters on cardboard cases. But his condition left him unable to describe the job or the workplace. Studies of H.M.'s profound memory loss have contributed many clues to

**FIGURE 7.2 Tracing Task**



how memories are stored—normally and abnormally—in the brain, and references to his case will appear throughout this chapter.

**Memory** is the nervous system's capacity to acquire and retain usable skills and knowledge, allowing organisms to benefit from experience. We remember millions of pieces of information, from the trivial to the vital. Each person's entire sense of self, or self-identity, is made up of what that person knows from memories, from his or her recollections of personal experiences and of things learned from others. Yet memory does not work like a digital video camera that faithfully captures and just as faithfully retrieves the events its operator experiences; instead, memories are often incomplete, biased, and distorted. It is often surprising how vastly two people's memories for the same event can differ; each person stores and retrieves memories of the event distinctively. We tend to remember personally relevant information and filter our memories through our various perceptions and our knowledge of related events. Memories are stories that can be altered subtly through tellings and retellings.


This chapter explores the mental processes involved in acquiring and retaining knowledge. We have multiple memory systems, each with its own "rules." The processes that underlie memory for something we will need to retrieve in 10 seconds, for example, operate differently from the processes that underlie memory for information we will need to retrieve in 10 years. In recent years, psychologists and neuroscientists have made great strides in their knowledge of how to improve memory and what happens in the brain when we remember. Researchers also examine how people's memories of past events are selectively distorted.

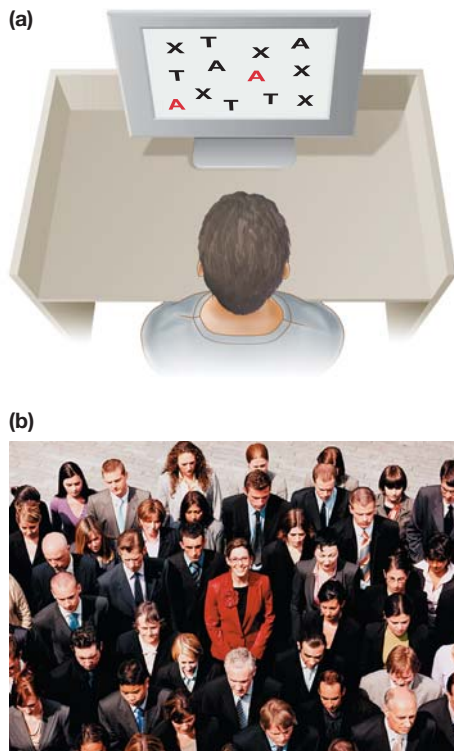
**memory** The nervous system's capacity to acquire and retain usable skills and knowledge.

## How Does Attention Determine What Is Remembered?

Your elementary school teachers probably had a basic understanding of the way memory works and so they demanded that you and your fellow students "pay attention." Good teachers know that to get information into memory, a person needs to attend. Think about the difference between the words *see* and *look*, *hear* and *listen*. *Look* and *listen* are commands that tell you where to direct your attention. Each of us has the ability to direct something in ourselves, called *attention*, to some information, at the cost of paying less attention to other information—the word *pay* indicates that costs are associated with attending to some forms of information and not others. Attention is limited, and when it is divided among too many tasks or the tasks are difficult, performance suffers. Of course, people have always been able to multi-task (that is, attend to more than one thing): Parents monitor their children while cooking dinner, we carry on conversations while walking, students do homework while listening to music, and so on. But those who overload their systems by, for example, studying while checking email, instant messaging, and watching television will do worse at all these tasks than they would if they focused on one at a time (Manhart, 2004).

Attention is important to your ability to function in your daily life, as you try to focus attention on the tasks at hand and ignore other things that might distract you. A task as simple as having a conversation requires paying focused attention. If the other speaker has unusual facial features or has food hanging from his or her chin, the unusual features or hanging food might capture your attention and make it difficult to comprehend what the person is saying. If the other speaker is boring, your mind might wander and find its own thoughts or even a quiet conversation

 **LEARNING OBJECTIVES**  
Explain how attention is adaptive.  
Explain why we can be blind to many changes in our environments.



**FIGURE 7.3 Parallel Processing**  
**(a)** Parallel processing allows us to process information from different visual features at the same time by focusing on targets (here, the red objects) over distractors. **(b)** In this photo, the woman's red jacket, upward gaze, and smile serve as targets.

#### FIGURE 7.4 Try for Yourself: Conjunction Tasks

Count the blue squares as quickly as you can.



**Result:** This task is relatively difficult because you are searching for two features. You need to slow down and determine if each stimulus is blue *and* square.

nearby more interesting to attend to than the long-winded companion. The following section presents the basic principles of how human attention works.

### Visual Attention Is Selective and Serial

The British psychologist Anne Treisman, who spent many years in the psychology department at the University of British Columbia, has made great advances in the study of attention. According to her theory about attention and recognition, we automatically identify “primitive” features, such as colour, shape, orientation, and movement, within an environment. Treisman has proposed that separate systems analyze objects’ different visual features. Through **parallel processing**, these systems all process information at the same time, and we can attend selectively to one feature by effectively blocking the further processing of the others (Treisman & Gelade, 1980). In studies employing Treisman’s *visual search tasks* (also called *feature search tasks*), participants look at a display of different objects on a computer screen, searching for ones, called *targets*, that differ from the others in only one feature. The other objects in the display are called *distractors*. Thus a typical display might consist of a few red As (targets) among many black ones (distractors; **FIGURE 7.3**). In these conditions, the targets seem to pop out immediately, regardless of the number of distractors. Some features that seem to pop out when the targets differ from the distractors are colour, motion, orientation, and size (Wolfe & Horowitz, 2004). So if you are trying to find a friend in a large crowd of people, it will be fairly easy if your friend is wearing red and everyone else is wearing black, or if your friend is the only one waving, the only one standing up, or much larger or smaller than everyone else. As discussed in Chapter 3, a similar research paradigm was used to identify synesthetes, some of whom see particular numbers as printed in particular colours even when all the numbers are black. If you are not a synesthete, it might take you a while to find, for example, all the 2s in an array of 2s and 5s if all the numbers are black. A synesthete who sees 2s in one colour and 5s in another colour will be able to find the 2s very quickly.

Although searching for a single feature, such as a red stimulus, is fast and automatic, searching for two features is *serial* (you need to look at the stimuli one at a time) and *effortful* (takes longer and requires more attention). For example, imagine trying to find all the red Xs in a display of differently coloured Xs and Ys; this would be called a *conjunction task* because the stimulus you are looking for is made up of two simple features (**FIGURE 7.4**).

### Auditory Attention Allows Selective Listening

Because attention is limited, it is hard to perform two tasks at the same time, especially if they rely on the same mechanisms. We easily can listen to music and drive at the same time, but it is hard to listen to two conversations at once. Think about driving along an open road, singing along with a song on the radio, and perhaps even talking with a passenger. What happens when you suddenly see the brake lights of the cars ahead of you? You need to stop talking and singing and direct your attention to the task of driving, which suddenly becomes more difficult and requires additional attention. Driving and listening to the radio at the same time can even be hazardous, depending on what you are listening to—for example, a sports broadcast might engage your visual system if it inspires you to imagine a game in progress, diverting attention from the visual cues on the road ahead. Recent research has shown that talking on a cellphone while driving is more hazardous than talking

with a passenger in the car while driving. A cellphone conversation will not vary naturally with the driving conditions, because the person talking with the driver will not know what is happening—that, for example, traffic has gotten heavy or the car ahead has suddenly braked. A driver talking with a passenger can signal in many ways that the conversation needs to pause as situations demand (Strayer & Drews, 2007). Hands-free cellphones do not solve the attention problem when drivers have to divide their attentional resources among multiple tasks.

In 1953, the British psychologist E. C. Cherry described what he called the *cocktail party phenomenon*: You can focus on a single conversation in the midst of a chaotic cocktail party, yet a particularly pertinent stimulus, such as hearing your name mentioned in another conversation or hearing a juicy piece of gossip, can capture your attention. While proximity and loudness influence what you will attend to, your selective attention can also determine which conversation you hear. Imagine you are having dinner with a friend at a crowded restaurant. Suddenly the conversation at the next table piques your interest. If you really want to hear that conversation, you can focus your attention on it rather than on what your closer (and therefore probably louder) friend is saying. When your friend notices the blank look on your face and protests, “You’re not listening to me!” chances are you will not be able to tell your friend what he or she said—but you will be able to relate the drama at the next table.

Cherry developed selective-listening studies to examine what people’s minds do with unattended information when people pay attention to one task. He used a technique called *shadowing*, in which a participant wears headphones that deliver one message to one ear and a different message to the other. The person is asked to attend to one of the two messages and “shadow” it by repeating it aloud. In this situation, the subject usually notices the unattended sound (the message given to the other ear) but will have no knowledge about its content (FIGURE 7.5).

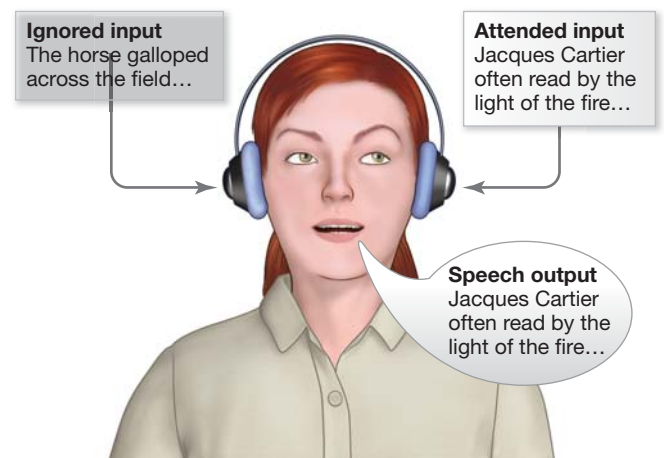
Imagine you are participating in an experiment about what happens to unattended messages, and you are repeating whatever is spoken into one ear (shadowing) and ignoring the message spoken into the other ear. What would happen if your own name were spoken into the unattended ear? You would probably hear your own name but know nothing about the rest of the message. Some important information gets through the filter of attention, but it needs to be personally relevant information, such as your name or the name of someone close to you, or it has to be particularly loud or different in some obvious physical way.

## Selective Attention Can Operate at Multiple Stages of Processing

In 1958, the British psychologist Donald Broadbent developed the *filter theory* to explain the selective nature of attention. He assumed that people have a limited capacity for sensory information and thus screen incoming information, letting in only the most important. In this model, attention is like a gate that opens for important information and closes for irrelevant information. But can we really close the gate to ignore some information? When and how is the gate closed?

Some stimuli demand attention and virtually shut off the ability to attend to anything else. Imagine you are focusing all your attention on reading this book, and suddenly you develop a muscle cramp. What will happen to your attention? The sharp jab of

**FIGURE 7.5 Shadowing** The participant receives a different auditory messages in each ear, but is required to repeat (“shadow”) only one.



the cramp will demand your attention, and whatever you are reading will leave your consciousness until you attend to the muscle. Similarly, some stimuli, such as those that evoke emotions, may readily capture attention because they provide important information about potential threats in an environment (Phelps, Ling, & Caruso, 2006). The same object produces a stronger attentional response when it is viewed as socially relevant (e.g., an eye) than when it is viewed as nonsocial (e.g., an arrowhead; Tipper, Handy, Giesbrecht, & Kingstone, 2008). Faces are a good example of stimuli that capture attention because they provide important social information, such as whether someone is a potential mate (i.e., has an attractive face) or may intend to cause physical harm (i.e., has an angry face). A series of studies conducted by psychologists at the University of Toronto found that faces, especially when threatening, are prioritized over less meaningful stimuli by the attentional system (West, Anderson, & Pratt, 2009). As an adaptive system, attention helps people focus on important objects in their environments.

Some studies indicate that decisions about what to attend to are made early in the perceptual process, but other studies reveal that unattended information is processed at least to some extent. (As discussed in Chapter 4, people are often influenced by information delivered subliminally or incidentally.) Several selective-listening studies have found that even when participants cannot repeat an unattended message, they still have processed its contents. In one experiment, participants were told to attend to the message coming in one ear: “They threw stones at the bank yesterday.” At the same time, the unattended ear was presented with one of two words: either “river” or “money.” Afterward, participants could not report the unattended words; however, those presented with “river” interpreted the sentence to mean someone had thrown stones at a riverbank, while those presented with “money” interpreted the sentence to mean someone had thrown stones at a financial institution (MacKay, 1973). Thus they extracted meaning from the word even though they did not process the word consciously.

**FIGURE 7.6 Scientific Method: Change Blindness Studies**

**Hypothesis:** People can be “blind” to large changes around them.

**Research Method:**

**1** A participant is approached by a stranger asking for directions.



**2** The stranger is momentarily blocked by a larger object.



**3** While being blocked, the original stranger is replaced by another person.



**Results:** Half the participants giving directions never noticed they were talking to a different person (as long as the replacement was of the same race and sex as the original stranger).

**Conclusion:** Change blindness results from inattention to certain visual information.

Photos from Simons, D. J., & Levin, D. T. (1998). Failure to detect changes to people during a real-word interaction. *Psychonomic Bulletin and Review*, 5, 644–649. © 1998 Psychonomic Society, Inc. Figure courtesy Daniel J. Simons.



One striking demonstration of how inattentive we can be is the phenomenon known as **change blindness**, the fact that we are often “blind” to large changes in our environments because we cannot attend to everything in the vast array of visual information available. For example, would you notice if the person you were talking to suddenly changed into another person? In a series of studies in which participants gave directions to a stranger who was momentarily blocked by a large object and was then replaced with another person, 50 percent of the people giving directions never noticed they were talking to a different person, as long as the replacement was of the same race and sex as the first stranger (Simons & Levin, 1998; **FIGURE 7.6**).

Change blindness shows that we can attend to a limited amount of information and that large discrepancies exist between what most people believe they see and what they actually see. Change blindness also shows how attention influences memory. When giving directions to a stranger, we normally do not attend to the distinctive features of the stranger’s face or clothing, so we are unable to recall them later—not because we forgot them, but more likely because we never encoded these features. After all, how often do we need to recall this information? Thus our perceptions of the world are often inaccurate, and we have little awareness of our perceptual failures; we simply do not know how much information we miss in the world around us.

**change blindness** The common failure to notice large changes in environments.

#### CRITICAL THINKING SKILL

### Recognizing When “Change Blindness Blindness” May Be Occurring

The main message from studies of change blindness is that people can miss obvious changes in what they see and hear. Despite this possibility, most people believe they will always notice large changes, that important events automatically draw their attention. This erroneous belief persists because people often do not find out about the things they fail to perceive (Simons & Ambinder, 2005). In addition, the phenomenon of change blindness is so counterintuitive that few people believe how much they do not see. *Change blindness blindness* is people’s unawareness that they often do not notice apparently obvious changes in their environments.

Imagine you are driving up a hill. At the top of the hill, there is an intersection. When you reach the top, you see another car heading straight into your lane, and in a flash you swerve to avoid a collision. The other car hits yours, but your last-minute swerve convinces eyewitnesses that you caused the accident by driving erratically. Change blindness blindness could be a factor in their reports: Perhaps out of a desire to help, the eyewitnesses believe they saw the whole accident, but they may have missed the critical moments because they were attending to their own activities.

Being aware of change blindness blindness is a critical thinking skill. Thinking that we always notice large changes in our visual field may lead us to perceive things incorrectly, such as in erroneously believing something did or did not happen. Recognizing the limitations of attention may help prevent us from misleading ourselves about our perceptions. Knowledge about change blindness should make us more humble about what we really see and what we remember.

## SUMMING UP

### How Does Attention Determine What Is Remembered?

Attention is the ability to focus on certain stimuli, which are passed along to be encoded into a neural code that can be retrieved later. It is an adaptation that enables a person to handle the huge amounts of information in an environment without becoming overloaded. Still, a person can fail to notice major changes in an environment because his or her attention is focused on something else. Visual search tasks indicate that we process visual information about basic features (e.g., colour, motion, orientation, and size) quickly, automatically, and effortlessly. Searching for stimuli that are the conjunction of two basic features (e.g., trying to find large, red numbers) is slow, serial, and effortful. A key aspect of attention is that it is selective; we can choose the stimuli to which we attend, as when we ignore a nearby conversation in favour of a more interesting one farther away. However, to an extent we can process some information contained in sensory stimuli to which we are not consciously attending. Attention can operate in multiple stages of perceptual processing, and unattended stimuli are reduced rather than eliminated from further processing. Because of change blindness, people have difficulty remembering events to which they did not attend.

## MEASURING UP

1. Which statement correctly describes the two stages of attention?
  - a. Attention can be captured by stimuli that vary along multiple dimensions (e.g., red, tilted squares) and stimuli that are important for survival (e.g., high-pitched screams).
  - b. Attention has a rapid process that searches for one feature and a slower, serial process that searches for multiple features one at a time.
  - c. Attention first segregates stimuli and then uses a binding process to build perceptions.
  - d. Attention is first narrow in focus and then broadens to include all items in the visual field.
2. What happens to information when we are not paying attention?
  - a. Some of the unattended information is passed on for further processing, but it is weaker than attended information.
  - b. It is always lost because attention filters out unattended information.
  - c. Unattended information is always available in some form; we just need to design experiments to demonstrate that it is available.
  - d. Loud unattended messages will be lost because we can block information from our auditory channels.

### LEARNING OBJECTIVE

Describe the stages in the modal model of memory, including how long each stage lasts and how much information it can hold.

## What Are the Basic Stages of Memory?

Memory allows us to take information from our experiences and store it for retrieval later. However, all experiences are not equally likely to be remembered. Some life events pass swiftly, leaving no lasting memory; others remain for a lifetime. The following section considers experiences that are never learned and leave no trace, others that create memories that will last into very old age, and others that are remembered but later forgotten.

Since the late 1960s, most psychologists have viewed memory as a form of information processing, with processes analogous to the ways through which computers

process information: A computer receives information through the keyboard or modem, and software determines how the information is processed; the information may then be stored in some altered format on the hard drive; and the information may be retrieved when it is needed. Likewise, memory's multiple processes can be thought of as operating over time in three distinct phases: (1) The **encoding** phase, which occurs at the time of learning, as information is acquired/encoded, or changed into a neural code that the brain can use (on acquisition, see Chapter 6, "Learning"); (2) the **storage** phase, which can last a fraction of a second or as long as a lifetime (there are at least three storage systems, which differ in how long they store information); and (3) **retrieval**, which we usually think of as reaching into our memory storage to find or retrieve a previously encoded and stored memory when we need it.

Psychological scientists often describe memory more specifically: as a three-part system that involves *sensory memory*, *short-term or working memory*, and *long-term memory*. This framework, the **modal memory model**, was proposed by the psychologists Richard Atkinson and Richard Shiffrin in 1968. Since then, although it is somewhat inaccurate and incomplete, the modal model has dominated psychological thinking about memory, and vocabulary from it remains widely used in memory research (FIGURE 7.7).

## Sensory Memory Is Brief

**Sensory memory** is a temporary memory system, lasting only a fraction of a second and closely tied to the sensory systems. It is not what we usually think of when we think about memory, because it is so short and, under most circumstances, we are not aware that it is operating.

As discussed in Chapter 5, we obtain all our information about the world through our senses. Our sensory systems transduce, or change, that information into

**encoding** The processing of information so that it can be stored.

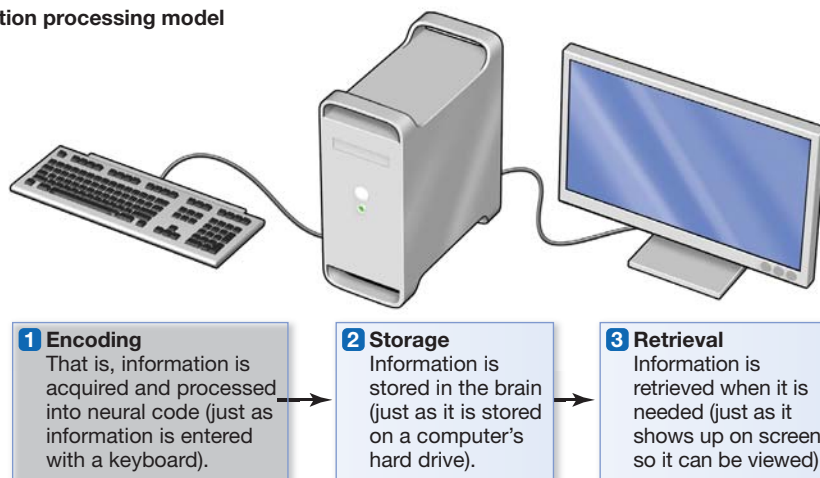
**storage** The retention of encoded representations over time that corresponds to some change in the nervous system that registers the event.

**retrieval** The act of recalling or remembering stored information to use it.

**modal memory model** The three-stage memory system that involves sensory memory, short-term memory, and long-term memory.

**sensory memory** Memory for sensory information that is stored briefly close to its original sensory form.

(a) Information processing model



(b) Modal memory model

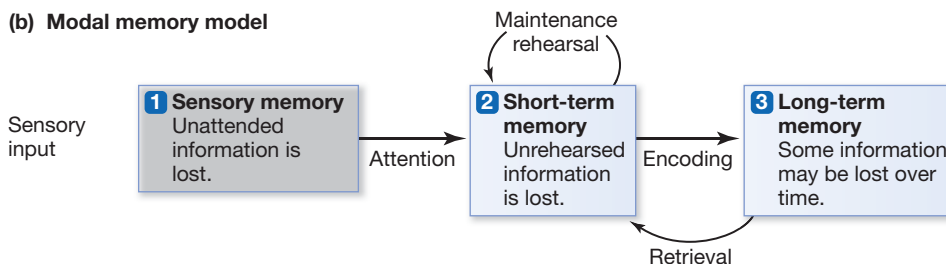


FIGURE 7.7 Memory Systems

(a) The information processing model compares the working of memory to the actions of a computer. (b) The modal memory model serves as a useful framework for thinking about the basic stages of memory.

neural impulses, and everything we remember is the result of neurons firing in the brain. A memory of a sight or of a sound, for example, is created by intricate patterns of neural activity in the brain. A sensory memory occurs when a light, a sound, an odour, a taste, or a tactile impression leaves a vanishing trace on the nervous system for a fraction of a second. When you look at something and quickly glance away, you can briefly picture the image and recall some of its details. When someone angrily proclaims, “You’re not paying attention to me,” you can often repeat back the last few words the person spoke, even if you were thinking about something else.

In 1960, the cognitive psychologist George Sperling provided the initial empirical support for sensory memory. In this classic experiment, three rows of letters were flashed on a screen for one-twentieth of a second. Participants were asked to recall all the letters. Most people believed they had seen all the letters, but they could recall only three or four. That is, in the time it took them to name the first three or four, they forgot the other letters. These reports suggested the participants had very quickly lost their memories of exactly what they had seen. Sperling tested this hypothesis by showing all the letters exactly as he had done before, but signalling with a high-, medium-, or low-pitched sound as soon as the letters disappeared. A high pitch meant the participants should recall the letters in the top row, a medium pitch meant they should recall the letters in the middle row, and a low pitch meant they should recall the letters in the bottom row. When the sound occurred very shortly after the letters disappeared, the participants correctly remembered almost all the letters in the signalled row. But the longer the delay between the letters’ disappearance and the sound, the worse the participants performed. Sperling concluded that the visual memory persisted for about one-third of a second, after which the sensory memory trace faded progressively until it was no longer accessible (FIGURE 7.8).

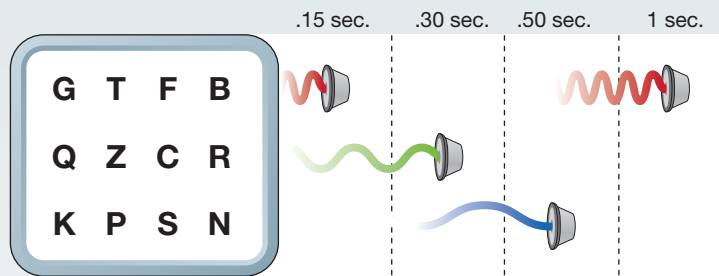
**short-term memory (STM)** A limited-capacity memory system that holds information in awareness for a brief period.

**FIGURE 7.8 Scientific Method: Sperling’s Sensory Memory Experiment**

**Hypothesis:** Information in sensory memories is lost very quickly if it is not transferred for further processing.

**Research Method:**

- 1 Participants looked at a screen on which three rows of letters flashed for one-twentieth of a second.
- 2 When a high-pitched tone followed the letters, it meant the participants should recall the letters in the top row. When a medium-pitched tone followed the letters, it meant the participants should recall the middle row. And when a low-pitched tone followed the letters, it meant the participants should recall the bottom row.
- 3 The tones sounded at various intervals: .15, .30, .50, or 1 second after the display of the letters.



**Results:** When the tone sounded very shortly after the letters disappeared, participants remembered almost all the letters in the signalled row. The longer the delay between the disappearance of the letters and the tone, the worse the participants performed.

**Conclusion:** Sensory memory persists for about one-third of a second and then progressively fades.

Our sensory memories allow us to experience the world as a continuous stream rather than in discrete sensations, much the way a movie projector plays a series of still pictures that follow each other closely enough in time to look like continuous action. In everyday vision, when you turn your head, the scene passes smoothly in front of you rather than in jerky bits, thanks to visual memory, which keeps information just long enough for you to connect one image with the next in a smooth way that corresponds to the way objects move in the real world.

### Working Memory Is Active

Information attended to is passed from sensory stores to **short-term memory (STM)**, a limited-capacity memory system that holds information in awareness for a brief period but longer than the fraction of a second that sensory memory lasts. Most psychologists call this

short-term system **working memory (WM)**, to indicate that it is a memory (storage) system that combines information from different sources and can work on the information we have in memory. It is also called *immediate memory*, to emphasize that it consists of our fleeting thoughts, ever-shifting feelings, and temporary impressions of things in the world. A computer analogy for immediate memory is random-access memory, or RAM, which can handle only a small amount of information compared with the vast amount stored in the computer's hard disk. The material in short-term memory, like that in RAM, is constantly replaced by new information, and it is lost forever if not saved.

Information remains in working memory for about 20 to 30 seconds, then disappears unless you actively prevent that from happening by thinking about or rehearsing the information. For instance, when you look up a telephone number and walk across the room to the phone, you repeat the number over and over until you dial it. If the number is busy, or if you trip over the cat on the way to phone, you probably will forget the number even though only a few seconds have passed since you looked it up.

As an example, try to remember some new information: the three-letter string of consonants X C J. As long as you keep repeating the string over and over, you will keep it in working memory. But if you stop rehearsing, you probably will soon forget the letters, because you are bombarded with other events that compete for your attention, and you may not be able to stay focused. Try again to remember X C J, but this time count backward in threes from the number 309. Most people find it difficult to remember the consonants after a few seconds of backward counting, and the longer they spend counting, the less able they are to remember the consonant string. After only 18 seconds of counting, most people recall the consonants extremely poorly—an indication that working memory lasts less than a half a minute without continuous rehearsing as a way to remember.

**MEMORY SPAN AND CHUNKING** Why do new items in working memory interfere with the recall of older items? WM can hold a limited amount of information. The cognitive psychologist George Miller has noted that the limit is generally seven items (plus or minus two), a figure referred to as *memory span*. More-recent research suggests that Miller's estimate may be too high and that WM may be limited to as few as four items (Conway, Kane, Hambrick, Wilhelm, & Engle, 2005). Memory span also varies among individuals. Indeed, some intelligence tests use memory span as part of the measure of IQ.

Because WM is limited, you might expect almost everyone to have great difficulty remembering a string of letters such as

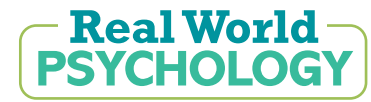
UTPHDUBCMASFUBAUWO.

These 18 letters would tax even the largest memory span. But what if we organized the information into smaller, meaningful units? For instance,

UT PHD UBC MA SFU BA UWO.

Here the letters are separated to produce acronyms for universities and academic degrees. This organization makes them much easier to recall, for two reasons. First, memory span is limited to seven items, probably fewer, but the items can be letters or groups of letters, numbers or groups of numbers, words, or even concepts. Second, meaningful units are easier to remember than nonsense units. This process of organizing information into meaningful units is known as **chunking**, as in breaking down the information into chunks. The more efficiently you chunk information, the more you can remember. Master chess players who glance at a scenario

**working memory (WM)** An active processing system that keeps different types of information available for current use.



**chunking** Organizing information into meaningful units to make it easier to remember.



**FIGURE 7.9 Memory Olympics**

Contestants in the Memory Olympics memorize names, faces, and even decks of cards, as shown here at the meet in Kuala Lumpur, October 2003. Almost all participants in such memory contests use strategies involving chunking.

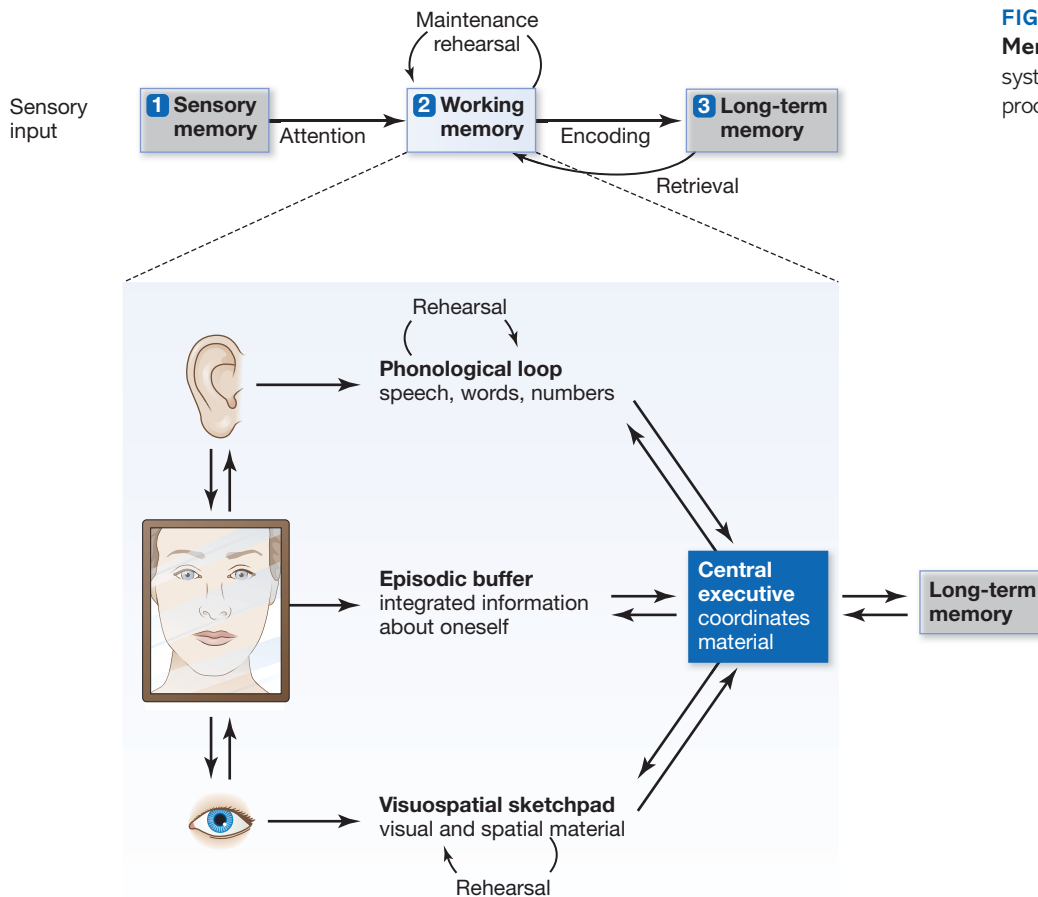
on a chessboard, even for a few seconds, later can reproduce the exact arrangement of pieces (Chase & Simon, 1973). They can do so because they instantly chunk the board into a number of meaningful subunits based on their past experiences with the game. However, if the pieces are arranged on the board in ways that make no sense in terms of chess, experts are no better than novices at reproducing the board. In general, the greater your expertise with the material, the more efficiently you can chunk information, and therefore the more you can remember. Over the last several years, the World Memory Championship, or Memory Olympics, has grown rapidly in popularity. Contestants compete by showing how much they can remember in several events (FIGURE 7.9). The contestants rely on various strategies to improve recall, but virtually all of them use some form of chunking.

Researchers in Australia have recently demonstrated how working memory is updated to take into account new information (Ecker, Lewandowsky, Oberauer, & Chee, 2010). For instance, suppose a restaurant manager is told to expect 20 people for dinner. If subsequently told five more people are coming, the manager needs to retrieve the original number, transform it by adding five, and then substitute the new number for the old in working memory. These three processes—retrieval, transformation, and substitution—make distinct and independent contributions to updating the contents of working memory. Sometimes only one of the processes is necessary to update working memory. For instance, if the manager is expecting 20 people for dinner but is told that 25 are coming, the manager does not have to retrieve the original number or transform it. He or she just has to substitute the new number into working memory.

**WORKING MEMORY'S FOUR PARTS** Researchers initially saw short-term memory as simply a buffer, or holding place, in which verbal information was rehearsed until it was stored or forgotten. They learned, however, that WM is not a single storage system but rather an active processing unit that deals with multiple types of information, such as sounds, images, and ideas. The British psychologist Alan Baddeley and his colleagues (2002) developed an influential model of an active memory system that they called working memory. The four components of working memory are the *central executive*, the *phonological loop*, the *visuospatial sketchpad*, and the *episodic buffer* (FIGURE 7.10).

The central executive presides over the interactions among the phonological loop, the visuospatial sketchpad, the episodic buffer, and long-term memory (discussed in the next section); as its name suggests, it is the control system. It encodes information from the sensory systems and then filters information that is sufficiently important to be stored in long-term memory. It also retrieves information from long-term memory as needed. The central executive relies on the other three sub-components, which temporarily hold auditory or visuospatial information or personally relevant information.

The phonological loop encodes auditory information and is active whenever a person tries to remember words by reading them, speaking them, or repeating them. You probably have noticed your “inner voice,” which reads along as your eyes process written material—it is difficult to absorb meaning simply by scanning your eyes across the text. If you are not familiar with your inner voice, try to read the rest of this sentence while reciting the alphabet, a task that interferes with your ability to “speak” the words of the sentence in your head. (Give up?) Evidence for the phonological loop comes from studies in which participants are shown lists of consonants and asked to remember them. People tend to make errors with consonants that sound alike rather than those that look alike—for instance, misremembering a D as a T rather than as a Q, which is visually similar to D but does not sound like it. Recall is also



**FIGURE 7.10 Baddeley's Working Memory System** The working memory system details the components and processes of short-term memory.

poorer when many words on a list sound the same than when they sound dissimilar but are related in meaning. These examples suggest that words are processed in WM by how they sound rather than by how they look or what they mean.

The visuospatial sketchpad processes visual information, such as objects' features and where they are located. Suppose you are walking and see a dog. The visuospatial sketchpad allows you to keep track of both where the dog is located and whether you need to be aware of the dog. Researchers have distinguished between phonological loop and visuospatial sketchpad by studying patients with specific kinds of brain damage. Patients with some types of brain injury have great difficulty remembering spatial layouts but have little difficulty remembering words, for example, whereas others show the opposite pattern. Such findings demonstrate that WM consists of much more than an all-inclusive storage system.

Recently added to Baddeley's model of working memory, the episodic buffer holds temporary information about oneself, drawing heavily on long-term episodic memory.

## Long-Term Memory Is Relatively Permanent

When people talk about memory, they usually are referring to the relatively permanent storage of information: **long-term memory (LTM)**. In the computer analogy presented above, LTM is the storage of information on a hard drive. In thinking about LTM's capacity, try to imagine counting everything you know and everything you are likely to know in your lifetime. It is hard to imagine what that number might be—you can always learn more. Unlike computer storage, human LTM is nearly limitless. Long-term memory allows you to remember nursery rhymes

**long-term memory (LTM)** The relatively permanent storage of information.

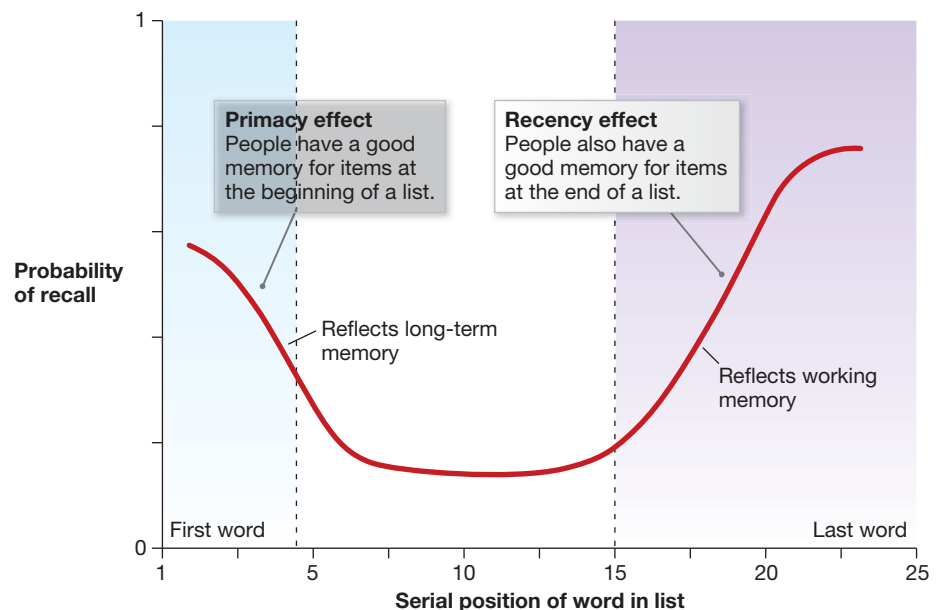
from childhood, the meanings and spellings of words you rarely use (say, *aardvark*), what you had for lunch yesterday, and so on, and so on.

**DISTINGUISHING LONG-TERM MEMORY FROM WORKING MEMORY** Long-term memory is distinct from working memory in two important ways, duration and capacity. A controversy exists, however, as to whether LTM represents a truly different type of memory storage from WM. Initial evidence that LTM and WM are separate systems came from research that required people to recall long lists of words. The ability to recall items from the list depended on order of presentation: Items presented early or late in the list were remembered better than those in the middle. Better recall of early and late items in a list relative to items in the middle of the list is known as the **serial position effect**, which involves two separate effects: The *primacy effect* refers to the better memory people have for items presented at the beginning of the list, whereas the *recency effect* refers to people's better memory for the most recent items, the items at the end of the list (**FIGURE 7.11**).

**serial position effect** The ability to recall items from a list depends on order of presentation, with items presented early or late in the list remembered better than those in the middle.

One explanation for the serial position effect relies on a distinction between WM and LTM. When research participants study a long list of words, they rehearse the earliest items the most, so that information is transferred into LTM. The last few items, by contrast, are still in WM when the participants have to recall the words immediately after reading them. The idea that primacy effects are due to LTM whereas recency effects are due to WM is supported by studies in which there is a delay between the presentation of the list and the recall task. Such delays interfere with the recency effect but not the primacy effect, just as you would expect if the former involves WM and the latter LTM. However, it is questionable whether the recency effect can be attributed entirely to WM. After all, you probably remember your most recent class better than the classes you had earlier, even though you are not holding that material in WM. If you had to recall the past prime ministers of your country, you would probably recall the early ones and most recent ones best and have poorer recall for those in between, but it is unlikely that you maintain the information about prime ministers in WM.

Perhaps the best support for the distinction between WM and LTM exists at the biological level of analysis, in case studies such as that of H.M., the patient described



**FIGURE 7.11** The Serial Position Effect



at the beginning of this chapter. His WM system is perfectly normal, as shown by his ability to keep track of a conversation as long as he stays actively involved in it, and much of his LTM system is intact, since he remembers events that occurred before his surgery, but he is unable to transfer new information from WM into LTM. In another case, a 28-year-old accident victim with damage to the left temporal lobe had extremely poor WM, with a span of only one or two items. However, he had perfectly normal LTM—he had a fine memory for day-to-day happenings and reasonable knowledge of events that occurred before his surgery (Shallice & Warrington, 1969). Somehow, despite the bottleneck in his WM, he was relatively good at retrieving information from LTM. These case studies demonstrate that LTM can be dissociated (separated) from WM. However, the two memory systems are highly interdependent, at least for most of us. For instance, to chunk information in WM, people need to form meaningful connections based on information stored in LTM.

**WHAT GETS INTO LONG-TERM MEMORY** Considering that we are bombarded with so much information and engage in so many activities, it seems obvious that some type of filtering system or series of rules must constrain what goes into our LTM. Researchers have provided several possible explanations for this process. One possibility is that information enters permanent storage through rehearsal (**FIGURE 7.12**). When you study for exams, you often go over the material many times to be sure you have learned it. Memory researchers have also shown that *overlearning*, in which you keep rehearsing material you already know pretty well, leads to improved memory, especially over longer periods of time. For this reason, material studied in multiple sessions over time—that is, through *distributed practice*—is remembered better than material studied in a brief period, through *massed practice*, or cramming. The conclusion from many years of research is that the most efficient way to learn is to study for shorter periods (in time blocks long enough to get a meaningful amount of information into memory) but to spread those study sessions out over several days or weeks. Unless you plan to “regurgitate” the information on an exam and never use it again, cramming is an ineffective way to acquire information. In later sections, this chapter will discuss ways to improve learning and memory.

Although rehearsal is a way to get some information into LTM, simply repeating something many times is not a good method for making information memorable. After all, sometimes we have extremely poor memory for objects that are highly familiar (**FIGURE 7.13**). Merely seeing something countless times does not enable people to recall its details. You can try this with your friends: Cover their watches, and ask each friend to describe his or her watch face. A surprising number of people will not know, for example, if all of the numbers are on the face, even if they look at the watch many times a day. This loss of information in memory really shows how well attention and memory function: We attend just enough for the task at hand and lose information that seems irrelevant.

Only information that helps us adapt to our environment is typically transformed into a long-term memory. Of the billions of both sensory experiences and thoughts we have each day, we want to store only useful information so as to benefit from experience. Remembering that a penny is money and being able to recognize one when we see it are much more useful than being able to recall its specific features, unless you receive counterfeit pennies and have to separate them from real ones.



**FIGURE 7.12 Long-Term Memory and Rehearsal** Actors—such as the ones seen here, performing at the Shaw Festival in Niagara-on-the-Lake, Ontario—need to memorize their lines and accompanying movements. To do so, they may rehearse alone, in small groups, or as a cast. In this way, they commit the script and added cues to LTM.

### FIGURE 7.13 Try for Yourself: The Penny Quiz

Can you tell which drawing of the Canadian penny is correct?



**Answer:** Even if you live in Canada and see pennies all the time, you might have had trouble identifying "(a)" as the accurate version. In any country, most people do not pay much attention to the specific details of their currency.

Evolutionary theory helps explain how we decide in advance what information will be useful. Memory allows us to use information in ways that assist in reproduction and survival. For instance, animals that can use past experiences to increase their chances of survival have a selective advantage over animals that fail to learn from past experiences. Recognizing a predator and remembering an escape route will help an animal avoid being eaten. Accordingly, remembering which objects are edible, which people are friends and which are enemies, and how to get home are typically not challenging for people with intact memory systems, but they are critical for survival.

## SUMMING UP

### What Are the Basic Stages of Memory?

From the somewhat dated perspective of information processing, memory has three basic parts: sensory memory, short-term memory, and long-term memory. Sensory memory consists of brief traces on the nervous system that reflect perceptual processes. Material is passed from sensory memory to short-term memory, a limited system that briefly holds information in awareness. More recently, psychologists have come to think about STM as working memory, which involves a central executive, a phonological loop, an episodic buffer, and a visuospatial sketchpad. WM is limited to perhaps as few as four chunks of information. The rules for chunking are determined by the meaning provided from LTM, a virtually limitless, relatively permanent store. The distinction between WM and LTM is best established by case studies of people with impairments to one but not to the other.



## MEASURING UP

1. Indicate how long each of the three stages of memory holds information, and indicate its capacity.  
Stage:
  - a. sensory memory
  - b. short-term (or working) memory
  - c. long-term memoryDuration:
  - i. one week
  - ii. a fraction of a second
  - iii. about one day
  - iv. between 20 and 30 seconds
  - v. potentially as long as a person lives
  - vi. until middle ageCapacity:
  - i. 20 chunks, plus or minus 10
  - ii. four to nine chunks
  - iii. much of the visual world
  - iv. almost limitless
  - v. about 100,000 pieces of information
  - vi. equal to the number of neurons in the brain
2. Which memory system is responsible for your ability to remember the first word in this question?
  - a. sensory memory
  - b. working memory
  - c. long-term memory

## What Are the Different Long-Term Memory Systems?

Only in the last few decades have most psychologists begun to think about long-term memory as composed of several systems. The older view was that memories differed in terms of their strength (how likely something would be recalled) and their accessibility (context in which something would be recalled), but generally all memories were considered to be of the same type. In the late 1970s and early 1980s, cognitive psychologists such as Endel Tulving, Daniel Schacter, Peter Graf, and Larry Squire began to challenge this view. Much of the related work took place in the psychology department at the University of Toronto, which has long been one of the world's leading centres for research on human memory. Researchers at Toronto argued that memory is not just one entity but rather a process that involves several interacting systems (Schacter & Tulving, 1994). Although the systems share a common function—to retain and use information—they encode and store different types of information in different ways. For instance, several obvious differences exist between your remembering how to ride a bicycle and your recalling what you ate for dinner last night or that the capital of Saskatchewan is Regina. These are long-term memories, but they differ in how they were acquired (learned) and in how they are stored and retrieved. Remembering how to ride a bike requires a behavioural component, an integration of specific motor and perceptual skills that you acquired over time. You are not consciously aware of your efforts to maintain balance or follow the basic rules of the road. By contrast, recalling a specific event



### LEARNING OBJECTIVES

Explain the differences among episodic, semantic, implicit, explicit, and prospective memories.

Provide an example of each of these types of memory.

you experienced or knowledge you learned from someone else sometimes requires a conscious effort to retrieve the information from LTM.

Scientists do not agree on the number of human memory systems. For instance, some researchers have distinguished among memory systems based on how information is stored in memory, such as whether the storage occurs with or without deliberate effort. Other researchers have focused on the types of information stored, such as words and meaning versus particular muscle movements versus information about a city's spatial layout. Understanding how different memory systems work has provided tremendous insight into memory, such as why it sometimes fails.

## Explicit Memory Involves Conscious Effort

The most basic distinction between memory systems is the division of memories we are consciously aware of from memories we acquire without conscious effort or intention and do not know we know. Remember that H.M., the memory loss sufferer described at the beginning of this chapter, improved at mirror tracing (tracing a pattern when only its mirror image is visible), so he must have learned this motor task even without knowing that he had. We all have memories about which we have no conscious knowledge. Peter Graf and Daniel Schacter (1985) referred to unconscious memory as **implicit memory**. They contrasted it with **explicit memory**, the processes we use to remember information that we can say we know. The cognitive information retrieved in explicit memory is **declarative memory**, knowledge that can be declared (consciously brought to mind).

You use explicit memory when you recall what you had for dinner last night, for example, or what the word *aardvark* means. Declarative memories can involve words or concepts, visual images, or both. For instance, when you imagine the earth's orbit around the sun, you might also retrieve the images and names of the other planets. You could describe this knowledge in words, so it is in declarative memory. Most of the examples presented in this chapter so far are of explicit memories. Every exam you ever took in school likely tested declarative memory.

In 1972, Endel Tulving, at the University of Toronto, proposed that explicit memory can be divided into *episodic* and *semantic memory*. **Episodic memory** refers to a person's past experiences and includes information about the time and place the experiences occurred (FIGURE 7.14A). If you can remember aspects of your 14th birthday, for example, such as where you were and what you did there, this information is part of your episodic memory. **Semantic memory** represents the knowledge of facts

**implicit memory** The system underlying unconscious memories.

**explicit memory** The processes involved when people remember specific information.

**declarative memory** The cognitive information retrieved from explicit memory; knowledge that can be declared.

**episodic memory** Memory for one's personal past experiences.

**semantic memory** Memory for knowledge about the world.

**FIGURE 7.14 Explicit Memory** Explicit memory involves information that individuals are aware of knowing. **(a)** When in 2009 the Canadian World War II veteran Okill Stuart **(right)** was awarded the French Legion of Honour for his role in the 1944 Normandy Beach landings, he drew on his episodic memory to describe his experiences to France's defence minister. **(b)** Game shows such as *Jeopardy* test semantic memory—the memory of facts independent of personal experience. In 2004, Ken Jennings (pictured here) became the longest-defending champion on *Jeopardy* when he won 75 games in a row.



independent of personal experience. We might not remember where or when we learned it, but we know it (**FIGURE 7.14B**). For instance, people know what Jell-O is, they know the capitals of countries they have never visited, and even those who have never played baseball know that three strikes mean you are out.

Scientists have learned a great deal about normal memory by studying people like H.M. and others who have impaired memories (Jacoby & Witherspoon, 1982). Evidence that episodic and semantic systems of explicit memory are separate can be found in cases of brain injury in which semantic memory is intact even though episodic memory is impaired. Researchers found this pattern of abnormal memory in a group of British children who experienced brain damage during infancy or early childhood and developed poor memory for episodic information (Vargha-Khadem et al., 1997). The children had trouble reporting what they had for lunch, what they were watching on television five minutes earlier, what they did during summer vacation. Their parents reported that the children had to be constantly monitored to make sure they remembered things such as going to school. Remarkably, these children attended mainstream schools and did reasonably well. Moreover, their IQs fell within the normal range. They learned to speak and read, and they could remember many facts. For instance, when asked “Who is Martin Luther King Jr.?” one of the children responded, “An American; fought for Black rights, Black rights leader in the 1970s; got assassinated.” These children, then, were able to encode and retrieve semantic information.

### Implicit Memory Occurs without Deliberate Effort

Implicit memory consists of memories without awareness of them, so you are not able to put the memories into words. If you ran to catch a ball that had been thrown high in the air, you would not be able to say just how you knew where the ball would be when you could reach it; if you came reasonably close to catching the ball, how to be in position to do so is information you know and can use. Classical conditioning, described in Chapter 6, employs implicit memory: If you always experience fear at the sight of a person in a white lab coat, for example, you might have past associations (implicit memories) between a person in a white lab coat and pain. In addition, implicit memory does not require conscious attention, but happens automatically, without deliberate effort. Suppose that while driving you realize you have been daydreaming and have no episodic memory of the past few minutes. During that time, you employed implicit memories of how to drive and where you were going—you did not crash the car or go in the wrong direction.

Implicit memory influences our lives in subtle ways, as when our attitudes are influenced by implicit learning. For example, you might like someone because he or she reminds you of another person you like, even if you are unaware of the connection. Advertisers rely on implicit memory to influence our purchasing decisions. Constant exposure to brand names makes us more likely to think of them when we buy products. If you find yourself wanting a particular brand of jeans, for example, you might be “remembering” advertisements for that brand, even if you cannot recall the specifics. This effect is another example of one of the seven main themes in this book: We often are unaware of influences on how we think or feel.

At the social level of analysis, implicit attitude formation can affect our beliefs about people, such as whether particular people are famous. Ask yourself: Is Richard Shiffrin famous? Try to think for a second how you know him. If you thought he was famous, you might have recalled that Shiffrin was one of the psychologists who introduced the modal memory model (an accomplishment that might make him famous in scientific circles), or you might have remembered reading his name before



even if you could not remember where. In studying what he called the *false fame effect*, the psychologist Larry Jacoby had research participants at McMaster University read aloud a list of made-up names (Jacoby, Kelley, Brown, & Jasechko, 1989). The participants were told that the research project was about pronunciation. The next day, Jacoby had the same people participate in an apparently unrelated study, in which they were asked to read a list of names and decide whether each person was famous or not. The McMaster students misjudged some of the made-up names from the previous day as being those of famous people. Because the participants knew they had heard the names before but could not remember where, implicit memory led them to assume the familiar names were those of famous people. The saying *There is no such thing as bad publicity* may be an exaggeration, but if all you remember about a name is that you have heard it before (it feels familiar), you will likely assume it belongs to a famous person.

Implicit memory is also involved in *repetition priming*, the improvement in identifying or processing a stimulus that has been experienced previously. In a typical priming experiment, participants are exposed to a list of words and asked to do something, such as count the number of letters in the words. Following some brief delay, the participants are shown word fragments and asked to complete them with the first word that comes to mind. For example, participants might be asked to count the letters in the words *appearance*, *chestnut*, *patent*. Later they would be asked to complete the stems *app*\_\_\_\_, *che*\_\_\_\_, and *pat*\_\_\_\_ with the first word that comes to mind. Typically, participants will be much more likely to complete the fragments with the words they previously encountered, which were primed (activated in memory) and therefore more easily accessible. In this example, they would more likely complete the stems as *appearance*, *chestnut*, and *patent* than as, say, *application*, *cheese*, and *paternal*. This effect occurs even when participants cannot explicitly recall the words in the first task. Even many hours after viewing the primes, participants show implicit memory without explicit recall of the words.

Another example of implicit memory is **procedural memory**, or *motor memory*, which involves motor skills, habits, and other behaviours employed to achieve goals, such as coordinating muscle movements to ride a bicycle or following the rules of the road while driving (**FIGURE 7.15**). You remember to stop when you see a red light because you have learned to do so, and you might drive home on a specific route without even thinking about it. Procedural memories have an automatic, unconscious aspect, so much so that most people find that consciously thinking about automatic behaviours interferes with the smooth production of those behaviours. The next time you are riding a bicycle, for instance, try to think about each step involved in the process.

**procedural memory** A type of implicit memory that involves motor skills and behavioural habits.

**prospective memory** Remembering to do something at some time in the future.

**FIGURE 7.15 Implicit Memory** The innate muscle memory for knowing how to ride a bicycle (procedural or motor memory) is an example of implicit memory, or memory without the awareness of having the memory. Once people learn how to ride a bike, they usually can remember how to do it again, unconsciously, at any age.

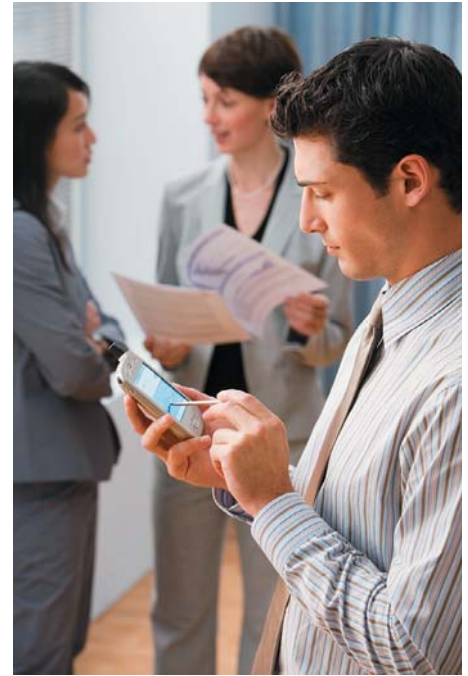


### Prospective Memory Is Remembering to Do Something

“When you see Liam, tell him to call me, and don’t forget to stop for milk on your way home from school.” Unlike the other types of remembering discussed so far in this chapter, **prospective memory** is future oriented, in that it means an individual remembers to do something at some future time (Graf & Uttl, 2001). As noted earlier in this chapter, paying attention has a “cost”: The cognitive effort involved in attending to certain information makes us unable to attend closely to other information. Likewise, remembering to do something takes up valuable

cognitive resources, either by reducing the number of items we can deal with in working memory or by reducing the number of things we can attend to (Einstein & McDaniel, 2005). In one laboratory study of prospective memory's effects, participants were given a list of words to learn, but in one condition they also had to remember to do something (such as press a key when they saw a certain word). The group that had to remember to do something took longer to learn the list than the control group that learned the same list of words but did not have to remember to do something (Cook, Marsh, Clark-Foos, & Meeks, 2007).

Prospective memory involves both automatic and controlled processes. As discussed in Chapter 4, automatic processes happen without conscious awareness or intent (McDaniel & Einstein, 2000). Sometimes the retrieval cues occur in a particular environment—for example, seeing Liam might automatically trigger your memory, so you effortlessly remember to give him the message. Sometimes particular environments do not have obvious retrieval cues for particular prospective memories—for example, you might not encounter a retrieval cue for remembering to buy milk, unless on your way home you walk or drive past a grocery store that has a large dairy display outside. Remembering to stop for milk might require some ongoing remembering as you travel home and perhaps earlier, even if you are not aware of that remembering. Prospective memory for events without retrieval cues is the reason sticky notes are so popular—by sticking one that says “Milk” on the steering wheel of your car, for example, you will ensure that you see it before heading home. By jogging your memory, the note helps you avoid the effort of remembering (FIGURE 7.16).



**FIGURE 7.16 Prospective Memory**

Prospective memory involves remembering to do something in the future. When you use a device, such as this personal digital assistant (PDA), to remember appointments and deadlines, you are assisting your prospective memory.

## SUMMING UP

### What Are the Different Long-Term Memory Systems?

Memory is not a single process or brain system. Fundamental differences exist among episodic and semantic memory, explicit and implicit memory, and prospective memory. Explicit memory involves the conscious storage and retrieval of declarative memories, such as personal experiences or meanings of words; explicit memories can be episodic or semantic. Episodic memory is of personally experienced events, such as where and when the events occurred—for example, you might remember that you had eggs for breakfast at home this morning. Semantic memory is of information that does not include the memory for where and when it was learned. Implicit memory is enhancement of memory without effort or awareness. Examples of implicit memory include procedural (or motor) memory, attitude formation, and repetition priming. Prospective memories involve a person's remembering to do things. If the cue to remember is available in the person's environment, prospective memory can operate automatically, but without a retrieval cue, remembering requires conscious effort.

## MEASURING UP

Indicate whether each of the following examples of memory is prospective, implicit, or explicit; if it is explicit, also indicate whether it is episodic or semantic.

- walking (for an adult)
- the value of pi to six decimal places
- writing a computer program
- the fact that working memory has four basic components
- the fact that you need to drive your sister home from school
- that the smell of eggs makes you sick and you do not know why

## How Is Information Organized in Long-Term Memory?

### LEARNING OBJECTIVES

Illustrate the organization of long-term memory.

Show how retrieval cues can determine what we remember.

Events important enough to be remembered permanently need to be stored in a way that allows for later retrieval. Imagine if a video store put each video or DVD wherever there was empty space on a shelf. How would you find a certain movie? You would have to go through the inventory film by film until you encountered the movie. Just as this random storage would not work well for movies, it would not work well for memories. The following section examines the temporal (time-based) and organizational principles of long-term memory.

### Long-Term Storage Is Based on Meaning

As viewed through the computer analogy presented a few sections above, memory is a process of storing new information so that the information is available when the rememberer needs it. And as discussed in Chapter 5, our perceptual experiences are transformed into representations, or *codes*, which are then stored. For instance, when your visual system senses a shaggy, four-legged animal and your auditory system senses barking, you perceive a dog. The concept of “dog” is a *mental representation* for a category of animals that share certain features, such as barking and fur. You do not have a tiny picture of a dog stored in your head; rather, you have a mental representation. The mental representation for “dog” differs from that for “cat,” even though the two are similar in many ways. You also have mental representations for complex and abstract ideas, including beliefs and feelings such as love.

All of this information is stored in networks of neurons in the brain. Memories, then, are stored representations. As discussed above, memories represent many different kinds of information, such as visual images, facts, ideas, tastes, or even muscle movements, such as the memories for riding a bicycle. Retrieval often involves an explicit effort to access the contents of memory storage, as when you try to remember your fifth birthday or something you learned in the previous chapter. But often you retrieve information without any effort, as when you instantly remember the name of an acquaintance you encounter. Thus retrieval is involved in explicit and implicit memory systems.

There are many ways to organize a large collection of things. For example, public libraries generally store books by call numbers, telephone books list names alphabetically, and video stores tend to organize movies by type *and* alphabetically. Memories are stored by meaning. In the early 1970s, the psychologists Fergus Craik and Robert Lockhart, at the University of Toronto, developed an influential theory of memory based on depth of elaboration. According to their *levels of processing* model, the more deeply an item is encoded, the more meaning it has and the better it is remembered. Craik and Lockhart proposed that different types of rehearsal lead to differential encoding. *Maintenance rehearsal* is simply repeating the item over and over. *Elaborative rehearsal* encodes the information in more meaningful ways, such as thinking about the item conceptually or deciding whether it refers to oneself. In other words, in this type of rehearsal we elaborate on basic information by linking it to knowledge from long-term memory.





How does the levels of processing model work? Suppose you showed research participants a list of words and then asked them to do one of three things. You might ask them to make simple perceptual judgments, such as whether each word is printed in capital or lowercase letters. You might ask them to judge the sound of each word, as in whether the word rhymes with *boat*. Or you might ask them about each word's semantic meaning, as in "Does this word fit the sentence *They had to cross the \_\_\_\_\_ to reach the castle?*" Once participants had completed the task (that is, processed the information), you might ask them to recall as many words as possible. You would find that words processed at the deepest level, based on semantic meaning, were remembered the best (FIGURE 7.17). At the biological (brain systems) level of analysis, brain imaging studies have shown that semantic encoding activates more brain regions than shallow encoding (Kapur et al., 1994). This greater brain activity is associated with better memory.

### Schemas Provide an Organizational Framework

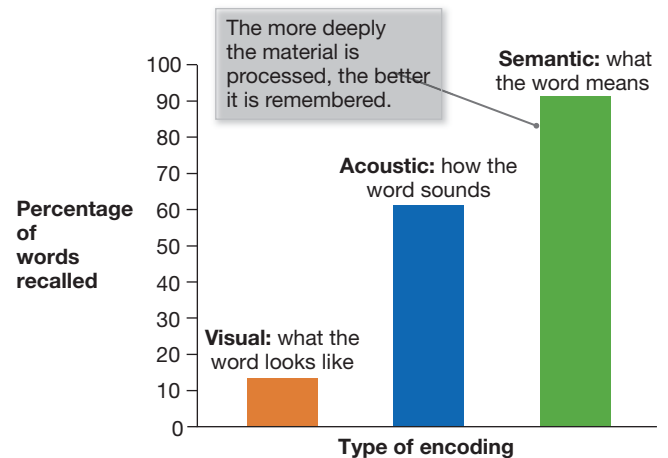
If people store memories by meaning, how is that meaning determined? Chunking, discussed above, is a good way to encode groups of items for memorization. The more meaningful the chunks, the better they will be remembered. Decisions about how to chunk information depend on **schemas**: structures in long-term memory that help us perceive, organize, process, and use information. Schemas help us sort out incoming information, and they guide our attention to an environment's relevant features. Thanks to schemas, we construct new memories by filling in holes within existing memories, overlooking inconsistent information, and interpreting meaning based on past experiences.

While helping us make sense of the world, schemas can lead to biased encoding. This bias occurs because culture heavily influences schemas. In a classic demonstration conducted in the early 1930s, the psychologist Frederic Bartlett asked British participants to listen to a Native American folk tale, which involved supernatural experiences and was difficult to understand for non-Native Americans unfamiliar with such tales. Fifteen minutes later, Bartlett asked the participants to repeat the story exactly as they had heard it. The participants altered the story greatly—and consistently, so that it made sense from their own cultural standpoint. Sometimes they simply forgot the supernatural parts they could not understand.

To understand schemas' influence on which information is stored in memory, consider a study in which students read a story about an unruly girl. Some participants were told the girl was Helen Keller (see the opening of Chapter 5, "Sensation and Perception") whereas others were told it was Carol Harris, a made-up name (Sulin & Dooling, 1974). One week later, the participants who had been told the girl was Helen Keller were more likely to mistakenly report having read the sentence *She was deaf, mute, and blind* in the story than those who thought the story was about Carol Harris. The students' cultural schema for Helen Keller included her disabilities, and when they retrieved information about Keller from memory, everything they knew about her was retrieved along with the story they were trying to remember.

To see how schemas affect your ability to recall information, read the following paragraph carefully:

The procedure is actually quite simple. First arrange things into different bundles depending on makeup. Don't do too much at once. In the short run this may not seem important, however, complications easily arise. A mistake can be



**FIGURE 7.17 Encoding** Participants are asked to consider a list of words according to how the words are printed, how they sound, or what they mean. Later they are asked to recall the words.

**schema** A hypothetical cognitive structure that helps us perceive, organize, process, and use information.

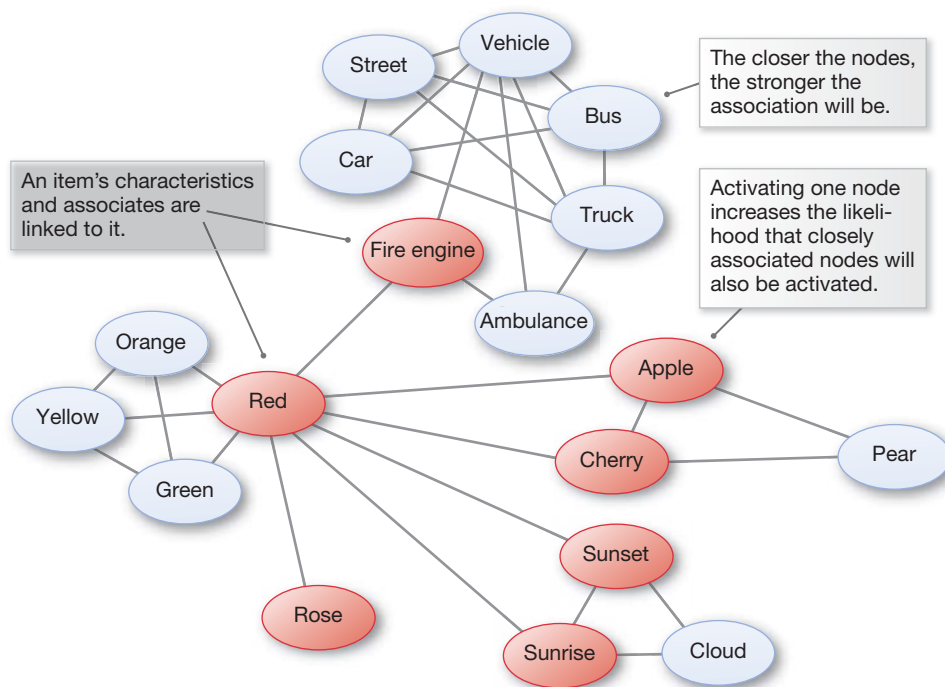
costly. Next, find facilities. Some people must go elsewhere for them. Manipulation of appropriate mechanisms should be self-explanatory. Remember to include all other necessary supplies. Initially the routine will overwhelm you, but soon it will become just another facet of life. Finally, rearrange everything into their initial groups. Return these to their usual places. Eventually they will be used again. Then the whole cycle will have to be repeated. (Bransford & Johnson, 1972, p. 722)

How easy did you find this paragraph to understand? Could you now recall specific sentences from it? It might surprise you to know that in a research setting, university students who read this paragraph found it easy to understand and relatively straightforward to recall. How is that possible? It was easy when the participants knew that the paragraph described washing clothes. Go back and reread the paragraph. Notice how your schema for doing laundry helps you understand and remember how the words and sentences are connected to one another. You will learn more about schemas in the next chapter.

### Information Is Stored in Association Networks

One highly influential set of theories about memory organization is based on *networks of associations*. We can trace back to the ancient Greek philosopher Aristotle the idea that our knowledge of the world is organized so that things related in meaning are linked in storage. In a network model proposed by the psychologists Allan Collins and Elizabeth Loftus, an item's distinctive features are linked so as to identify the item. Each unit of information in the network is a *node*. Each node is connected to many other nodes. When you look at a fire engine, for example, all the nodes that represent a fire engine's features are activated, and the resulting activation pattern gives rise to the knowledge that the object is a fire engine rather than, say, a cat. An important feature of network models is that activating one node increases the likelihood that closely associated nodes will also be activated. As shown in **FIGURE 7.18**, the closer the nodes, the stronger the association between them and therefore the more likely that activating one will activate the other. Seeing a fire engine activates nodes that indicate other vehicles, so that once your fire engine nodes are activated, you are much quicker to recognize other vehicles than, for instance, fruits or animals. A central tenet of *spreading activation* models of memory is the idea that activating one node increases the likelihood of associated nodes becoming active. According to these views, stimuli in working memory activate specific nodes in long-term memory, and this activation increases the ease of access to that material, thereby facilitating retrieval. Indeed, a recent study by German researchers showed that retrieval of some items led to enhanced memory for related items even when participants were told to forget those items (Bäumli & Samenih, 2010). The implication is that when one is reminded of a

**FIGURE 7.18 A Network of Associations**  
In this semantic network, similar concepts are connected through their associations.



memory that one would rather avoid (such as an embarrassing past incident), other parts of that event will be reactivated, perhaps leading to even greater distress.

Associative networks' overall organization is based on hierarchically structured categories, which provide a clear and explicit blueprint for where to look for needed information. Given the vast amount of material in memory, it is amazing how quickly we can search for and obtain needed memories from storage. Each time you hear a sentence, you not only have to remember what all the words mean but also have to recall all relevant information that helps you understand the sentence's overall meaning. For this process to occur, the information needs to be organized logically. Imagine trying to find a specific file on a full 2-terabyte hard disk by opening one file at a time. Such a method would be hopelessly slow. Instead, most computer disks are organized into folders, within each folder are more-specialized folders, and so on. Associative networks in the brain work similarly, and this hierarchical storage system allows us to find needed information quickly.

## Retrieval Cues Provide Access to Long-Term Storage

A **retrieval cue** can be anything that helps a person sort through the vast data in long-term memory to access the right information. Say, for example, you remember the name of your French teacher in your senior year of high school. The activation of this memory node makes it more likely that you will remember the name of the person who sat next to you in French class than if you cannot recall your French teacher's name. In this case, your French teacher's name serves as a retrieval cue for your classmate's name. Retrieval cues' power explains why it is easier to *recognize* than to *recall* information. For example, if you were asked to name the capital of Australia and are not very knowledgeable about that country, for a moment or two you probably would have to think about whether you could retrieve the correct answer. If, however, you were asked whether Australia's capital is Canberra, London, or Winnipeg, you probably would find it easier to remember that Canberra is the correct answer. The word would help you retrieve information, such as that London is England's capital and Winnipeg is Manitoba's capital, that allows you to answer the question. However, if Sydney were among the options, you might have selected Sydney, remembering that it is a major city in Australia. Because it is easier to recognize a correct answer than to recall it, many students prefer multiple-choice exams over essay exams. After all, a multiple-choice exam provides all the correct answers—you only have to recognize them.

**ENCODING SPECIFICITY** Almost anything can be a retrieval cue. Encountering stimuli such as the smell of turkey, a favorite song from years past, a familiar building, and so on, can trigger unintended memories. According to Endel Tulving's **encoding specificity principle**, any stimulus encoded along with an experience can later trigger a memory of the experience. In one study of encoding, participants studied 80 words in either of two rooms. The rooms differed in ways such as location, size, and scent. The participants were then tested for recall in the room in which they studied or in the other room. When they studied and were tested in the same room, participants recalled an average of 49 words correctly. In contrast, when they were tested in the room in which they did not study, participants recalled an average of 35 words correctly (Smith, Glenberg, & Bjork, 1978). This kind of memory enhancement, when the recall situation is similar to the encoding situation, is known as *context dependent memory*. Context dependent memory can be based on things such as physical location, odours, and background music, many of which produce a sense of familiarity (Hockley, 2008). In the most dramatic research demonstration of context dependent

**retrieval cue** Anything that helps a person (or other animal) recall information from memory.

**encoding specificity principle** Any stimulus that is encoded along with an experience can later trigger memory for the experience.

FIGURE 7.19 Scientific Method: Godden and Baddeley's Study of Context Dependent Memory

**Hypothesis:** When the recall situation is similar to the encoding situation, memory is enhanced.

**Research Method:**

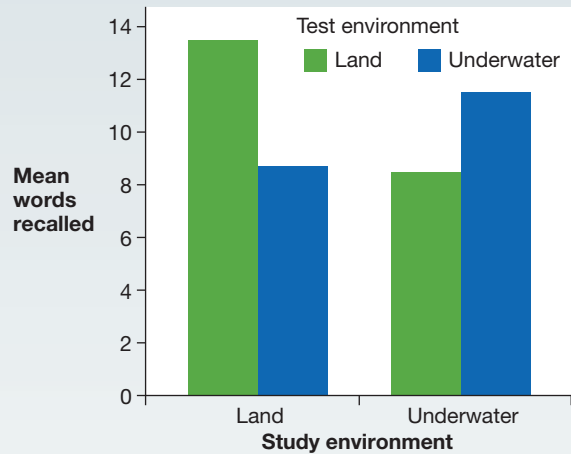
1 One group of scuba divers learned a list of words on land.



2 Another group of scuba divers learned a list of words underwater.



**Results:** The scuba divers who learned information underwater tested better underwater than on land, and those who studied on land tested better on land than underwater.



**Conclusion:** Information is best recalled in the same environment where it is learned.

memory, scuba divers who learned information underwater later tested better underwater than on land (Godden & Baddeley, 1975; FIGURE 7.19).

Just as physical context can affect memory, so internal cues such as mood state or inebriation can facilitate the recovery of information from long-term memory. Enhancement of memory when internal states match during encoding and recall is known as *state dependent memory*. Research on this topic was inspired by the observation that alcoholics often misplace important objects, such as paycheques, because they store them in safe places while they are drinking but cannot remember where when they are sober. The next time they are drinking, however, they may remember where they hid the objects. Eric Eich and his colleagues (1975) conducted a study of state dependent memory and marijuana use. Participants best remembered items on a list when tested in the same state in which they had studied the list, either sober or high. Overall, however, they recalled the information best when they were sober during studying and testing. In a study involving alcohol, participants performed worst when they studied intoxicated and took the test sober. They did worse than participants who studied sober and took the test intoxicated. Participants who studied intoxicated and took the test intoxicated did much worse than those who were sober during study and test (Goodwin, Powell, Bremer, Hoine, & Stern, 1969). So, if you were thinking about taking your next exam high or intoxicated, think again. You will do far better if you study sober and take the test sober.

**SUMMING UP**

**How Is Information Organized in Long-Term Memory?**

Human memory is stored according to meaning. The more a meaning is elaborated at the time of storage, the richer the later memory will be because more


connections can serve as retrieval cues for additional aspects. Schemas help people perceive, organize, and process information, which is then stored if processed deeply. Culture influences our schemas and thus can affect what and how we remember. Hierarchical networks of associated nodes provide semantic links between related items. Activation of a node spreads throughout the rest of its network. Retrieval cues, including contextual cues and internal states, help us access stored information.

## MEASURING UP

1. Which is the best way to teach scuba divers how to surface safely?
  - a. Teach them in a classroom so they can use their declarative knowledge on a written test.
  - b. Teach them underwater because the situation will provide retrieval cues for when they need to use the knowledge.
  - c. Teach them when they are on land and better able to pay attention.
  - d. Have them learn from experience so the method becomes part of their implicit and explicit memory systems.
2. One strategy for improving memory is to relate something you are learning to information you already know. Why would that strategy be effective?
  - a. Because the known information can act as a retrieval cue to help you remember the new information when you need it.
  - b. Because the known information will create a feeling of familiarity, which will make the new information similar to what you already know.
  - c. Because new information is easier to remember than known information and can help you remember older memories by making them more distinct and exciting.
  - d. Because old and new information need to mingle in memory so you are not confused when you implicitly try to retrieve information.

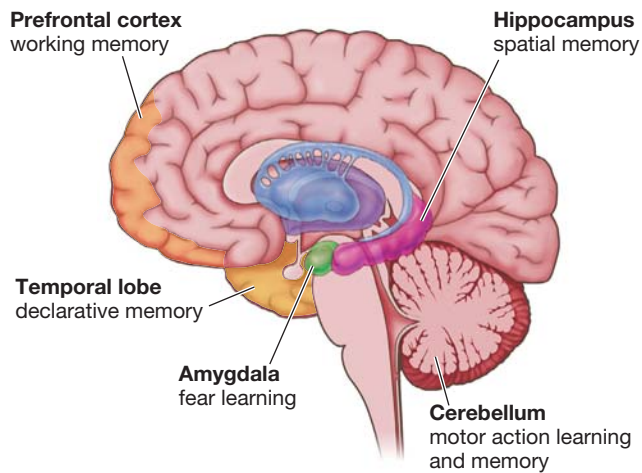
## What Brain Processes Are Involved in Memory?

What role does biology play in the formulation of our memories? This question is fundamental for memory researchers. As an outgrowth of the biological revolution, researchers have made tremendous progress over the past two decades in understanding what happens in the brain when we store and retrieve memories. Brain imaging has revealed memory processes in the healthy brain, and studies of patients with brain injuries have uncovered the basic foundations of memory's neural basis. The following section focuses on the biological level of analysis, presenting first the brain structures involved in memory, then some of the neurochemical processes that affect what and when we remember.

 **LEARNING OBJECTIVE**  
Describe the underlying changes in the brain when something is learned.

### There Has Been Intensive Effort to Identify Memory's Physical Location

One of memory researchers' central goals during the twentieth century was to figure out where in the brain memories are stored. As discussed in Chapter 3, Karl Lashley spent much of his career trying to localize memory; his term *engram* refers to the physical site of memory storage. As part of his research, Lashley



**FIGURE 7.20** Brain Regions Associated with Memory

trained rats to run a maze, then removed different areas of their cortices. (On the cortex, and on brain regions discussed below such as the cerebellum and the amygdala, see **FIGURE 7.20**.) In testing how much of the maze learning the rats retained after the surgery, Lashley found that the size of the area removed rather than its location was most important in predicting retention. From these findings, he concluded that memory is distributed throughout the brain rather than confined to any specific location, an idea known as *equipotentiality*. Lashley was partially right—memories are not stored in any one brain location—but in other ways he was quite wrong.

Memories are stored in multiple regions of the brain and linked through memory circuits, as proposed by the psychologist Donald Hebb, who suggested that neurons that “fire together wire together” (see Chapter 6, “Learning”). Not all brain areas are equally involved in memory, however. A great deal of neural specialization occurs, such

that different brain regions are responsible for storing different aspects of information. Indeed, different memory systems, such as declarative memory and procedural memory, use different brain regions. Lashley’s failure to find critical brain regions for memory is due to at least two factors. First, the maze task he used to study memory involved multiple sensory systems (such as vision and smell), so the rats could compensate for the loss of one by using other senses. Second, Lashley did not examine subcortical areas, which are now known to be important for memory retention.

Over the past three decades, researchers have identified many brain regions that contribute to learning and memory. For instance, we know from studies of H.M. (discussed in this chapter’s opening section) that regions within the temporal lobes are important for the ability to encode new memories. The temporal lobes are important for declarative memory (being able to say what you remember) but less important for implicit memory (such as motor learning and classical conditioning). As noted in Chapter 3, the cerebellum plays a role in how motor actions are learned and remembered. The amygdala, in contrast, is responsible for one type of classical conditioning, fear learning. As noted in Chapter 6, an animal without an amygdala cannot learn to fear objects that signal danger. Other important sites for memory are discussed in the following sections.

### The Medial Temporal Lobes Are Important for Consolidation of Declarative Memories

The brain area repeatedly identified as important for declarative memory is the middle section (called the *medial* section) of the temporal lobes. The medial temporal lobes consist of numerous structures relevant to memory, including the amygdala and the hippocampus. As described earlier, H.M.’s brain surgery rendered him unable to form new memories. Brain imaging revealed that a large portion of H.M.’s hippocampus had been removed (Corkin, Amaral, Gonzalez, Johnson, & Hyman, 1997). We now know that damage to this region causes *anterograde amnesia*, the inability to store new explicit memories (discussed further below). However, this finding does not mean that the medial temporal lobes are the final repository of memory. After all, H.M. remembered things from before his surgery. Thus damage to the medial temporal lobes interrupts storage of new material without impairing access to old material.

Immediate memories become lasting memories through **consolidation**. All learning leaves a biological trail in the brain. This process results from changes in the strength of neural connections that support memory and from the construction of new

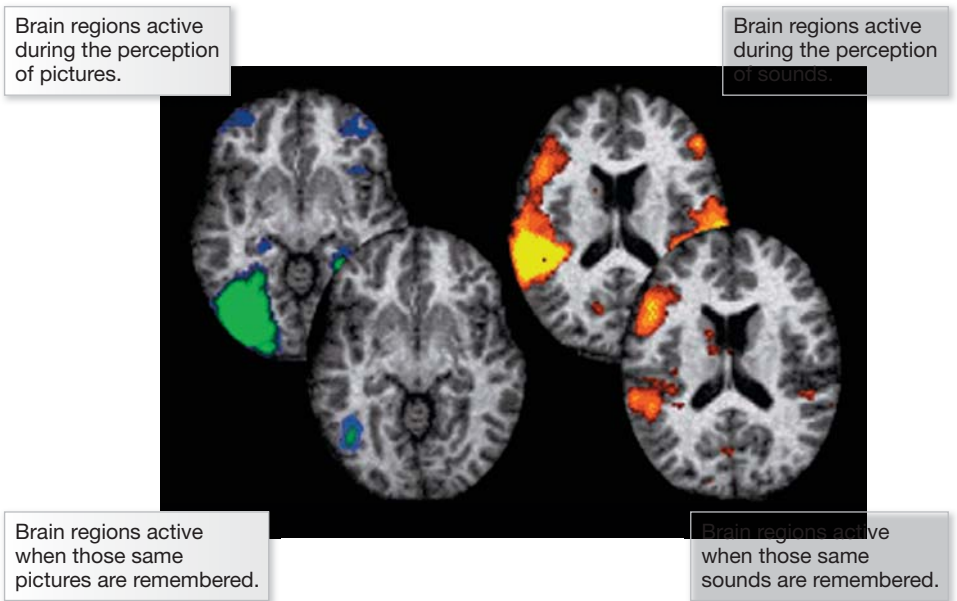
**consolidation** A hypothetical process involving the transfer of contents from immediate memory into long-term memory.

synapses (Miller, 2005). For example, reading this chapter should be making some of your neural connections stronger and creating new ones, especially in your hippocampus. Your brain is different than it was before you began reading the chapter.

The current thinking is that the medial temporal lobes are responsible for coordinating and strengthening the connections among neurons when something is learned, but that the actual storage most likely occurs in the particular brain regions engaged during the perception, processing, and analysis of the material being learned. For instance, visual information is stored in the cortical areas involved in visual perception, whereas sound is stored in the areas involved in auditory perception. Thus memory for sensory experiences, such as remembering something seen or heard, involves reactivating the cortical circuits involved in perceiving them (FIGURE 7.21). The medial temporal lobes form links, or pointers, between the different storage sites and direct the gradual strengthening of the connections between these links (Squire, Stark, & Clark, 2004).

An exciting theory developed by Karim Nader, of McGill University (FIGURE 7.22) and Joseph LeDoux, of New York University, proposes that once memories are activated, they need to be consolidated again to be stored back in memory (Nader & Einarsson, 2010; LeDoux, 2002). This process is known as **reconsolidation**. Think of it as being like a librarian's returning a book to the shelf for storage so that it can be taken out again later. Evidence for reconsolidation has been found by administering drugs that interfere with memory storage after a memory has been activated (Nader, Schafe, & LeDoux, 2002). These researchers' findings suggest that when memories for past events are retrieved, those memories can be affected by new circumstances, so that the newly reconsolidated memories may differ from their original versions. This explanation suggests that our memories change when we use them and are not accurate reproductions of what was experienced. In the library book analogy, this change would be like tearing pages out of the book or adding new pages before returning it. The book placed on the shelf differs, however slightly, from the one taken out; the information in the torn-out pages is no longer available for retrieval, and the new pages that were inserted alter the memory the next time it is retrieved. The reconsolidation process repeats itself each time a memory is activated and placed back in storage, and it may explain why our memories for events can change over time. As you might imagine, this theory has received considerable attention: It not only has implications for what it means to remember something but also opens up the intriguing possibility that bad memories could be erased by activating them and then interfering with reconsolidation. (The idea that people can eliminate unwanted memories is the premise of the movie *Eternal Sunshine of the Spotless Mind*. See Figure 7.27, which accompanies the discussion "On Ethics: Altering Memory.")

**SPATIAL MEMORY** Another important memory function of the hippocampus is **spatial memory**, memory for the physical environment, including information



**FIGURE 7.21 Brain Activation from Various Stimuli** Four horizontally sliced brain images acquired using magnetic resonance imaging indicate that regions of the sensory cortex are reactivated when we remember sensory-specific information.

**reconsolidation** Neural processes involved when memories are recalled and then stored again for later retrieval.

**spatial memory** Memory for the physical environment; it includes things such as location of objects, direction, and cognitive maps.

**FIGURE 7.22 Karim Nader** Karim Nader has conducted research demonstrating that activated memories go through a process of reconsolidation, during which they can be altered.



such as directions, locations of objects, and cognitive maps. A laboratory example of this type of learning is the *Morris water maze test*, in which a rat is placed into a circular pool of murky water and learns to swim to a platform hidden just below the surface. Although they do not like to swim, rats are good swimmers, and they can quite readily use environmental cues to remember where to find the platform. Rats with hippocampal damage are severely impaired at this learning task, however. The role of the hippocampus in spatial memory is supported by *place cells*, neurons that, in lab tests with rats, fire only when a rat returns to a specific location, such as one part of a maze. When a rat is placed in a novel environment, none of the hippocampal place cells fire. But as the rat becomes familiar with the environment, its place cells acquire links to aspects of the surroundings. This finding suggests that the hippocampus helps an animal orient itself and find its way (FIGURE 7.23). Indeed, birds that store food and thus rely on memory to find it, such as chickadees, have larger hippocampal regions than birds that do not store food. And as discussed in Chapter 3, a study showed that the sizes of London taxi drivers' hippocampi were positively correlated with the number of years the drivers had driven taxis in London, a finding that suggests the hippocampus is also important for humans' spatial memory (Maguire, Frackowiak, & Frith, 1997; Maguire et al., 2000).

In a study of rats' hippocampal place cells, the researchers found that the place cells that fired when rats were learning a maze fired again during the rats' REM sleep, a finding that suggests the rats were dreaming about the maze they had just learned (Wilson & McNaughton, 1994).

## The Frontal Lobes Are Involved in Many Aspects of Memory

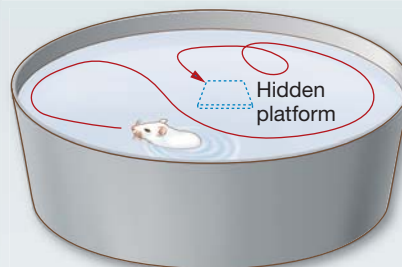
Researchers have long known that the frontal lobes are important to many aspects of memory, including episodic memory, working memory, spatial memory, time sequences, and various aspects of encoding and retrieval (Wager & Smith, 2003).

**FIGURE 7.23 Scientific Method: The Morris Water Maze Test**

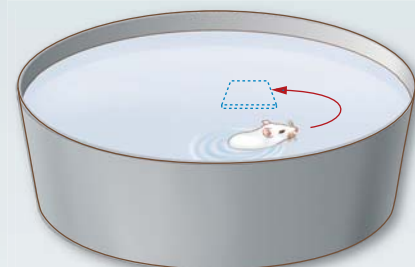
**Hypothesis:** The hippocampus is important to spatial memory.

**Research Method:**

**1** A rat is placed in the Morris water maze and must learn to find the hidden platform.



Before learning



After learning

**2** A rat with hippocampal damage is put in the water maze to do the same task.

**Results:** After many trials, a normal rat quickly learns where the platform is hidden and swims directly to it. A rat with hippocampal damage, however, has great difficulty learning to find the hidden platform.

**Conclusion:** The hippocampus is important for spatial learning.

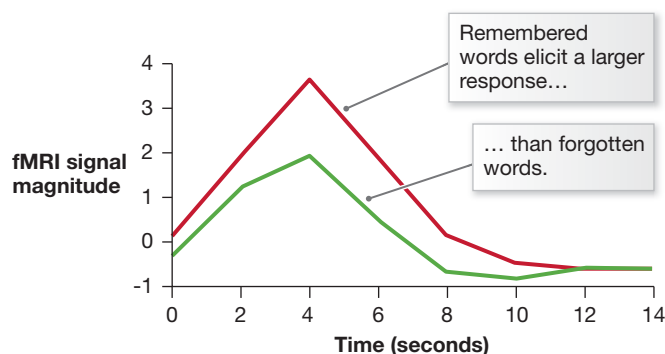


Extensive neural networks connect the prefrontal cortex with other brain regions involved in memory, such as the medial temporal areas. Thus the frontal lobes work together and with other brain regions to coordinate the encoding, storage, and retrieval of memory.

Brain imaging studies have provided compelling evidence that the frontal lobes are crucial for encoding (Buckner, Kelley, & Petersen, 1999). Moreover, deep encoding tasks (learning about a text's meaning, for example) will more likely lead to frontal activation than will shallow encoding tasks (such as learning which typeface that text is printed in). Frontal activation is also a particularly good predictor for which events will later be remembered or forgotten (Brewer, Zhao, Glover, & Gabrieli, 1998). Researchers have found, for instance, that remembered words are associated with stronger activation of the frontal lobes than are forgotten words (Wagner et al., 1998; **FIGURE 7.24**). Further, activity in frontal brain regions involved in processing specific types of information is associated with better memory for that type of information (Paller & Wagner, 2002). For example, the medial prefrontal cortex is selectively active when people think about themselves. As a result, activity in this region predicts memory for information encoded about the self but not for information encoded about others (Macrae, Moran, Heatherton, Banfield, & Kelley, 2004).

Some researchers have hypothesized that the frontal lobes also play a role in working memory (Curtis & D'Esposito, 2003). Working memory holds information temporarily so that it can be used to solve problems, understand conversations, and follow plans. Patients with damage to the frontal areas often have difficulty following plans and goals, and monkeys given frontal lesions show impaired working memory (Goldman-Rakic, Scialidhe, & Chafee, 2000). In one research task, a monkey watches the experimenter hide a reward under one of two objects. After a delay, the monkey is allowed to reach for the object covering the reward. A monkey with a frontal lesion has difficulty with this task, as will a human infant when presented with a similar task. These results further implicate the frontal lobes in working memory, since a human's frontal lobes do not fully mature until much later in development (Diamond & Doar, 1989).

Frontal regions become active when information is being retrieved from long-term memory into working memory or encoded from working memory into long-term memory. For example, when you enter a classroom, your frontal lobes oversee the retrieval of stored knowledge about classrooms from neural networks that are spread throughout your cortical and subcortical locations. This information helps you remember what to do when you enter the room (sit down), who the person is at the front of the class (the instructor), and the meaning of the sounds that will emanate from the instructor's mouth (words that form a lecture). The frontal lobes and medial temporal lobes then work together to consolidate storage of the lecture in your long-term declarative memory.



**FIGURE 7.24 Brain Activation in Memory Tasks** The amount of brain activation and the areas activated in the brain depend on the type and timing of the material being remembered.

## Neurochemistry Underlies Memory

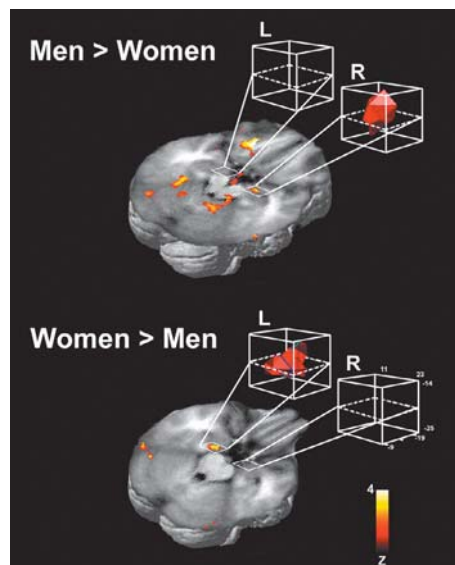
Memory involves alterations in connections across synapses. As memories are consolidated, neurons link into distributed networks, and those networks become linked. Research has shown that various neurotransmitters can weaken or enhance memory. Collectively, these neurotransmitters are known as *memory modulators*, because they modulate, or modify, memory storage.

**NEUROCHEMISTRY INDICATES THE MEANINGFULNESS OF STIMULI** As discussed in the sections above, we store meaningful information. Important events, for example, lead to neurochemical changes that produce emotional reactions, which in turn make those events especially likely to be stored in memory. An animal that outruns a predator experiences a fear reaction that will help the animal remember to avoid that predator and perhaps other predators. A child that eats and enjoys a particular food experiences an easily remembered rewarding sensation (as parents who have watched their preverbal children point at cookie jars can readily attest).

What neurochemical signals indicate that an experience is meaningful? After animals engage in minimally arousing tasks, they retain little memory of those tasks. When injected with epinephrine, the hormone secreted when a person or animal is excited or scared, those same animals show significant memory enhancement even for trivial events. It is as if the jolt of epinephrine gives the message *Remember!*

Epinephrine is secreted not within the brain but into the bloodstream from the adrenal glands, which are near the kidneys. Thus it does not affect memory directly. Researchers initially believed that epinephrine affected memory because it causes a release of glucose, which then enters the brain and influences memory storage. Glucose's role as a memory enhancer was implicated in a study in which elderly participants were given a memory test after consuming lemonade sweetened with glucose (sugar) or saccharine (a sugar substitute). Those who drank the lemonade with glucose better remembered the items they studied, even when the recall test was given a day later (Gold, McIntyre, McNay, Stefani, & Korol, 2001). More-recent studies suggest that epinephrine enhances memory because of its effect on norepinephrine activity in the amygdala, as discussed below. Other drugs, such as opiates, alcohol, and surgical anaesthetics, may also interfere with memory through their effects on norepinephrine (McGaugh, 2002).

**FIGURE 7.25 Sex Differences in Brain Activity Related to Memory** Studies have shown that men's and women's brains respond differently to emotional experiences and to the memories of those experiences. **(top)** This image shows the greater activity in the right amygdala of a man's brain while the man is viewing emotionally arousing images. **(bottom)** This image shows the greater activity in the left amygdala of a woman's brain while the woman is viewing emotionally arousing images.



**THE AMYGDALA AND THE NEUROCHEMISTRY OF EMOTION** Any arousing event causes greater activity of norepinephrine receptors, which strengthens the memory of that event. The amygdala, that almond-shaped brain structure discussed so frequently in this book, has norepinephrine receptors and is involved in the memory of fearful events. For example, in humans, the amygdala is activated when people are asked to recall an emotional film clip but not during recall of neutral film clips (Cahill et al., 1996). There appears to be a gender difference in this effect, however: Emotional memory activates the right but not the left amygdala in men, and it activates the left but not the right amygdala in women (Cahill et al., 2001; **FIGURE 7.25**). Moreover, women have better memory than men for emotional events. For instance, when Turhan Canli and colleagues (2002) showed men and women neutral and negative pictures, women not only reported greater emotional reactions to the negative pictures but also remembered those pictures better. Women may process emotional information differently than men, perhaps rehearsing it and thinking about it more, or they may focus on different aspects of stimuli (Cahill, 2003). The effects of amygdala activity on

memory are long lasting. So the more the amygdala is activated during the encoding of emotional memories, for example, the more powerful the retrieval of those memories is likely to be for at least a year (Dolcos, Labar, & Cabeza, 2005).

When people experience severe stress or emotional trauma—such as having a serious accident, being raped, fighting in active combat, or surviving a natural disaster—they often have negative reactions long after the danger has passed. In severe cases, people develop **post-traumatic stress disorder (PTSD)**, a serious mental health disorder that involves frequent and recurring unwanted thoughts related to the trauma, including nightmares, intrusive thoughts, and flashbacks. Those with PTSD often have chronic tension, anxiety, and health problems, and they may experience memory and attention problems in their daily lives. PTSD involves an unusual problem in memory—the inability to forget. PTSD is associated with an attentional bias, such that people with PTSD are hypervigilant to stimuli associated with their traumatic events. For instance, soldiers with combat-induced PTSD show increased physiological responsiveness to pictures of troops, sounds of gunfire, and even words associated with combat. Exposure to stimuli associated with past trauma leads to activation of the amygdala (Rauch, van der Kolk, Fislser, & Alpert, 1996). It is as if the severe emotional event is “overconsolidated,” burned into memory.

#### **post-traumatic stress disorder (PTSD)**

A mental disorder that involves frequent nightmares, intrusive thoughts, and flashbacks related to an earlier trauma.

### **SUMMING UP**

#### **What Brain Processes Are Involved in Memory?**

Research during the past thirty years has demonstrated that memories are encoded in distributed networks of neurons in relatively specific brain regions. We now know that damage to the medial temporal lobes, especially to the hippocampus, causes significant memory disturbances. These medial temporal regions are important for the consolidation of declarative memories into storage. The sites of memory storage are the brain structures involved in perception. Fear causes activation of the amygdala, which is associated with the strengthening of memories. There are sex differences in which of the brain regions underlie emotional memories and perhaps in the processing of emotional memories. Memories for highly traumatic events can result in post-traumatic stress disorder, a clinical disorder diagnosed when the traumatic memories intrude into everyday life.

### **MEASURING UP**

1. What changes occur at the synapses when people learn and remember? Choose as many as apply.
  - a. Neuronal connections are strengthened.
  - b. Reuptake is enhanced.
  - c. Neurons make more synaptic connections.
  - d. Brain regions associated with learning and remembering become more sensitive to glucose.
  - e. The amygdala grows larger.
2. One difference between females' and males' underlying brain mechanisms for memory is found in \_\_\_\_\_.
  - a. motor memory
  - b. emotional memory
  - c. childhood memory
  - d. explicit memory

### LEARNING OBJECTIVES

List and explain the basic processes used to understand forgetting.

**forgetting** The inability to retrieve memory from long-term storage.

**transience** The pattern of forgetting over time.

**FIGURE 7.26 Forgetting and Remembering** In the movie *Memento*, Leonard Shelby (played by the Australian actor Guy Pearce) suffers from severe memory loss: an excess of forgetting. In search of his wife's killer, he tattoos words onto his body to remind himself of information he has discovered.



## When Do People Forget?

In addition to remembering information, people fail to remember it. **Forgetting**, the inability to retrieve memory from long-term storage, is a perfectly normal, everyday experience. Ten minutes after you see a movie, you probably remember plenty of its details, but the next day you might remember mostly the plot and the main characters. Years later, you might remember the gist of the story, or you might not remember having seen the movie at all. We forget far more than we remember (**FIGURE 7.26**).

Most people bemoan forgetting, wishing they could better recall the information they study for exams, the names of childhood friends, the names of all seven dwarfs who lived with Snow White, what have you. But imagine what life would be like if you could not forget. Imagine, for example, walking up to your locker and recalling not just its combination but the 10 or 20 combinations from all of the locks you have ever used. Consider the case of a Russian newspaper reporter who had nearly perfect memory. If someone read him a tremendously long list of items and he visualized the items for a few moments, he could recite the list, even many years later. But his memory was so cluttered with information that he had great difficulty functioning in normal society. Tortured by this condition, he eventually was institutionalized. Paradoxically, not being able to forget is as maladaptive as not being able to remember. It is therefore not surprising that we tend to best remember meaningful points. We remember the forest rather than the individual trees. Normal forgetting helps us remember and use important information.

The study of forgetting has a long history in psychological science. The late-nineteenth-century German psychologist Hermann Ebbinghaus provided compelling evidence that forgetting occurs rapidly over the first few days but then levels off. Ebbinghaus used the so-called *methods of savings* to examine how long it took people to relearn lists of nonsense syllables (e.g., vut, bik, kuh). Most of us do not need to memorize nonsense syllables, but Ebbinghaus's general findings apply to meaningful material as well. You may remember very little of the geography or calculus you took in high school, but relearning these subjects would take you less time and effort than it took to learn them the first time. The difference between the original learning and relearning is “savings”—time and effort saved because of what you remember.

Daniel Schacter (1999) has identified what he calls *the seven sins of memory* (**TABLE 7.1**). The first three sins, *transience*, *absentmindedness*, and *blocking*, are related to forgetting and discussed below. The next three, *misattribution*, *suggestibility*, and *bias*, are discussed later in this chapter. *Persistence* is discussed above as post-traumatic stress disorder. These so-called sins are very familiar to most people, and Schacter argues that they are useful or perhaps even necessary characteristics for survival, by-products of otherwise desirable aspects of human memory.

### Transience Is Caused by Interference

Memory **transience** is the pattern of forgetting over time, such as the one Ebbinghaus observed in his studies of nonsense syllables. What causes transience? Many early theorists argued that forgetting results from the memory trace's *decay* in a person's nervous system. Indeed, some evidence indicates that unused memories are forgotten. However, research over the last few decades has established that most forgetting occurs because of *interference* from other information. Additional

## ON Ethics Altering Memory

Post-traumatic stress disorder (PTSD) is a serious mental health problem, with an estimated prevalence of 9.2 percent in Canada (Van Ameringen, Mancini, Patterson, & Boyle, 2008). The most common triggers of PTSD include events that threaten people or those close to them, including the unexpected death of a loved one, a physical or sexual assault, a car accident, a natural disaster, or seeing someone badly injured or killed. Post-traumatic stress disorder is an occupational hazard for police officers, firefighters, soldiers, butchers, rescue workers, and so on.

Consider train crews. According to Edward Dubroski (2000), international president of the Brotherhood of Locomotive Engineers and Trainmen (BLET), a train strikes a motor vehicle in North America every two hours. No doubt such an event gets seared into the crew's memory, with the help of an epinephrine rush. BLET's Timothy L. Smith (2007) vividly reported: "You cannot imagine the terror a train's crew experience when their train comes roaring around a curve at full speed and a truck, car, or pedestrian is just ahead. You can't blow the whistle long enough or loud enough, and your heart creeps up further in your throat with each passing yard as your closing distance races to zero. . . . The emotional toll that is exacted on our members—who are unable to stop these incidents—is often life-altering" (pp. 6–7). Why should these workers suffer such agonizing memories, which may result from another person's carelessness? If it were possible, would it be more humane to give the sufferers drugs that could erase or lessen the emotional memories of these events?

Much research is under way to produce drugs that will alter memory, not only to increase the ability to remember things but also to erase unwanted memories. (As discussed earlier, Karim Nader, of McGill University, has done work on reconsolidation that is the basis for this research. For example, Nader has administered drugs to patients with PTSD to alter their memories.) One drug, propranolol, blocks the post-synaptic norepinephrine receptors. If it is given before or right after a traumatic experience, the hormonally enhanced memories and fear response for that event are reduced, and the effect lasts for months (Cahill et al., 1994; Pitman et al., 2002). Using propranolol in such situations is equivalent to treating a possible future disease, since there is no way to know whether the person who has just had the difficult experience (or is about to have it) will develop PTSD.

Is tampering with memory formation ethical? Like many medications, treatments for PTSD could also be used for other purposes. Such drugs could be used to prepare soldiers to kill (or



**FIGURE 7.27 Altering Memories** In the 2004 film *Eternal Sunshine of the Spotless Mind*, Joel Barish (played by the Canadian actor Jim Carrey) undergoes a procedure that eliminates memories of his former girlfriend. In real life, researchers struggle with the ethical implications of developing drugs that can alter memory.

kill again), to blunt the memory of one's own shameful or embarrassing acts, to dull the pain of the loss of a loved one, or to allow criminals to numb their consciences. Who should determine which uses are appropriate and which are not (FIGURE 7.27)? Some memories are so traumatic that they destroy the life of the individual who suffers them. If we could erase such traumatic memories, should only those of traumas that were beyond the sufferer's control be relieved? Or should a person be treated for suffering a guilty conscience after an intentional malicious act?

Humans are social animals with intricate societal structures honed by evolution. Many of those societal structures are based on reciprocity and on detecting people who cheat. Although it may benefit an individual to have a blunted memory of a traumatic assault, will society survive if individuals no longer have the moral outrage to pursue their perpetrators, thus undermining cheater detection? Victims of the Holocaust have suffered greatly from traumatic memories but also have contributed greatly to society by increasing our vigilance against regimes like that of the Nazis. Would memory alteration put truth (remembering events as they really happened) in opposition to compassion or well-being? Our senses of ourselves, of who we are, come from the amalgamation of memories that we each possess. Would we be better or worse off if we could cherry-pick those memories? And finally, do we really understand memory well enough to start tinkering with it?

**Table 7.1 Seven Sins of Memory**

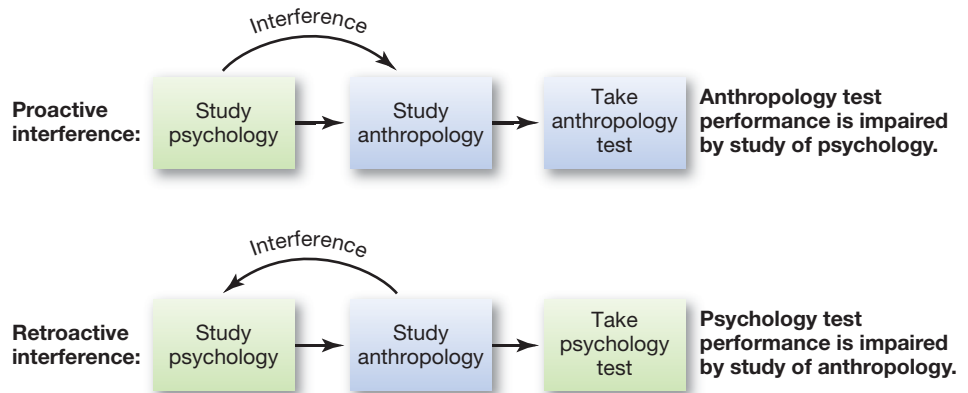
ERROR	TYPE	DEFINITION	EXAMPLE
Transience	Forgetting	Reduced memory over time	Forgetting the plot of a movie
Absentmindedness	Forgetting	Reduced memory due to failing to pay attention	Losing your keys or forgetting a lunch date
Blocking	Forgetting	Inability to remember needed information	Failing to recall the name of a person you meet on the street
Misattribution	Distortion	Assigning a memory to the wrong source	Falsely thinking that Richard Shiffrin is famous because his name is well known
Suggestibility	Distortion	Altering a memory because of misleading information	Developing false memories for events that did not happen
Bias	Distortion	Influence of current knowledge on our memory for past events	Remembering past attitudes as similar to current attitudes even though they have changed
Persistence	Undesirable	The resurgence of unwanted or disturbing memories that we would like to forget	Remembering an embarrassing faux pas

SOURCE: Based on Schacter (2001).

**proactive interference** When prior information inhibits the ability to remember new information.

information can lead to forgetting through *proactive interference* or *retroactive interference*. In both cases, competing information displaces the information we are trying to retrieve (FIGURE 7.28). In **proactive interference**, old information inhibits the ability to remember new information. For instance, if you receive a new locker combination each year, you may have difficulty remembering the current one because you keep recalling the previous one. Indeed, because the physical context

**FIGURE 7.28 Proactive and Retroactive Interference** Proactive interference occurs when information already known (here, psychology material) interferes with the ability to remember new information (here, anthropology material). Retroactive interference occurs when new information (anthropology material) interferes with memory for old information (psychology material).



provides retrieval cues for that earlier combination, you might find it especially difficult to remember the current one while standing in front of your locker! In **retroactive interference**, new information inhibits the ability to remember old information. So once you finally memorize your new locker combination, you might forget the old one.

## Blocking Is Temporary

**Blocking** occurs when a person temporarily is unable to remember something: You can't recall the name of a favorite CD, you forget the name of someone you're introducing, you "blank" on some lines when acting in a play, and so on. Such temporary blockages are common and frustrating. Another good example of blocking is the *tip-of-the-tongue phenomenon*, first described by the psychologists Roger Brown and David MacNeill, in which people experience great frustration as they try to recall specific, somewhat obscure words. The researcher Alan Brown (no relation to Roger) has shown that the tip-of-the-tongue phenomenon can be produced reliably in the laboratory (Brown, 1991). For instance, when asked to provide a word that means "patronage bestowed on a relative, in business or politics" or "an astronomical instrument for finding position," people often struggle. Sometimes they know which letter the word begins with, how many syllables it has, and even what it sounds like, but even with these partial retrieval cues they cannot pull the precise word into working memory. (Did you know the words were *nepotism* and *sex-tant*?) Blocking often occurs because of interference from words that are similar in some way, such as in sound or meaning, and that keep recurring, as when you keep calling an acquaintance Margaret though her name is Melanie.

## Absentmindedness Results from Shallow Encoding

**Absentmindedness** is the inattentive or shallow encoding of events—for instance, forgetting where you left your keys, the name of a person you met five minutes before, or whether you took your vitamins this morning (FIGURE 7.29). As discussed earlier in this chapter, the phenomenon of change blindness is demonstrated when people fail to notice that a person they have been talking with is replaced by someone else. In the original study, older people were especially likely not to notice a change in the person asking them for directions; university students were pretty good at noticing the change. Are older people especially inattentive? Or do they tend to process a situation's broad outlines rather than its details? Perhaps the older people encoded the stranger as simply "a university student" and did not look for more-individual characteristics. To test this idea, Simons and Levin (1998) conducted an additional study in which a construction worker asked university students for directions. Sure enough, the university students failed to notice the replacement of one construction worker with another, a finding that supports the idea that the students encoded the person as belonging to a broad category of "construction workers" without looking more closely at him. For these students, construction workers are pretty much all alike and interchangeable.

A recent study examined whether cultural differences exist in change blindness. The underlying idea behind this study was that East Asians live in highly interdependent societies, so they are more likely to attend to an event's context than are North Americans, who live in more-individualistic societies and thus are more likely to attend to a salient object. To test this hypothesis, Japanese native Takahiko Masuda and American Richard Nisbett (2006) had American and East Asian university students view pairs of images in which either the object in the foreground

**retroactive interference** When new information inhibits the ability to remember old information.

**blocking** The temporary inability to remember something that is known.

**absentmindedness** The inattentive or shallow encoding of events.

### FIGURE 7.29 Absentmindedness

The major cause of absentmindedness is failing to pay sufficient attention when encoding memories. The celebrated American musician Yo-Yo Ma is pictured here with his \$2.5 million eighteenth-century cello, which was returned to him after he absentmindedly left it in a cab.





**FIGURE 7.30 Amnesia** Jeff Ingram, pictured here, developed amnesia after leaving his home, in Washington state. When he arrived in Denver, Colorado, four days later, he had no memory of his previous life. He was recognized two months later, when he appeared on the news pleading for help from anyone who knew who he was. Though he did not remember his three-year relationship with his fiancée (here seated next to him), the two eventually married.

**amnesia** Deficits in long-term memory that result from disease, brain injury, or psychological trauma.

**retrograde amnesia** The condition in which people lose past memories, such as memories for events, facts, people, or even personal information.

**anterograde amnesia** An inability to form new memories.

changed or an object in the background changed. As predicted, the East Asian students recognized changes in the picture's background faster than the American students did, whereas Americans better recognized changes in the foreground object. The researchers verified these results across several studies, concluded that there are cultural variations in patterns of attention, and attributed these differences to early socialization practices, when children learn what to attend to.

## Amnesia Is a Deficit in Long-Term Memory

Sometimes we lose the ability to retrieve vast quantities of information from long-term memory. **Amnesia** is a deficit in long-term memory, resulting from disease, brain injury, or psychological trauma (**FIGURE 7.30**). The two basic types of amnesia are *retrograde* and *anterograde*. In **retrograde amnesia**, people lose past memories for events, facts, people, or even personal information. Most portrayals of amnesia in the media are of retrograde amnesia, as when a character in a soap opera awakens from a coma and does not know who he or she is. By contrast, in **anterograde amnesia**, people lose the ability to form new memories. As discussed at the beginning of this chapter, H.M. had a classic case of anterograde amnesia. He could remember old information about his past, but after his surgery he lost the ability to form new memories. However, evidence suggests that H.M. acquired some new semantic knowledge about things that occurred after 1953. For instance, when given a list of people who became famous after 1953, H.M. was able to provide some information about them (O'Kane, Kensinger, & Corkin, 2004). Given the name Lee Harvey Oswald, H.M. described him as the man who “assassinated the president.” This new learning may have occurred through extensive repetition of materials over a long time.

Many cases of amnesia result from damage to the medial temporal lobes. Damage to other subcortical areas, such as around the thalamus, can also lead to amnesia. A common cause of this type of amnesia is *Korsakoff's syndrome*, a severe form of memory disturbance linked to chronic alcoholism. Long-term alcohol abuse can lead to vitamin deficiency that results in thalamic damage and, subsequently, amnesia.

### SUMMING UP

#### When Do People Forget?

Forgetting is the inability to retrieve memory from long-term storage. The ability to forget is just as important as the ability to remember. Forgetting that occurs over time is often due to interference from competing stimuli. Blocking—a temporary inability to retrieve specific information, as exemplified by the tip-of-the-tongue phenomenon—also is caused by interference during retrieval. Absentmindedness results from shallow encoding, which occurs when people fail to pay sufficient attention to details. There are cultural differences in what people attend to (for example, East Asians attend more carefully to changes in the background, and North Americans attend more carefully to changes in a central figure), and these attention differences necessarily imply differences in what people remember. Amnesia is a deficit in long-term memory, causing people to forget past information (retrograde amnesia) or making them unable to store new information (anterograde amnesia). Most amnesia is caused by brain injury.

### MEASURING UP

1. Indicate whether each of the following is an example of retroactive interference or proactive interference or neither.



- a. You learned Russian as a teenager, but now you speak Hungarian. You have forgotten much of the Russian you used to know.
  - b. According to an old saying in Yiddish, a language spoken by Eastern Europeans a generation or two ago, you should never marry someone with a name similar to that of your last spouse. Although the expression loses a lot in translation, the idea is that you will forget and call your new spouse by the old spouse's name.
  - c. For years you took a bus home from work, and then you got a new car. One night after work, you take the bus home, forgetting that you drove your new car to work.
2. Which of the following examples reflects an accurate understanding of cultural differences in change blindness?
- a. East Asians are more self-centred, so they tend to pay attention to changes important to self-image or self-esteem. North Americans are less concerned with “saving face,” so they are free to make more errors.
  - b. North Americans tend to be more individualistic and therefore tend to notice changes to a central figure faster than East Asians do, whereas East Asians notice changes in background information faster.
  - c. Students from Canada and the U.S. are faster at noticing changes because they are more familiar with research paradigms than are students from East Asia.
  - d. East Asian students are more competitive than North American students and thus notice changes in visual displays faster.

## How Are Memories Distorted?

Most people believe that human memory is permanent storage, from which even minute and apparently forgotten details can be retrieved through hypnosis, truth drugs, or other techniques (Magnussen et al., 2006). Research has shown clearly, however, that human memory is biased, flawed, and distorted. In the following section, you will learn how the human memory systems provide less-than-accurate portrayals of past events. Keep in mind that a thing is not necessarily faulty because it does not work the way we think it works. As Daniel Schacter has argued, many of the seemingly flawed aspects of memory may be by-products of beneficial mechanisms.

### Flashbulb Memories Can Be Wrong

Do you remember where you were when you found out that the pop star Michael Jackson had died (**FIGURE 7.31A**)? Some events cause people to experience what Roger Brown and James Kulik (1977) termed **flashbulb memories**, vivid memories for the circumstances in which one first learned of a surprising and consequential or emotionally arousing event. When in 1977 Brown and Kulik interviewed people about their memories of the assassination of the U.S. president John F. Kennedy, which happened in 1963, they found that people described these 14-year-old memories in highly vivid terms. The details included who they were with, what they were doing or thinking, who told them or how they found out, and what their emotional reaction was to the event.

**DO YOU REMEMBER WHERE YOU WERE WHEN YOU HEARD . . . ?** An obvious problem affects research into the accuracy of flashbulb memories, namely that researchers have to wait for a “flash” to go off and then immediately conduct their study. The explosion of the U.S. space shuttle *Challenger*, on January 28, 1986, provided a unique opportunity for research on this topic. Ulric Neisser and Nicole



#### LEARNING OBJECTIVE

Describe how memories can be distorted.

**flashbulb memories** Vivid memories for the circumstances in which one first learned of a surprising, consequential, or emotionally arousing event.



(a)



(b)

### FIGURE 7.31 Flashbulb Memories

Surprising and consequential or emotionally arousing events can produce flashbulb memories. For example, (a) the death of pop star Michael Jackson in 2009 and (b) the resignation of British Prime Minister Margaret Thatcher in 1990 have left flashbulb memories of different kinds, depending on how consequential the events were to the people remembering them.

**source misattribution** Memory distortion that occurs when people misremember the time, place, person, or circumstances involved with a memory.

**cryptomnesia** A type of misattribution that occurs when a person thinks he or she has come up with a new idea, yet has only retrieved a stored idea and failed to attribute the idea to its proper source.

Harsch (1993) had 44 psychology students fill out a questionnaire the day the shuttle exploded. When they tested the students' memories three years later, only three students had perfect recall, and the rest were incorrect about multiple aspects of the situation. However, other researchers have documented better memory for flashbulb experiences, such as where British participants were when they heard about Prime Minister Margaret Thatcher's resignation. Martin Conway and his colleagues (1994) have shown that better memory for the flashbulb experience occurs among those who found the news surprising and felt the event was important. Thus students in the United Kingdom experienced stronger flashbulb memories for the Thatcher resignation than did students in North America (FIGURE 7.31B). For three years after the terrorist attacks on September 11, 2001, a study was conducted of more than 3,000 people across the United States (Hirst et al., 2009). Memories related to 9/11—such as where the person first heard about the attacks and the person's knowledge about the events—declined somewhat during the first year, but memory remained stable thereafter. As might be expected, people who were living in New York City on 9/11 had, over time, the most accurate memories of the World Trade Center attacks.

**STRESS AND MEMORY REVISITED** Although flashbulb memories are not perfectly accurate, they are at least as accurate as memory for ordinary events. Indeed, people are more confident about their flashbulb memories than they are about their ordinary memories (Talarico & Rubin, 2003). Any event that produces a strong emotional response is likely to produce a vivid, although not necessarily accurate, memory (Christianson, 1992). Or a distinctive event might simply be recalled more easily than a trivial event, however inaccurate the result. This latter pattern is known as the *von Restorff effect*, named after the researcher who first described it in 1933. It is also possible that greater media attention to major events leads to greater exposure to the details of those events, thus encouraging better memory (Hirst et al., 2009).

### People Make Source Misattributions

As discussed above, Daniel Schacter has identified **source misattribution**—the misremembering of the time, place, person, or circumstances involved with a memory—as one of memory's seven sins. A good example of this is the *false fame effect*, also discussed above, in which people mistakenly believe that someone is famous simply because they have encountered the person's name before. Another example, long known about by social psychologists, is the *sleeping effect*, in which arguments that initially are not very persuasive because they come from questionable sources become more persuasive over time. For example, you probably would disbelieve a weekly tabloid's claim that scientists had discovered a way for people to learn calculus while sleeping. Yet over time you might remember the argument but fail to remember the source; hence you might come to believe that people can learn calculus while sleeping, or you might at least wonder if they can.

**CRYPTOMNESIA** An intriguing example of source misattribution is **cryptomnesia**, when a person thinks he or she has come up with a new idea, but really has retrieved an old idea from memory and failed to attribute the idea to its proper source (Macrae, Bodenhausen, & Calvini, 1999). Students who take verbatim notes while conducting library research sometimes experience the illusion that they have written the sentences, a mistake that can later lead to an accusation of plagiarism. (Be especially vigilant about indicating verbatim notes while you are taking them; FIGURE 7.32.) George Harrison, the former Beatle, was sued because his 1970 song

“My Sweet Lord” is strikingly similar to the song “He’s So Fine,” recorded in 1962 by the Chiffons. Harrison acknowledged having known “He’s So Fine,” but vigorously denied having plagiarized it. He argued that with a limited number of musical notes available to all musicians, and an even smaller number of chord sequences appropriate for rock and roll, some compositional overlap was inevitable. In a controversial verdict, the judge ruled against Harrison.

## People Are Bad Eyewitnesses

One of the most powerful forms of evidence is the eyewitness account. Research has demonstrated that very few jurors are willing to convict an accused individual on the basis of circumstantial evidence alone. But add one person who says, “That’s the one!” and conviction rates shoot up, even if it is shown that the witness had poor eyesight or some other condition that raises questions about the testimony’s accuracy. Eyewitness testimony’s power is troubling because witnesses are so often in error (FIGURE 7.33). When Gary Wells and his colleagues (1998) studied 40 cases in which DNA evidence indicated that a person had been falsely convicted of a crime, they found that in 36 of these cases the person had been misidentified by one or more eyewitnesses.

**CROSS-ETHNIC IDENTIFICATION** One factor that contributes to poor eyewitness identification is that people are particularly bad at accurately identifying individuals of other ethnicities or races. This effect occurs among Caucasians, Asians, African Americans, and Hispanics. In brain imaging studies discussed in Chapter 5, blacks and whites showed better memory for same-race faces. The difference in participants’ performances was associated with the degrees of activity in the fusiform face area (Golby, Gabrieli, Chiao, & Eberhardt, 2001), which, as discussed in Chapter 3, responds more strongly to faces than to other objects. Apparently, the greater activation of this area to same-race faces accounts for people’s superior memory for members of their own racial group. One explanation for this effect is that people tend to have less frequent contact with members of other races and ethnicities; another is that people encode race and ethnicity according to rules of categorization and do not notice much about the individual person beyond this group description—a phenomenon similar to the way, discussed above, that in the change blindness experiments older people saw “a university student,” students saw “a construction worker,” and neither old people nor students noticed individual characteristics.

**SUGGESTIBILITY AND MISINFORMATION** During the early 1970s, Elizabeth Loftus and her colleagues conducted a series of important studies demonstrating that people can develop biased memories when provided with misleading information—the “sin” of **suggestibility**. The general methodology of this research involved showing research participants an event and then asking them specific questions about it; the questions’ wording altered the participants’ memories for the event. In one experiment (Loftus, Miller, & Burns, 1978), one group of participants viewed a videotape of a car—a red Datsun—approaching a stop sign. A second group viewed a videotape of that same scene but with a yield sign instead of a stop sign. Each group was then asked, “Did another car pass the red Datsun while it was stopped at the stop sign?” Some participants in the second group, even though they had seen the red Datsun approaching a yield sign, claimed to have seen it stop at the stop sign (FIGURE 7.34).



**FIGURE 7.32 Cryptomnesia** In a possible case of cryptomnesia—thinking she had come up with new material, but really having retrieved other people’s material from memory—the Harvard student Kaavya Viswanathan wrote a novel, *How Opal Mehta Got Kissed, Got Wild, and Got a Life*, that had to be recalled from bookstores. Several passages in the novel were taken from books that Viswanathan admitted having read in high school.

**suggestibility** The development of biased memories when people are provided with misleading information.

**FIGURE 7.33 Eyewitness Accounts Can Be Unreliable** William Jackson (left) served five years in prison because he was wrongly convicted of a crime based on the testimony of two eyewitnesses. How much does Jackson look like the man on the right, the real perpetrator?



## FIGURE 7.34 Scientific Method: Loftus's Studies on Suggestibility

**Hypothesis:** People can develop biased memories when provided with misleading information.

### Research Method:

- 1 One group of participants was shown a videotape of a red Datsun approaching a stop sign.
- 2 Another group of participants was shown a videotape of a red Datsun approaching a yield sign.



- 3 Immediately after viewing the tapes, the participants were asked, "Did another car pass the red Datsun while it was stopped at the stop sign?"

**Results:** Some participants who had seen the yield sign responded to the question by claiming they had seen the car at the stop sign.

**Conclusion:** People can "remember" seeing nonexistent objects.

In another experiment, Loftus and John Palmer (1974) found that participants, when asked about a videotape of a car accident, estimated the cars to be travelling faster when they heard the word *smashed* than when they heard the words *contacted*, *hit*, *bumped*, or *collided*. In a related study, participants saw a videotape of a car accident and then were asked about seeing the cars either *smash into* or *hit* each other. One week later, they were asked if they had seen broken glass on the ground in the video. No glass broke in the video, but nearly one-third of those who heard *smashed* falsely recalled having seen broken glass, whereas very few of those who heard *hit* did.

Are these sorts of laboratory analogues appropriate for studying eyewitness accuracy? After all, the sights and sounds of a traffic accident, for example, impress the event on the

witness's awareness. Some evidence supports the idea such memories are better in the real world than in the laboratory. A study in Vancouver examined reports of those who had witnessed a fatal shooting (Yuille & Cutshall, 1986). All observers had been interviewed by the police within two days of the incident. Months afterward, the researchers, at the University of British Columbia, found the eyewitness reports, including the details, highly stable. Given the memory modulation effect of stress hormones, it makes sense for eyewitnesses' accounts to be more vivid than laboratory research participants', but it remains unclear how accurate those stable memories were in the first place. And by retelling their stories over and over again—to the police, to friends and relatives, to researchers, and so on—eyewitnesses might inadvertently develop stronger memories for inaccurate details.



**FIGURE 7.35 Unreliable Evidence** In 1981, in Winnipeg, Thomas Sophonow was tried three times for the murder of Barbara Stoppel. His first trial was declared a mistrial because the jury could not reach a verdict. His second trial ended in a conviction, which a court of appeal overturned. His third trial ended in another conviction. After spending nearly four years in prison, Sophonow was acquitted by a court of appeal and released from jail. In June 2000, Winnipeg police announced that DNA evidence had proven his innocence. It subsequently was revealed that the witnesses whose testimony had helped convict Sophonow had been shown flawed photos and a lineup in which he stood a head taller than the other men.

**EYEWITNESS CONFIDENCE** How good are observers, such as jurors, at judging eyewitnesses' accuracy (FIGURE 7.35)? The general finding from a number of studies was that people cannot differentiate accurate eyewitnesses from inaccurate ones (Clark & Wells, 2008; Wells, 2008). The problem is that eyewitnesses who are wrong are just as confident, often more confident, than eyewitnesses who are right. Eyewitnesses who report vivid details of all the scene's aspects are probably less credible than those with poor memories for trivial details. After all, eyewitnesses to real crimes tend to be focused on the weapons or on the action—they fail to pay attention to minor details. Thus strong confidence for minor details may be a cue that the memory is likely inaccurate or even false. However, some people are just particularly confident, and jurors find them convincing. Taryn Simon, a photographer for the *New York Times*, created "The Innocents Project," a photo essay of people who were wrongfully convicted of crimes they did not commit, most because of faulty eyewitness testimony. Simon described many cases—many compelling examples of memory's malleability—including one in which a victim, Jennifer Thompson, misidentified her attacker. According to Thompson, who was shown multiple images of possible assailants, "All the images became enmeshed to one image that became Ron, and Ron became my attacker" (quoted in Simon, 2003, para. 3).

## Recognizing How the Fallibility of Human Memory Can Lead to Faulty Conclusions

Brooke Patterson (2004) refers to the “tyranny of the eyewitness,” meaning that people generally believe an eyewitness even though memory researchers know that eyewitnesses are frequently wrong. Of course, beliefs often remain strong despite data showing those beliefs are unjustified. When a person confidently reports what he or she heard or saw, other people tend to assume the report reflects an accurate memory. For the most part, however, there is little or no relationship between a person’s confidence about a memory and the probability of that memory’s accuracy (Weber & Brewer, 2004). An unknown number of innocent people have been imprisoned or even put to death because of memory errors. No doubt, guilty people have gone free because of either faulty memories or failure to believe valid memories. Most people do not like to have their memories questioned, and unless an independent party can verify the information, it is difficult to distinguish between a valid memory and a faulty one. As a critical thinker with an understanding of psychological science, you must recognize the fallibility of memories—including your own, even when you believe your memories are accurate. When a memory is important to some outcome, consider that memory’s likely accuracy. Whenever possible, check the memory against related objective facts, such as video or audio recordings.

### People Have False Memories

**Source amnesia** occurs when a person has a memory for an event but cannot remember where he or she encountered the information. What is your earliest childhood memory? How vivid is it? Are you actually recalling the event or some retelling of the event? How do you know you are not remembering something you saw in a photograph, or a story related to you by family members? Most people cannot remember specific memories from before age three. The absence of early memories, *childhood amnesia*, may be due to the early lack of linguistic capacity as well as to immature frontal lobes. How easily can people develop false memories (FIGURE 7.36)? Think back to when you were five. Do you remember getting lost in a mall and being found by a kind old man who returned you to your family? No? Well, what if your family told you about this incident, including how panicked your parents were when they could not find you? According to research by Elizabeth Loftus, you might then remember the incident, even if it did not happen.

In an initial study, a 14-year-old named Chris was told by his older brother Jim, who was part of the study, about the “lost in the mall” incident. The context was a game called “Remember when. . .” All the other incidents narrated by Jim were true. Two days later, when asked if he had ever been lost in a mall, Chris began reporting memories of how he felt during the mall episode. Within two weeks, he reported the following:

I was with you guys for a second and I think I went over to look at the toy store, the Kay-bee toy and uh, we got lost and I was looking around and I thought, “Uh-oh. I’m in trouble now.” You know. And then I . . . I thought I was never going to see my family again. I was really scared you know. And then this old man, I think he was wearing a blue flannel shirt, came up to me. . . . [H]e was kind of old. He was kind of bald on top. . . . [H]e had like a ring of gray hair . . . and he had glasses. (Loftus, 1993, p. 532)

**source amnesia** A type of amnesia that occurs when a person shows memory for an event but cannot remember where he or she encountered the information.

#### FIGURE 7.36 Try for Yourself: Creating False Memories

Read the following list out loud:

*Sour, Candy, Sugar, Bitter, Good,  
Taste, Tooth, Nice, Honey, Soda,  
Chocolate, Heart, Cake Tart, Pie*

Now put your book aside and write down as many of the words as you remember.

**Explanation:** Researchers have devised tests such as this for investigating whether people can be misled into recalling or recognizing events that did not happen (Roediger & McDermott, 1995). For instance, without looking back, which of the following words did you recall?

*Candy, honey, tooth, sweet, pie.*

**Answer:** If you recalled *sweet* (or think you did), you have experienced a false memory, because *sweet* was not on the original list. All the words on that list are related to sweetness, though. This basic paradigm produces false recollections extremely reliably; moreover, people are often extremely confident in saying they have seen or heard the words they recollect falsely.

You might wonder if there was something special about Chris that made him susceptible to developing false memories. But in a later study, Loftus and her colleagues used the same paradigm to assess whether they could implant false memories in 24 participants, and 7 of the participants falsely remembered events that had been implanted by family members who were part of the study. How could this be so? When a person imagines an event happening, he or she forms a mental image of the event. The person might later confuse that mental image with a real memory. Essentially, the person has a problem monitoring the source of the image. To Chris, the memory of being lost in the mall became as real as other events in childhood. Children are particularly susceptible, and false memories, such as of getting fingers caught in mousetraps or having to be hospitalized, can easily be induced in them. It is unlikely, however, that false memories could be created for certain types of unusual events, such as receiving an enema (Pezdek & Hodge, 1999).

**confabulation** The unintended false recollection of episodic memory.

**CONFABULATION** Some types of brain injury are associated with **confabulation**, the unintended false recollection of episodic memory. Morris Moscovitch, a memory research pioneer from the University of Toronto, has described confabulating as “honest lying,” because the person does not intend to deceive and is unaware that his or her story is false. Moscovitch (1995) provides a striking example of confabulation in a patient he refers to as H.W., a 61-year-old man who was the biological father of four children, all of them grown. H.W. experienced severe frontal lobe damage following a cerebral hemorrhage. Here is part of the clinical interview:

- Q. Are you married or single?  
H.W. Married.  
Q. How long have you been married?  
H.W. About four months.  
Q. How many children do you have?  
H.W. Four. (He laughs.) Not bad for four months!  
Q. How old are your children?  
H.W. The eldest is 32, his name is Bob, and the youngest is 22, his name is Joe.  
Q. How did you get those children in four months?  
H.W. They're adopted.  
Q. Does this all sound strange to you, what you are saying?  
H.W. (He laughs.) I think it is a little strange.

Patients such as H.W. confabulate for no apparent purpose. They simply recall mistaken facts and, when questioned, try to make sense of their recollections by adding facts that make the story more coherent. (Chapter 4 discusses Michael Gazzaniga's theory of the interpreter and how split-brain patients confabulate to make sense of conflicting information fed to each cerebral hemisphere.) A dramatic example of confabulation occurs in *Capgras syndrome*, where patients delusionally believe their family members have been replaced by imposters; even when confronted with contradictory evidence, they persist in inventing facts that support their delusions. In fact, no amount of evidence can convince them that their siblings, parents, spouses, children, and so on, are real. This bizarre syndrome is devastating to the family members accused of being imposters. Patients with Capgras often have damage to the frontal lobes and the limbic brain regions. The most likely cause is that the brain region involved in emotions is separated from the visual input, so the images of family members are no longer associated with warm feelings. The visual image is the same, but the feeling is not, leading the sufferer to conclude that the people are not his or her real relatives. Once we understand the underlying brain mechanisms, bizarre behaviours such as this become more understandable.

## Repressed Memories Are Controversial

Over the past few decades, one of the most heated debates in psychological science has centred on repressed memories. On one side, some psychotherapists and patients claim that long-repressed memories for traumatic events can resurface during therapy. Recovered memories of sexual abuse are the most commonly reported repressed memories (FIGURE 7.37), and in the early 1990s there was a rash of reports about celebrities who had recovered memories of early childhood sexual abuse. On the other side, memory researchers such as Elizabeth Loftus point out that little credible evidence indicates that recovered memories are genuine or at least sufficiently accurate to be believable. Part of the problem is best summarized by a leading memory researcher, Daniel Schacter: “I am convinced that child abuse is a major problem in our society. I have no reason to question the memories of people who have always remembered their abuse, or who have spontaneously recalled previously forgotten abuse on their own. Yet I am deeply concerned by some of the suggestive techniques that have been recommended to recover repressed memories” (Schacter, 1996, p. 251).

Schacter alludes to the frightening possibility that false memories for traumatic events have been implanted by well-meaning but misguided therapists. Convincing evidence indicates that methods such as hypnosis, age regression, and guided recall can implant false memories. Likewise, a growing body of evidence from carefully controlled laboratory studies has demonstrated that children can be induced to remember events that did not occur (Ceci & Bruck, 1995). In a few infamous examples, adults have accused their parents of abuse based on memories that the accusers later realized were not reality but the products of therapy. For instance, Diana Halbrook came to believe not only that she had been abused but that she had been involved in satanic ritualistic abuse, as part of which she had killed a baby. When she expressed doubts to her therapist and her “support” group about these events’ veracity, they told her she was in denial and not listening to “the little girl” within. After all, the other members of the support group had recovered memories of being involved in satanic ritualistic abuse. After Halbrook left her therapy group, she came to believe she had not been abused and had not killed. Tellingly, “though thousands of patients have ‘remembered’ ritual acts, not a single such case has ever been documented in the United States despite extensive investigative efforts by state and federal law enforcement” (Schacter, 1996, p. 269).

Understandably, people on both sides of the debate about repressed memories hold strong and passionate beliefs. While research shows that some therapeutic techniques seem especially likely to foster false memories, it would be a mistake simply to dismiss all adult reports of early abuse. Some abuse certainly could have occurred and been forgotten until later, and we cannot ignore the memories of actual victims. In the latter half of the 1990s, the incidence of recovered memories fell dramatically, but we do not know whether this decline happened because of less media attention to reports or because fewer people sought therapy to uncover their past memories.

## People Reconstruct Events to Be Consistent

A final example of memory distortion is **memory bias**, in which people’s memories for events change over time to be consistent with current beliefs or attitudes. As one of psychology’s greatest thinkers, Leon Festinger (1987, p. 1), put it: “I prefer to rely on my memory. I have lived with that memory a long time, I am used to it, and if I have rearranged or distorted anything, surely that was done for my own benefit.”

Consider people who take study skills courses. Students often fail to heed the advice they receive in such courses, and only modest evidence indicates that the courses are beneficial, yet most students who take them describe them as extremely



(a)



(b)

**FIGURE 7.37 Fallibility of Memory (a)** Eileen Franklin (**centre**) claimed to have recovered a previously repressed memory that her father had murdered a friend of hers two decades earlier. **(b)** George Franklin was found guilty and imprisoned based on his daughter’s testimony. Evidence subsequently emerged proving his innocence, and he was released.

**memory bias** The changing of memories over time in ways consistent with current beliefs.



helpful. How can something that generally produces unimpressive outcomes be endorsed so positively? To understand this phenomenon, researchers randomly assigned students at the University of Waterloo to either a genuine study skills course or a control group that received no special training. Students who took the real course showed few signs of improvement; in fact, their final-exam performances were slightly poorer than the control group's. Still, they reported the study skills program as helpful. The experiment had one feature that helps explain why. At the beginning of the course, participants were asked to rate their studying skills. At the end of the course, they again rated themselves and were asked to recall how they had originally rated themselves. In describing their earlier ratings, Waterloo students in the study skills course recalled themselves as having been significantly worse than they had rated themselves at the beginning, thereby "getting what they want by revising what they had" (Conway & Ross, 1984).

People tend to recall their past attitudes and past beliefs as being consistent with their current ones, often revising their memories when they change attitudes and beliefs. People also tend to remember events as casting them in prominent roles or favourable lights. As discussed further in Chapter 12, people also tend to exaggerate their contributions to group efforts, take credit for successes and blame failures on others, and remember their successes more than their failures. Societies, too, bias their recollections of past events. Groups' collective memories can seriously distort the past, as expressed in George Orwell's observation that we can change only the past, not the future. Most societies' official histories tend to downplay their past unsavoury, immoral, and even murderous behaviours; perpetrators' memories are generally shorter than victims'.

### Neuroscience May Make It Possible to Distinguish between "True" and "False" Memories

With so many advances in the neuroscience of how we learn and remember, you might wonder if any neuroscientific techniques can help us distinguish between "true" memories (memories for events that really happened) and "false" memories (memories for events that people believe really happened but that happened differently than remembered or not at all). It is important to distinguish between two very different situations: when a person tells a lie, reporting something he or she knows is not true, and when a person experiences a false or faulty memory but honestly believes it is true.

Recall that when we remember something, the brain areas activated are the same ones that were active when we first learned it—auditory memories activate auditory areas of the brain, for example. Retrieving a memory seems to require the same neural activity that was involved in the initial encoding. Given this information, how might researchers try to answer the question about whether we can determine if someone is having a "true" memory or a "false," illusory one? If the memory is "true," the brain areas activated should be the same as those active when the event occurred, but if the memory is "false," unrelated brain areas would be activated (Garoff-Eaton, Slotnick, & Schacter, 2006). In fact, some preliminary data suggest we can make this distinction, but this emerging area of research needs a great deal of further testing. One problem with this method is that false memories tend to be similar in many ways to true memories; for example, you might correctly recall an event that occurred in high school gym class but have a false memory about the teacher involved. In a case like this one, the area of the brain involved in true memory for similar events in high school would probably also be involved in the retrieval of the false memory. A totally unrelated memory, such as about what you ate for lunch today, would involve different brain regions.



## SUMMING UP

### How Are Memories Distorted?

Memory is far from a faithful, objective recorder of facts and events. Rather, memory often includes biases and distortions. People tend to make poor eyewitnesses because human memory is better for broad outlines than for details. Yet people maintain unjustified confidence in their personal memories, such as flashbulb memories. Memories can be distorted, or even implanted, by false information, and the mind has a general bias toward maintaining consistency in our memories.

## MEASURING UP

1. Which principles must be balanced in a court of law when considering memories' accuracy?
  - a. Does the witness have a motive for lying, and is the witness trustworthy?
  - b. What activity patterns does an fMRI show for true memories, and what patterns does it show for false memories?
  - c. What body language does the witness use, and do the lawyers ask leading questions?
  - d. What are the costs of letting a possible felon go free, and what are the costs of incarcerating someone who may be innocent?
2. Flashbulb memories \_\_\_\_\_.
  - a. are almost always true memories because they involve emotional events
  - b. are likely to be wrong because people misattribute the source of information
  - c. are often distorted in the same way as other memories, but “feel” true to the people whose memories they are
  - d. are less important for men than for women because, on average, men are less emotional and have less need to remember emotional events
3. Suppose a teacher accuses you of plagiarizing a term paper. To back up his accusation, he shows you a published passage similar to one you wrote in your paper. Of course, you did not commit plagiarism—you would never do that. Which of the following phenomena might be cited in your defence?
  - a. cryptomnesia
  - b. social comparison
  - c. absentmindedness
  - d. temporary blocking

## How Can We Improve Learning and Memory?

### Mnemonics Are Useful Strategies for Learning

This chapter has described research indicating how and when people are more likely to remember or forget information. One central question in psychological science is how people learn, and research over the past century has provided a wealth of information directly relevant to education. Many findings from psychological laboratories make their way into classrooms, as teachers apply new techniques that enhance both learning and memory. Through research, psychological scientists have also developed specific strategies, called **mnemonics**, for improving memory. By using mnemonic strategies, most people can study and remember the information

### LEARNING OBJECTIVE

Explain how we can use scientific knowledge about memory to improve memory.

**mnemonics** Strategies for improving memory.

## Real World PSYCHOLOGY

on long lists. The following section examines some of the ways that findings from psychological science can help you study more effectively.

**PRACTICE** To become proficient in any activity, you need to practice. The more times you repeat an action, the easier it is to perform that action. Motor skills, such as those used to play the piano, play golf, and drive, become easier with practice. Memories are strengthened with retrieval, so one way to make durable memories is to practice retrieval. Recent research in classrooms has shown that repeated testing is a good way to strengthen memories. In fact, it is even better than spending the same amount of time reviewing information you have already read (Roediger & Karpicke, 2006). When you study—retrieving information by remembering it or rehearsing it—you are strengthening existing synaptic connections and making new ones. So, for example, after reading a section in this or any other book, look back at the main section heading and, if it is not already a question, rephrase it as a question; then be sure that you can answer the heading’s question without looking at the text. (Also note that there are test questions at the end of every section in this book except the one you are now reading. There is a practice test at the end of each chapter. And on the book’s website additional tests provide feedback and explanations of the additional tests’ correct answers.)

**ELABORATE THE MATERIAL** The deeper the level of processing, the more likely you are to remember the material later. This is another reason that critical thinking skills are important. Rather than just reading the material, think about its meaning and how it is related to other concepts. Try to organize the material in a way that makes sense to you, putting the concepts into your own words. Indeed, making the material relevant to you is an especially good way to process material deeply and therefore to remember it easily.

**OVERLEARN** With material in front of them, people are often overly confident that they will remember it later. But recognition is easier than recall, and information in a book might not be as accessible when the book is closed and you have to answer questions about what you read. Rehearse material even after you think you have learned it. Test yourself by trying to recall the material a few hours after studying. Keep rehearsing until you can recall the material easily. Distributing your study over time rather than cramming will help you retain the information for longer periods of time (Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006). Three sessions of two hours each are much better for learning than one six-hour marathon.

**GET ADEQUATE SLEEP** Many students underestimate the importance of getting a good night’s sleep. Some compelling evidence indicates that sleep may help with the consolidation of memories and that disturbing sleep interferes with learning. Chronic sleep deprivation certainly will interfere with learning.

**USE VERBAL MNEMONICS** How many days are there in September? In the Western world at least, most people can readily answer this question thanks to the old saying that begins, “Thirty days hath September.” Children also learn “i before e except after c” and “weird is weird.” By memorizing such phrases, we more easily remember things that are difficult to remember. Advertisers, of course, often create slogans or jingles that rely on *verbal mnemonics* so that consumers cannot help but remember them. Students have long used acronyms to remember information, such as HOMES to remember the great lakes (Huron, Ontario, Michigan, Erie, and Superior). In studying Chapter 13, the acronym OCEAN will help you remember the major personality traits: openness to experience, conscientiousness,

extroversion, agreeableness, and neuroticism. Even complex ideas can be understood through simple mnemonics, such as “cells that fire together wire together” as a way to remember long-term potentiation, the brain mechanism responsible for learning, discussed in Chapter 6.

**USE VISUAL IMAGERY** Creating a mental image of material is an especially good way to remember. Recall that working memory has a verbal component called the phonological loop and a visuospatial component, sometimes called a sketchpad. When you use visual imagery, you are engaging both systems in working memory and creating a more lasting memory. Memory researchers have developed specific strategies that rely on imagery to help people remember long lists of information. One, the *method of loci*, involves visualizing yourself placing objects in familiar locations so that when you have to retrieve the material you simply imagine going back to that location. A similar technique involves learning a list of key words, or *pegs*, then hanging new words on those pegs by visualizing the new words together with the pegs. Although useful for remembering long lists, these strategies typically are not widely used. Most of us find it just as easy to keep lists of things we need on our computers, our PDAs, or even pieces of paper. (We simply have to remember where we put the lists!)



## SUMMING UP

### How Can We Improve Learning and Memory?

Memory is strengthened with repeated retrieval, so frequent testing and active responding spaced out over time is a strategy to enhance memory. When you relate new information to information you already know, you create more retrieval cues, which make you more likely to recall the new information later. Overlearning also creates stronger memory traces, probably because of repeated retrieval. Because memories undergo consolidation during sleep, it is important to get adequate sleep. Catchy verbal associations can help you remember information because the phrases can act as retrieval cues. Imagery requires you to pay attention, and it uses both the verbal and visuospatial components in working memory, thus creating stronger memory traces. Finally, many external aids, including paper and pencil, can be helpful when you need to remember something.

## CONCLUSION

The brain has allowed humans to develop language, build civilizations, and visit the moon. However, even this wonderfully evolved organ cannot guarantee that people will remember where they left their keys, that the witnesses or victims of crimes will remember the criminals' faces, that readers will recall details from books they read last year, or that anyone will recognize a name and know for sure whether the person is famous. As a system, memory has evolved to solve certain problems related to survival, such as remembering our friends and foes. It did not evolve to remember phone numbers, textbook definitions, how to drive a car, and so on, but it does a pretty good job at tasks like these, considering the amount of information that bombards the nervous system. Finally, as one of the most dynamic areas of research in psychological science, memory highlights our fundamental themes, in particular the way that researchers are working at various levels of analysis to unwrap the mystery of the mind.

## CHAPTER SUMMARY

### How Does Attention Determine What Is Remembered?

- **Visual Attention Is Selective and Serial:** Simple searches for stimuli that differ in only one primary factor (e.g., size, colour, orientation) occur automatically and rapidly, but searches for objects that are the conjunction of two or more properties (e.g., red and large) occur slowly and serially.
- **Auditory Attention Allows Selective Listening:** We can attend to more than one message at a time but not well. Evidence indicates that we weakly process some unattended information.
- **Selective Attention Can Operate at Multiple Stages of Processing:** We often miss large objects in our visual field when we are attending to something else, a phenomenon known as change blindness.

### What Are the Basic Stages of Memory?

- **Sensory Memory Is Brief:** Visual and auditory memories are maintained long enough to ensure a continuous sensory experience.
- **Working Memory Is Active:** Immediate active memory is limited. Chunking reduces information into units that are easier to remember. The four components of working memory are the central executive, the phonological loop, the visuospatial sketchpad, and the episodic buffer.
- **Long-Term Memory Is Relatively Permanent:** Long-term memory (LTM) is the potentially indefinite storage of all memories. Meaningful memories are stored in LTM in networklike structures.

### What Are the Different Long-Term Memory Systems?

- **Explicit Memory Involves Conscious Effort:** Explicit, declarative memories that we consciously remember include personal events (episodic memory) and general knowledge (semantic memory).
- **Implicit Memory Occurs without Deliberate Effort:** Procedural (motor) memories of how to do things automatically are implicit.
- **Prospective Memory Is Remembering to Do Something:** Prospective memory has “costs” in terms of reducing attention and reducing working memory capacity.

### How Is Information Organized in Long-Term Memory?

- **Long-Term Storage Is Based on Meaning:** Memory processes include encoding, storage, and retrieval. Elaborative rehearsal involves encoding information in more meaningful ways and results in better memory than maintenance (repetition) rehearsal.
- **Schemas Provide an Organizational Framework:** Schemas, cognitive structures of meaning, aid the organization of memories. Cultural variations in schemas produce differences in what and how information is remembered.
- **Information Is Stored in Association Networks:** Networks of associations are formed by nodes of information, which are linked together and are activated by spreading activation.
- **Retrieval Cues Provide Access to Long-Term Storage:** According to the encoding specificity principle, any stimulus encoded along with an experience can later trigger the memory of the experience. The memory’s context is also activated.

### What Brain Processes Are Involved in Memory?

- **There Has Been Intensive Effort to Identify Memory’s Physical Location:** Research has revealed that a number of specific brain regions contribute to learning and memory.

- **The Medial Temporal Lobes Are Important for Consolidation of Declarative Memories:** The process of consolidation of new memories involves changes in neural connections. The hippocampus, a structure in the medial temporal lobe, is important for declarative memories. Place cells in the hippocampus aid spatial memory.
- **The Frontal Lobes Are Involved in Many Aspects of Memory:** Extensive neural networks connect the frontal lobes with other memory regions of the brain. Activation of neurons in the frontal lobes is associated with deeper meaning.
- **Neurochemistry Underlies Memory:** Neurochemicals modulate the storage of memories. Epinephrine enhances memory. The amygdala is probably responsible for memory modulation through activity in its norepinephrine receptors.

### When Do People Forget?

- **Transience Is Caused by Interference:** Forgetting over time occurs because of interference from both old and new information.
- **Blocking Is Temporary:** The tip-of-the-tongue phenomenon is a person’s temporary trouble retrieving the right word, usually due to interference from a similar word.
- **Absentmindedness Results from Shallow Encoding:** Inattentive or shallow processing causes memory failure.
- **Amnesia Is a Deficit in Long-Term Memory:** Both injury and disease can result in amnesia, either the inability to recall past memories (retrograde) or the inability to form new memories (anterograde).

### How Are Memories Distorted?

- **Flashbulb Memories Can Be Wrong:** The strong emotional response that attends a flashbulb memory may affect the memory’s strength and accuracy.
- **People Make Source Misattributions:** A person can misremember the source of a memory (source misattribution). In cryptomnesia, a person thinks he or she has come up with a new idea, but has only retrieved a memory.
- **People Are Bad Eyewitnesses:** Poor eyewitness recall occurs, particularly when people try to identify those of other ethnicities. Suggestibility leads to misinformation.
- **People Have False Memories:** Immature frontal lobes cause childhood amnesia. False memories can be implanted. Confabulation can occur because of brain damage.
- **Repressed Memories Are Controversial:** Some therapeutic techniques can result in false repressed memories.
- **People Reconstruct Events to Be Consistent:** People tend to maintain consistency between their past memories, their current knowledge, and their current attitudes.
- **Neuroscience May Make It Possible to Distinguish between “True” and “False” Memories:** By examining brain activity at encoding and retrieval, researchers hope to distinguish true from false memories. The current research has many flaws, but the techniques may be improved.

### How Can We Improve Learning and Memory?

- **Mnemonics Are Useful Strategies for Learning:** Mnemonics include practicing at retrieval through frequent testing, overlearning, getting enough sleep, spacing study sessions, and using imagery.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.

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## ■ KEY TERMS

absentmindedness, p. 325	encoding specificity principle, p. 313	modal memory model, p. 297	reconsolidation, p. 317	short-term memory (STM), p. 298
amnesia, p. 326	episodic memory, p. 306	parallel processing, p. 292	retrieval, p. 297	source amnesia, p. 331
anterograde amnesia, p. 326	explicit memory, p. 306	post-traumatic stress disorder (PTSD), p. 321	retrieval cue, p. 313	source misattribution, p. 328
blocking, p. 325	flashbulb memories, p. 327	proactive interference, p. 324	retroactive interference, p. 325	spatial memory, p. 317
change blindness, p. 295	forgetting, p. 322	procedural memory, p. 308	retrograde amnesia, p. 326	storage, p. 297
chunking, p. 299	implicit memory, p. 306	prospective memory, p. 308	schema, p. 311	suggestibility, p. 329
confabulation, p. 332	long-term memory (LTM), p. 301		semantic memory, p. 306	transience, p. 322
consolidation, p. 316	memory, p. 291		sensory memory, p. 297	working memory (WM), p. 299
cryptomnesia, p. 328	memory bias, p. 333		serial position effect, p. 302	
declarative memory, p. 306	mnemonics, p. 335			
encoding, p. 297				

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## ■ PRACTICE TEST

- The card game Set requires players to attend to four features (shape, colour, shading, and number) across 12 cards in an effort to identify a “Set.” A player has identified a Set when “any feature in the ‘Set’ of three cards is either common to all three cards or is different on each card” (directions from Set Enterprises, Inc.). Playing this game requires participants to engage in a \_\_\_\_\_, which is \_\_\_\_\_.
  - conjunction task; effortful
  - conjunction task; fast and automatic
  - primitive features task; effortful
  - primitive features task; fast and automatic
- Sarah and Anna are chatting at a coffee shop. Anna notices that Sarah does not seem to be paying attention to what she, Anna, is saying. Which strategy could Anna use to effectively pull Sarah’s attention back to the conversation?
  - Anna should buy Sarah a fresh cup of coffee; more caffeine will help her pay attention.
  - Anna should covertly modify something about her own appearance (for example, remove her earrings); even subtle changes in a person’s visual field draw attention.
  - Anna should lower her voice to a near-whisper.
  - Anna should use Sarah’s name in a sentence.
- Imagine you are a manager seeking to hire a new employee. Before leaving work Monday afternoon, you look through a stack of 30 resumés organized alphabetically by last name. When you return to work Tuesday morning, which job applicant are you most likely to remember?
  - Alvarado
  - Martonosi
  - Russo
- You are asked to memorize a list of words. Which encoding strategy will likely result in the best recall performance?
  - As you read each word, repeat it five times.
  - As you read each word, count the number of letters in it.
  - As you read each word, think of a word that rhymes with it.
  - As you read each word, think of a synonym for it.
- You ask a friend to memorize the following list: bed, rest, night, tired, blanket, pillow, relaxed. Later, you ask your friend to tell you as many words from the list as he or she can remember. In addition to remembering some of the words, your friend lists the word *sleep*, which did not appear on the original list. Which of the following phenomena is most related to your friend’s error in recall?
  - context-dependent encoding
  - culturally relevant schemas
  - networks of associations
  - state-dependent encoding
- Damage to which area of the brain (amygdala, frontal lobe, hippocampus) would most likely lead to each of the following impairments?
  - In spite of having lived in the same city all her life, Kate is unable to describe the route from her home to the grocery store.
  - Moses rates a list of adjectives on the extent to which each describes him. He is later asked to recall the words on the list, but is unable to do so.
  - Meriam claims to have no emotional understanding of fear.
- Which “sin of memory” is demonstrated in each of the following examples?
  - A friend introduces you to her brother; five minutes later, you find you cannot remember the brother’s name.
  - A friend introduces you to her brother. Later, you ask your friend, “How’s your brother . . . ah, what’s his name? Jake? John? Oh, James! How is James?”
- Fill in the blanks. People experiencing \_\_\_\_\_ amnesia are unable to recall memories from the past, whereas people experiencing \_\_\_\_\_ amnesia are unable to form new memories.

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## ■ PSYCHOLOGY AND SOCIETY

- Write a letter to a newspaper editor that articulates your position on whether using a cellphone while driving should be legal. Support your position with scientific evidence and statistics from reputable sources. Be sure your letter will make sense to someone not already familiar with the concepts and methodologies of psychology.
- Imagine you have been asked to serve as the director of your school’s academic advising program for first-year students. Prepare a study skills brochure to be distributed to new students. An effective brochure will explain why the study skills work and will reflect your awareness of particular issues on your campus and resources available there.





# Thinking and Intelligence

ON SEPTEMBER 11, 2001, AND FOR DAYS AFTERWARD, footage of the two jets striking the World Trade Center, in New York City, was broadcast repeatedly throughout the world (FIGURE 8.1). Most of us who were near televisions and computers at the time will never forget those vivid images, which made it impossible not to think of the passengers in the hijacked planes and of the office workers in the World Trade Center and the Pentagon who died as a result of the hijackings. Another tragic consequence of 9/11 has rarely been discussed: the hundreds of people who died in automobile accidents because they chose to drive rather than fly in the months following the tragedy. These additional deaths were caused not by terrorists' actions but by the way people commonly think about risks.

The German psychologist Gerd Gigerenzer (2004) has proposed that low-probability events that are highly publicized and have dire consequences, such as the deaths associated with the hijackings of 9/11, can result in fears he calls *dread risks*. Dread risks can profoundly affect reasoning and decision making. After 9/11, for example, even in countries that were not

## How Does the Mind Represent Information?

- Mental Images Are Analogical Representations
- Concepts Are Symbolic Representations
- Schemas Organize Useful Information about Environments

## How Do We Make Decisions and Solve Problems?

- People Use Deductive and Inductive Reasoning

- Decision Making Often Involves Heuristics
- Critical Thinking Skill: Understanding How the Availability and Representativeness Heuristics Can Affect Thinking
- Problem Solving Achieves Goals

## How Do We Understand Intelligence?

- Intelligence Is Assessed with Psychometric Tests
- Critical Thinking Skill: Recognizing and Avoiding Reification

- General Intelligence Involves Multiple Components
- Intelligence Is Associated with Cognitive Performance
- Genes and Environment Influence Intelligence
- Group Differences in Intelligence Have Multiple Determinants



(a)



(b)

**FIGURE 8.1 Dread Risks** (a) The second plane strikes the World Trade Center on September 11, 2001. (b) More than 40 airliners were diverted to the Halifax International Airport when officials closed American airspace following attacks on the World Trade Center and the Pentagon.

### LEARNING OBJECTIVES

Explain the difference between analogical and symbolic representations and provide examples of each.

Describe how concepts and scripts can positively and negatively affect how we think.

likely targets for terrorists, many more people feared flying than normally do. In fact, in the following three months airline revenues dropped dramatically in North America, with the result that Air Canada cut more than 5,000 jobs and another Canadian courier (the discount airline Canada 3000) went bankrupt. As fewer people were flying, estimates for kilometres driven increased by almost 3 percent in the United States in those three months. Drivers in Canada made 3.2 percent more trips in 2002 than in the prior year, with the most dramatic increases occurring in the eastern provinces (Statistics Canada, 2002). But while hijacked planes may prompt people to avoid airline travel, the number of people who die in car accidents every year far exceeds the number who die in airline disasters, much less in hijackings. According to Transport Canada (2004), the number of fatalities on Canadian roads increased by over 5 percent in 2002 compared to 2001. Likewise, the number of U.S. traffic fatalities in the three months following 9/11 was significantly above average. An estimated 350 Americans died during those months because they avoided flying—more than the 266 airplane passengers and crew members who died in all four hijackings on 9/11.

When reasoning about the right choice to make, humans do not always weigh the actual probabilities of different actions. In fact, we can be influenced heavily by numerous factors that might not be considered rational, such as the prominence of events or of images in our minds. Psychologists have identified some of the typical biases that enter into reasoning and decision making. Gigerenzer believes the biases that typically affect decision making after highly unlikely tragic events should be publicized, so that education about dread risks might prompt people to reconsider choices that could result in additional negative consequences. As Gigerenzer suggests, the way we think about information makes important differences in the quality of our lives—both individually and collectively. This chapter therefore considers the nature of thought: How we represent ideas in our minds, how we use these ideas to solve problems and to make decisions, and how we can explain differences in intelligence among people.

## How Does the Mind Represent Information?

What is the nature of thought, and how can exploring the nature of thought help us improve our thinking? To begin answering these questions, consider your thinking processes as you respond to a few more questions:

*What does your mother look like?* In answering this question, were you consciously aware of a mental image, similar to an internal picture, of your mother's face?

*In the alphabet, what letter comes after N?* Did you find yourself singing “l, m, n, o, p?” Most people do.

*How much is  $2 + 2$ ?* Did “4” immediately pop into your mind?

*In your home when you were 10 years old, how many windows did the living room have?* Answering this question might have required at least two sorts of mental processes. If you moved many times as a child, you might have put some pieces of information together to recall where you lived when you were 10 and if that place even had a living room; then you might have created a mental image of the living room, so you could “look around” as you counted the windows. If you have lived in the same home at least since you were 10, you would have skipped the first step and gone directly to generating an image. You also might have recalled the number



of windows without imagery—for example, if you recently bought curtains for all the windows in that room.

*What is Shania Twain’s phone number?* Unless you hobnob with celebrities, you immediately realized that you do not know this star’s phone number and never did. You most likely did not search through your memory and decide the number was not there. You know you did not forget the number, but how did you know so quickly what you do not know?

The preceding two chapters discussed how we learn and remember information. But once we have acquired information, how do we use it? This chapter is concerned with how we use information when we think and what it means to think intelligently. Our thoughts guide much of our behaviour as we solve problems, make decisions, and try to make sense of events going on around us. Sometimes our thought processes lead to great ideas and creative discoveries, but sometimes they lead to bad decisions and regret. Yet even in the face of all these thought processes and biases, some people seem to be better at using information than others; we describe this ability as intelligence.

For the most part, our thinking is adaptive. We develop rules for making fast decisions, for example, because daily life demands we do so. In his 2005 book, *Blink: The Power of Thinking without Thinking*, the Canadian journalist Malcolm Gladwell makes the case that the ability to use information rapidly is a critical human skill. When you encounter a person on the street who might pose a threat, you might change your route to avoid that person. Being able to size up whether a person is trustworthy allows you to avoid harm, and you do this sizing up instantly and without conscious awareness. Unconscious cognitive processes not only influence thought and behaviour (as discussed in Chapter 4, “The Mind and Consciousness”) but also affect decision making and problem solving.

In illustrating how snap judgments can have important consequences, Gladwell describes a firefighter who led his colleagues in an effort to put out a kitchen fire. When they sprayed water on it, the fire did not respond in the expected way. Sensing that something was wrong, the firefighter quickly ordered everyone to leave the building; his decision turned out to be a good one because the fire was in the basement, under the kitchen, and the kitchen floor collapsed moments after the building was evacuated. The firefighter had known something was wrong but not what it was, and if he had stopped to figure out the problem, he and his colleagues might have been killed. His decision saved him and the others, but it was based on an intuition developed over years of experience in fighting fires.

Some thoughts, as when we are describing someone or counting the windows in a room we remember, generate images in our heads. Others are like words spoken in our heads. Still others are difficult to describe because we seem to pull them up fully formed without any conscious awareness of where they came from. The field of cognitive psychology was originally based on the notions that the brain *represents* information and that the act of thinking—that is, **cognition**—is directly associated with manipulating these representations. In this way, we use representations to understand objects we encounter in our environments. Representations are all around us. A road map represents streets, a menu represents food options, a photograph represents part of the world, as might a verbal description. The challenge for cognitive psychologists is to understand the nature of our everyday *mental* representations. You do not need a map if you have a mental representation of the local streets, and although you might like to have a picture of your mother on your desk, you most likely can describe what she looks like without referring to it. But what are the

## Real World PSYCHOLOGY

**cognition** Mental activity such as thinking or representing information.

**analogical representation** A mental representation that has some of the physical characteristics of an object; it is analogous to the object.

**symbolic representation** An abstract mental representation that does not correspond to the physical features of an object or idea.

characteristics of mental representations? When are such representations like maps or pictures, ones that happen to be in your mind? And when are they more abstract, like language?

We use two basic types of representations, *analogical* and *symbolic*, which usually correspond to images and words, respectively. Both types of representations are useful in understanding how we think because they form the basis of human thought, intelligence, and the ability to solve everyday life's complex problems. **Analogical representations**—which have some characteristics of (and are therefore *analogous* to) actual objects—include maps, which correspond to geographical layouts, and family trees, which depict relationships between relatives. By contrast, **symbolic representations**, usually words or ideas, are abstract and do not have relationships to physical qualities of objects in the world. For example, the world *violin* stands for a musical instrument. There are no correspondences between what a violin looks or sounds like and the letters or sounds that make up the word *violin*. In Chinese, the world for violin is

小提琴

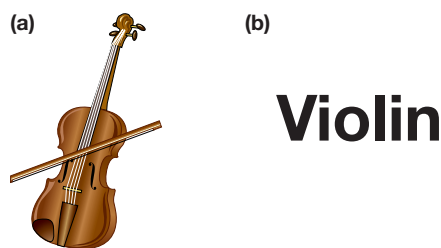
In Mandarin, it is pronounced *xiǎotíqín*, or *shiao ti chin*. Like the English word *violin*, it is a symbolic representation because it bears no systematic relationship to the object it names. The individual characters that make up the word stand for different parts of what makes a violin, but they are arbitrary—you cannot “see” any part of a violin in their shapes (FIGURE 8.2).

### Mental Images Are Analogical Representations

In the mind's eye, we often *see* images without trying. For example, pause while reading this sentence and think about a lemon. What form did your “lemon” thought take? Did you pull up an image that resembled an actual lemon, with its yellow and waxy, dimpled skin? Did your mouth water (a different sort of mental image)? Not surprisingly, several lines of evidence support the notion that representations take on picturelike qualities.

In a famous set of studies in the early 1970s, participants were shown letters and numbers and asked to determine whether each object was in its normal orientation (e.g., R) or was a mirror image (Я). The objects were rotated and presented in various positions, sometimes upright, sometimes upside down, sometimes somewhere in between. The time a participant took to determine whether an object was in its normal orientation or a mirror image depended on its degree of rotation (Cooper & Shepard, 1973). The farther the object was rotated from the upright position, the longer the discrimination took; the longest reaction time occurred when the object was fully upside down. Based on the reaction times, the researchers concluded that the participants had mentally rotated representations of the objects to “view” the objects in their upright positions. Presumably, the farther an object was from upright, the longer the task took because the representation needed to be rotated more (FIGURE 8.3).

But are all representations of objects analogical? Could they instead be simple representations based on factual knowledge about the world: Lemons (1) are yellow and (2) have dimpled, waxy skin, so perhaps instead of visualizing a lemon you recalled its attributes without a visual image (Pylyshyn, 1984)? Researchers have used the tools of cognitive neuroscience to demonstrate that at least some thoughts take the form of mental images. In analyzing mental



**FIGURE 8.2 Analogical Representations and Symbolic Representations**

(a) Analogical representations, such as this picture of a violin, have some characteristics of the objects they represent. (b) Symbolic representations, such as the word *violin*, are abstract and do not have relationships to the objects.

representations at the biological level, Stephen Kosslyn and his colleagues (1995) have shown that visual imagery is associated with activity in visual perception–related areas of the brain (that is, the primary visual cortex). In other words, the same brain areas activated when we view something are active when we think in images.

Such studies have shown that when you retrieve information from memory, as when you recall a picture you recently saw in a newspaper, the representation of that picture in your mind’s eye parallels the representation in your brain the first time you saw the picture. This process is like having an eye that faces into the brain instead of outside to the world. Of course, no “picture” exists inside your head; neural activity consists of electrical impulses that cause groups of neurons to fire (as explained in Chapter 3, “Biological Foundations”), but the experience seems like viewing a picture inside your head. The mental image is not perfectly accurate; rather, it corresponds generally to the physical object it represents. By using mental images, you can answer questions about objects not in your presence, as when you visualize a lemon and describe its colour. Manipulating mental images also allows you to think about your environment in novel and creative ways, helping you solve problems.

**LIMITS OF ANALOGICAL REPRESENTATIONS** We can represent only a limited range of knowledge analogically. If something cannot be perceived wholly by our perceptual system, we cannot form a complete analogical representation of it. Maps are an interesting case. For example, most of us can pull up a visual image, a map, of Africa’s contours even if we have never seen the actual contours with our own eyes. Mental maps therefore involve a mixture of analogical and symbolic representations.

Consider the following question about two North American places: Which is farther east, San Diego, California, or Jasper, Alberta? If you are like most people (at least most North Americans), you answered that Jasper is farther east than San Diego. In fact, San Diego is farther east than Jasper. Even if you formed an analogical representation of a map of southeastern North America, your symbolic knowledge probably told you that a city on the Pacific Coast is always farther west than a place in a province that does not border the Pacific Ocean.

**FIGURE 8.3 Scientific Method: The “R” Studies and Analogical Mental Images**

**Hypothesis:** The time it takes to say whether a stimulus is a mirror image will increase as a function of how far the stimulus is rotated from its upright position.

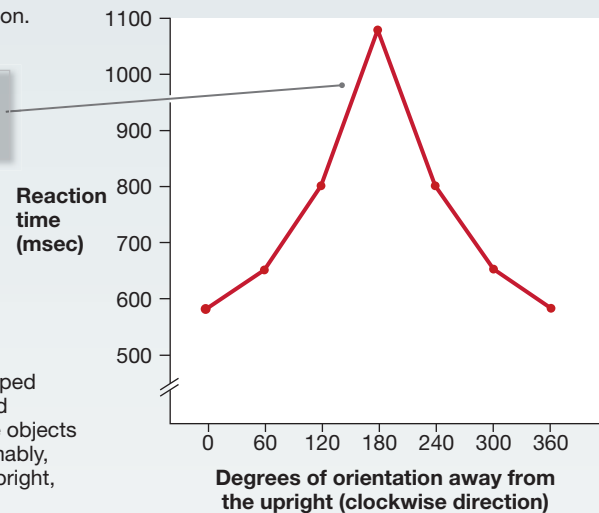
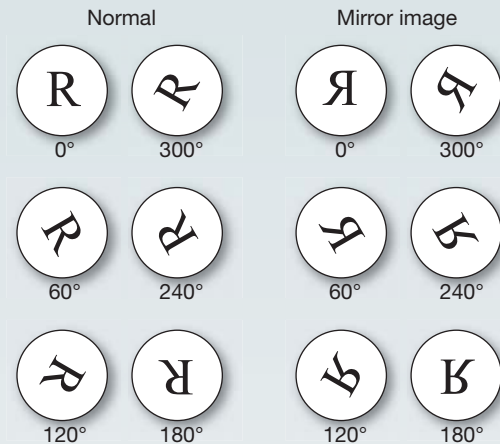
**Research Method:**

- 1 Participants were shown rotated objects—letters and numbers.
- 2 Participants were asked whether each object was in its normal orientation or was a mirror image.
- 3 Researchers timed how long it took the participants to respond.

**Results:** The farther an object was rotated from its upright position, the longer participants took to determine whether the object was in its normal orientation or a mirror image. Participants were fastest when the object was at or close to upright; they were slowest when it was at 180-degree rotation.

After the rotation passes 180°, the figure starts going back around to being right side up.

**Conclusion:** Participants developed mental images of the objects and rotated these images to view the objects in their upright positions. Presumably, the farther an object was from upright, the longer this process took.



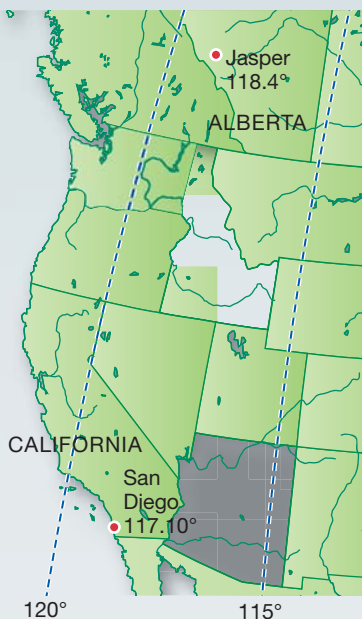
**FIGURE 8.4 Try for Yourself: Conceptual Mental Maps**

When asked whether San Diego or Jasper is farther east, your symbolic knowledge probably informed you that California is farther west than Alberta.

So your conceptual mental map made you think that San Diego was west of Jasper.

But this real map, showing location relative to uniform lines of longitude, shows that symbolic knowledge was inadequate in this case.

**Explanation:** Symbolic representations can lead to errors, because we can represent only a limited range of knowledge analogically and thus use memory shortcuts unconsciously. In this case, you probably were not taking into account the way southern California juts east.



**Try for Yourself:** Which is farther north, Seattle, Washington, or Montreal, Quebec? You probably are picturing a mental map that looks like this, but be careful—consider the lines of latitude on a real map.



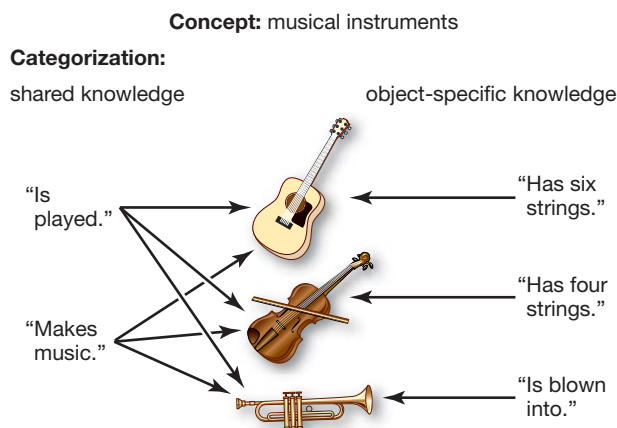
**Answer:** Seattle (47° north latitude) is north of Montreal (45° north latitude).

However, a symbolic representation can yield a wrong answer in this instance, because while our general knowledge is correct, it does not take into account the way the Pacific Coast near Mexico juts east. The regularization of irregular shapes in memory is a shortcut we use unconsciously for keeping information in memory. While generally useful, such shortcuts can lead to errors (FIGURE 8.4).

## Concepts Are Symbolic Representations

Much of our thinking reflects not only visual representations of objects in the world but also our general knowledge about the world. Our symbolic representations consist of words, which can represent abstract ideas in a succinct verbal form. Picturing a lemon, for example, does not tell you what to do with a lemon or how a lemon tastes. But knowing that parts of a lemon are edible helps you decide how to use the fruit—such as squeezing its juice onto a piece of fish. Thus what you do with a lemon depends on how you think about it. One question of interest to cognitive psychologists is how we use knowledge about objects efficiently. As discussed in Chapter 7, our memory

**FIGURE 8.5 Categorization** We group objects into categories according to the objects' shared properties.



systems are organized so we quickly can call up information as needed. The same principle holds true when we think about objects. If asked to say what a violin is, for instance, most people probably would begin by defining it broadly as a musical instrument. Grouping things based on shared properties, *categorization*, reduces the amount of knowledge we must hold in memory and is therefore an efficient way of thinking. We can apply a category such as “musical instruments”—objects that produce music when played—automatically to all members of the category rather than storing this same bit of knowledge over and over for each musical instrument. We have to store unique knowledge for each member of a category, however, such as “has four strings” for a violin and “has six strings” for a guitar (FIGURE 8.5).

A **concept** is a category, or class, that includes subtypes and/or individual items. A concept can consist of mental representations (musical instruments, fruits, bachelors, what have you), of a relation between representations (e.g., “violins are smaller than violas,” “elephants are heavier than mice”), or of a quality or dimension, such as brightness or width. By allowing us to organize mental representations around a common

theme, a concept ensures that we do not have to store every instance of an object, a relation, or a quality or dimension individually. Instead, we store an abstract representation based on the properties that particular items or particular ideas share.

Consider the concept of a bachelor. If asked to, you probably could indicate whether each of your male acquaintances is a bachelor. According to the **defining attribute model** of concepts, each concept is characterized by a list of features that are necessary to determine if an object is a member of the category. The dictionary defines a bachelor as a male who has not married, so this concept's defining attributes would be *male* and *unmarried*; for a musical instrument, attributes would include *is a device that produces sound* (FIGURE 8.6).

Although the defining attribute model is intuitively appealing, it fails to capture many key aspects of how we organize things in our heads. First, the model suggests that membership within a category is on an all-or-none basis, but in reality we often make exceptions in our categorizations, allowing members into groups even if they do not have all the attributes or excluding them even if they have all the attributes. For instance, most people would include *can fly* as an attribute of *bird*. However, some birds, such as penguins, cannot fly. In addition, some people use spoons and even saws to play music, yet we do not usually categorize a spoon or saw as a musical instrument.

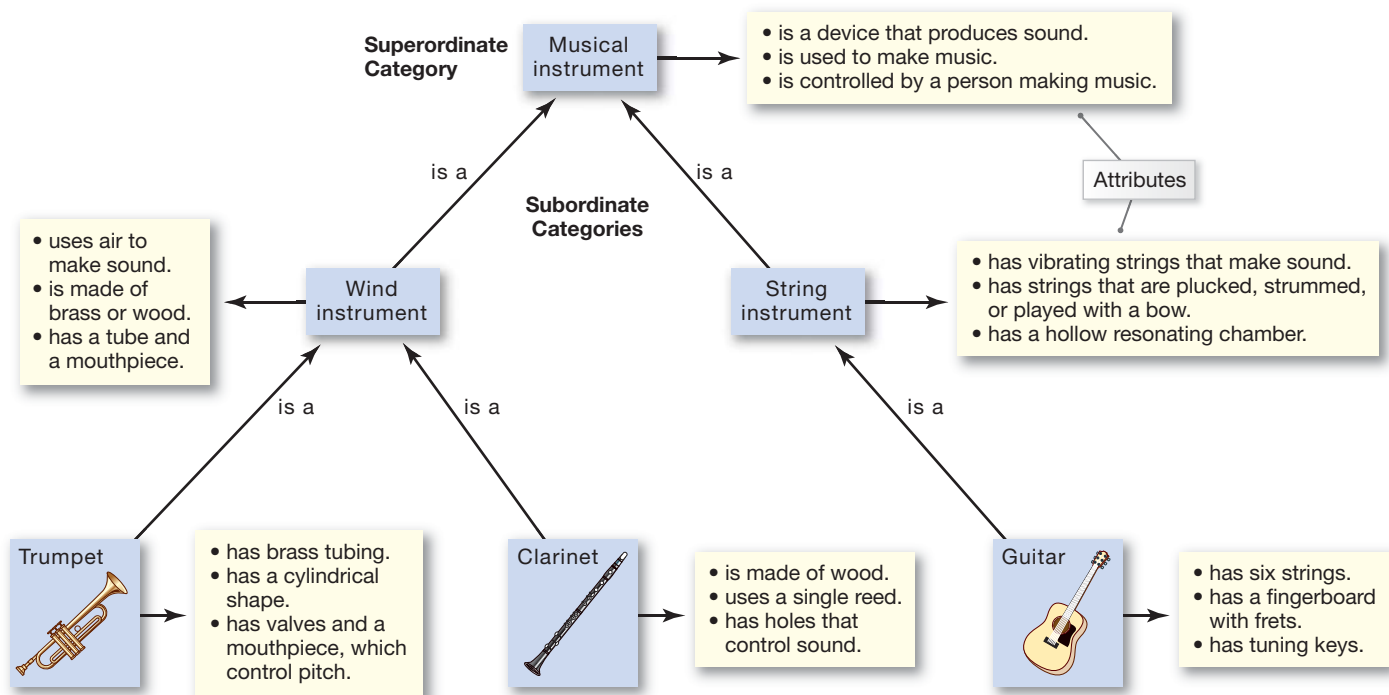
Second, the defining attribute model suggests that all of a given category's attributes are equally salient in terms of defining that category. However, research demonstrates not only that some attributes are more important for defining membership than others but that the boundaries between categories are much fuzzier than the defining attribute model suggests. For example, *has wings* is generally considered a clear attribute of *bird*, whereas *is warm-blooded* does not as readily come to mind when we think of birds, so being warm-blooded is not salient in how we think about birds.

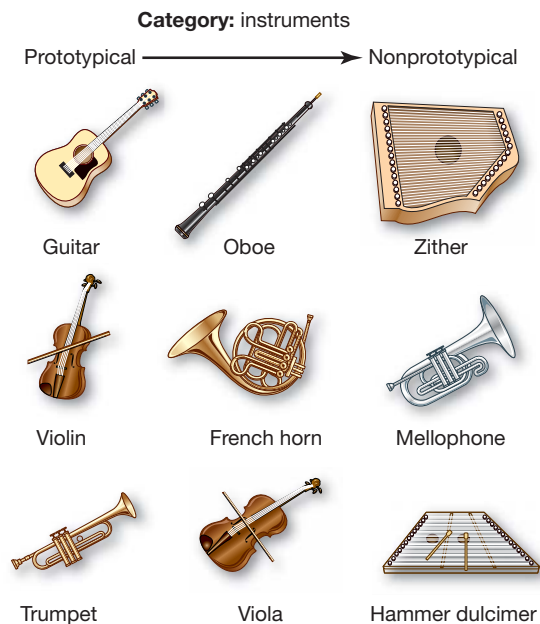
Third, the model posits that all members of a category are equal in category membership—no one item is a better fit than any other. Consider again the concept of a bachelor. According to the definition, a 16-year-old boy, a man who

**concept** A mental representation that groups or categorizes objects, events, or relations around common themes.

**defining attribute model** The idea that a concept is characterized by a list of features that are necessary to determine if an object is a member of the category.

**FIGURE 8.6 The Defining Attribute Model** In the defining attribute model, concepts are organized hierarchically, such that they can be superordinate or subordinate to each other. For example, horns and stringed instruments are subordinate categories of the superordinate category of musical instruments.





**FIGURE 8.7 The Prototype Model**

According to the prototype model, some items within a group or class are more representative (or prototypical) of that category than are other items within that group or class.

**prototype model** An approach to object categorization that is based on the premise that within each category, some members are more representative than others.

**exemplar model** Information stored about the members of a category is used to determine category membership.

has been in a committed relationship for 25 years but never married, and a man in his 30s who goes on dates a few nights a week would equally exemplify the category *bachelor*. Do they seem the same to you?

Among the alternatives to the defining attribute model is the **prototype model** of concepts (FIGURE 8.7). In thinking about a category, we tend to think in terms of a “best example,” or *prototype*, for that category (FIGURE 8.8).

One positive feature of the prototype model is that it allows for flexibility in the representation of concepts. One drawback related to that flexibility is that a particular prototype can be chosen for different reasons: Is it the most common example of that particular category? Is it a representation that all category members most resemble? Or does it represent a combination of typical attributes? The **exemplar model** addresses this concern, proposing that any concept has no single best representation—instead, all the examples, or *exemplars*, of category members form the concept (FIGURE 8.9). For instance, your representation of dogs is made up of all the dogs you have encountered in your life. If you see an animal in your yard, you compare this animal with your

**FIGURE 8.8 Try for Yourself: The Prototype Model of Concepts**

For each of the following categories, name the first member that comes into your mind (based on demonstration from Decyk, 1994):

- a bird \_\_\_\_\_
- a hero \_\_\_\_\_
- a colour \_\_\_\_\_
- an animal \_\_\_\_\_
- a motor vehicle \_\_\_\_\_

**Result:** For a bird, you likely named a robin or sparrow if you live in North America. If you live in New Zealand, you might have named a kiwi. Wherever you live, you probably named a common bird in your country—a bird that seems to represent an idealized version of all birds.

For a hero, most people name a superhero such as Superman, Spiderman, or Mighty Mouse, or a police officer or firefighter; few people will name a woman, child, or real animal (such as Lassie, a hero dog from a popular television series), all of whom can be heroes.

Robin (North America)      Kiwi (New Zealand)      Superman (Canada)      Black Mask (China)



For a colour, most people name red or blue—the primary colours are primary in our memory as well.

Despite regional differences in regard to animals, four legs and hair are the idealized attributes of an animal, and most people name a dog or cat.

For a motor vehicle, most people name a car or truck, except in the countries where the dominant motor vehicle is a motorbike.

**Explanation:** Even though there are countless birds we could name (penguin, chicken, dodo, etc.), we tend to think in terms of a “best example” of each category. The example will vary depending on our life experiences, but within a culture people will be fairly consistent in the category members they name. The best example of a category is a prototype. For most people in North America, a robin is a better example of a bird than a penguin, so it becomes the prototype for the category.

memories of other animals you have encountered. If it most closely resembles the dogs you have encountered (as opposed to the cats, squirrels, rats, and other animals), you conclude it is a dog. How would you explain the difference between a dog and a cat to someone who has never seen either? Dogs bark, but a dog is still a dog if it does not bark. It is still a dog if it loses its tail or a leg. The exemplar model assumes that through experience people form a fuzzy representation of a concept because there is no single representation of any concept. And the exemplar model accounts for the observation that some category members are more prototypical than others: The prototypes are simply members we have encountered more often.

The defining attribute and prototype models explain how we classify objects we encounter and how we represent those objects in our minds. The following section considers how in our daily lives we use classifications and representations.

## Schemas Organize Useful Information about Environments

How we think about the world extends well beyond a simple list of facts about the specific items we encounter every day. Rather, a different class of knowledge, called *schemas*, enables us to interact with the complex realities of our daily environments. As discussed in Chapter 7, schemas help us perceive, organize, and process information. As we move through various real-world settings, we act appropriately by drawing on knowledge of what objects, behaviours, and events apply to each setting. For example, at a casino blackjack table it is appropriate to squeeze in between the people already sitting down. However, if a stranger tried to squeeze into a group of people dining together in a restaurant, the group's reaction would likely be quite negative. This kind of knowledge regarding situations and social contexts differs greatly from the knowledge associated with object classification.

Basically, researchers believe we develop schemas about the different types of real-life situations we encounter. One prominent theory in this domain has focused on schemas about the sequences of events in certain situations. The American psychologists Roger Schank and Robert Abelson (1977) have referred to these schemas about sequences as *scripts*. For example, *going to the movies* is a script most of us are familiar with (FIGURE 8.10).

We can employ schemas because (1) common situations have consistent attributes (e.g., libraries are quiet and contain books), and (2) people have specific roles within situational contexts (e.g., a librarian behaves differently in a library than a



**FIGURE 8.9 The Exemplar Model** The exemplar model holds that all members of a category are exemplars. For example, even this strange-looking feline—a brown tortie white and tabby sphinx—is an exemplar of the category *cats*.

**FIGURE 8.10 Script Theory of Schemas**

According to this theory, we tend to follow general scripts of how to behave in particular settings. **(a)** At the movies, for example, we expect to buy a ticket, the cost of which might depend on the moviegoer's age and the time of day. **(b)** Next, we might opt to buy a snack before selecting a seat. **(c)** Although quiet talking might be appropriate before the movie, most of us expect talking to cease once the feature begins.



**(a)**



**(b)**

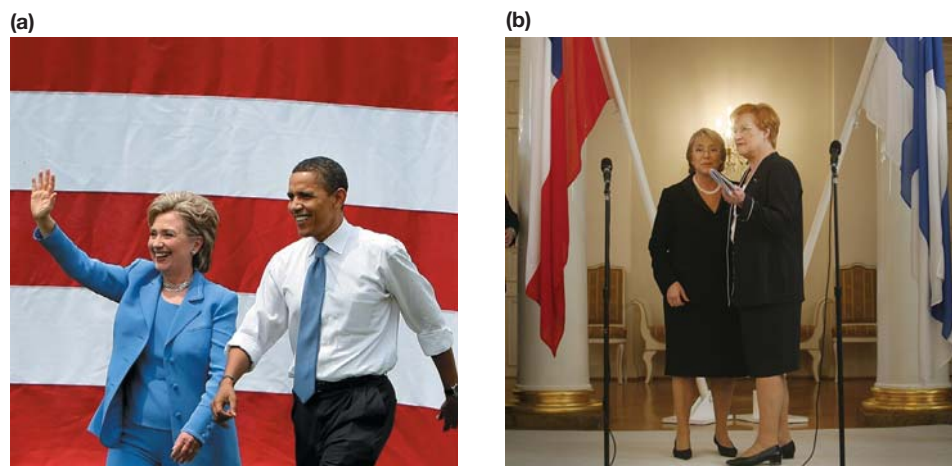


**(c)**

reader does). Unfortunately, schemas and scripts, like prototypes, sometimes have unintended consequences, such as reinforcing sexist or racist beliefs (FIGURE 8.11). For example, when children and teens are asked to draw a scientist, very few draw women as scientists, because they unconsciously associate being a scientist with being male (Chambers, 1983).

*Gender roles*, the prescribed behaviours for females and males, are a type of schema that operates at the unconscious level: We follow them without consciously knowing we are doing so. One reason we need to become aware of the way schemas and scripts direct our thinking is that they may unconsciously cause us to think, for example, that women are generally unsuited for positions of leadership because they lack assertiveness. In *Blink*, Malcolm Gladwell discusses a perfect example of gender-related bias. In the past, orchestral conductors invariably chose men for principal positions in orchestras because the conductors believed that women did not play as well as men. The schema of women as inferior musicians interfered with the conductors' ability to rate auditioners objectively when the conductors knew the names and sexes of the musicians. After recognizing this bias, the top North American orchestras began holding auditions with the musicians hidden behind screens and their names withheld from the conductors. Since these methods were instituted, the number of women in the orchestras has increased considerably.

Scripts dictate appropriate behaviours, and what we view as appropriate is shaped by culture. For example, Mark Baldwin (1992), of McGill University, has documented how *relational schemas* influence what people expect from others in their social interactions. The script for a heterosexual date, perhaps "dating" back to the automobile's invention, traditionally has involved the male driving and paying for dinner. In the 1950s, a black person's script for getting on a bus in the southern United States involved going to the back of the bus. The schemas and scripts that children learn will likely affect their behaviour when they are older. In one recent study, children aged two to six were asked to use props and dolls to act out a social evening for adults (Dalton et al., 2005). As part of the role play, each child selected items from a miniature grocery store stocked with 73 products, including beer, wine, and cigarettes. Two of the most common items purchased were alcohol (by 62 percent) and cigarettes (by 28 percent). Children whose parents smoked



**FIGURE 8.11** Scripts Distorted by Stereotypes (a) Many reactions to the presidential candidacies of Hillary Clinton and Barack Obama reflected stereotypical scripts that exist in the United States. (b) Different countries have different scripts concerning gender, race, leadership, and many other issues; here, Chilean President Michelle Bachelet (left) meets with Finnish President Tarja Halonen (right) in May 2007.



or consumed alcohol were four times more likely to select them. When the children were asked about the items they chose, alcohol and cigarettes were clearly included in most children's scripts for adult social life. One four-year-old girl who selected cigarettes explained, "I need this for my man. A man needs cigarettes." These examples highlight the need for us to think critically about whether our automatic beliefs and actions reflect the values we wish to hold (a subject discussed in greater detail in Chapter 12, "Social Psychology").

If scripts and schemas are potentially problematic, why do they persist? Their adaptive value is that they minimize the amounts of attention required to navigate familiar environments. They also allow us to recognize and avoid unusual or dangerous situations. Mental representations in all forms assist us in using information about objects and events in adaptive ways. Manipulating our mental representations—that is, thinking about objects, events, and circumstances—allows us to take appropriate actions, make intelligent decisions, and function efficiently in our daily lives.

### **SUMMING UP**

#### **How Does the Mind Represent Information?**

Our thoughts consist of mental representations of the objects and events we learn about in our environments. When we think of an object, we often bring to mind a visual image, or analogical representation, of the object. By contrast, a symbolic representation will correspond not to the object's physical features but to our knowledge of the object. Much of our knowledge of the world is based on concepts, which are ways of classifying objects. Concepts are based on defining attributes, prototypes, or exemplars. Schemas assist us in organizing information so that it is useful in our daily lives, such as in understanding what script to follow in a restaurant. Scripts allow us to make quick judgments with little effort, but they can also lead to thinking in stereotypical ways.

### **MEASURING UP**

1. Indicate whether each of the following examples is an analogical or symbolic representation.
  - \_\_\_\_\_ a. a watch with a standard watch face
  - \_\_\_\_\_ b. a digital watch
  - \_\_\_\_\_ c. a drawing of the information in a math problem
  - \_\_\_\_\_ d. the word *rouge*, meaning "red" in French
  - \_\_\_\_\_ e. a photograph of your best friend
  - \_\_\_\_\_ f. a mental image of your best friend
  - \_\_\_\_\_ g. a sketch of a football play
2. Which of the following is an advantage of scripts?
  - a. They provide quick and almost effortless guides to behaviour in different situations.
  - b. They provide a flexible way of assessing different situations so each of us can decide how we want to behave in a given situation.
3. Which of the following is a disadvantage of scripts?
  - a. They tend to reinforce stereotypical behaviours.
  - b. Because they emphasize independent analysis of every situation, they take time.

# How Do We Make Decisions and Solve Problems?

## LEARNING OBJECTIVES

Distinguish among reasoning, decision making, and problem solving.

Explain how confirmation bias, affective forecasting, and framing can lead to errors in decision making.

**reasoning** Using information to determine if a conclusion is valid or reasonable.

**decision making** Attempting to select the best alternative among several options.

**problem solving** Finding a way around an obstacle to reach a goal.

**deductive reasoning** Using a belief or rule to determine if a conclusion is valid (follows logically from the belief or rule).

**inductive reasoning** Using examples or instances to determine if a rule or conclusion is likely to be true.

The previous sections discussed how we represent and organize knowledge of the world. But how do we use knowledge to guide our daily actions? Throughout each day we make decisions: what to eat for breakfast, which clothes to wear, which route to take to work or school, and so on. We scarcely notice making many of these decisions. Some decisions, such as about which university to attend, whether to buy a house, and if it is time to commit to one's relationship partner, are much more consequential and require greater reflection. We also solve problems, as in figuring out how to break bad news or identifying the best way to study for a particular exam. Thinking enables us to do these things.

Sometimes the terms *reasoning*, *decision making*, and *problem solving* are used interchangeably, but there are differences among them. In **reasoning**, you determine if a conclusion is valid, using information you believe is true. In **decision making**, you select among alternatives, usually by identifying important criteria and determining how well each alternative satisfies these criteria. If you can go to Paris or Cancún for your spring break, for example, you need to choose either one. If you need to solve a calculus problem and know several ways to do it, you might want to select the fastest method. In **problem solving**, you overcome obstacles to move from a present state to a desired goal state. For example, if you decide to go to Paris but do not have enough money for a plane ticket, or if you cannot figure out a solution on a calculus test, you have a problem. In general, you have a problem when a barrier or a gap exists between where you are and where you want to be.

## People Use Deductive and Inductive Reasoning

How do we evaluate evidence to draw conclusions? A police detective sifts through all the clues and tries to identify the right suspect. A parent listens to two children's conflicting stories and tries to figure out the truth. A scientist analyzes data to see if they support or refute a given hypothesis. Each situation requires reasoning, or evaluating information, arguments, and beliefs to draw a conclusion. Psychological scientists generally distinguish between *deductive* and *inductive reasoning*, although in real life, people switch back and forth between the two classes. In **deductive reasoning**, you reason from the general to the specific, as in expecting a person from Vancouver to be friendly because you have heard the people there are friendly. In **inductive reasoning**, you reason from the specific to the general, as in deciding the people in Vancouver are friendly because the five people you have met from there are friendly. (The differences among deductive reasoning, inductive reasoning, decision making, and problem solving are presented in **FIGURE 8.12**.)

**DEDUCTIVE REASONING** In deductive reasoning, you use logic to draw specific conclusions under certain assumptions, or *premises*. For example, imagine you are deciding on a place to go for dinner and your friend Bonnie tells you the new Thai restaurant is excellent. If you like Thai food and think Bonnie has good taste, then choosing the place Bonnie has recommended might be an excellent decision. Deductive reasoning tasks are often presented as syllogisms, logical arguments containing premises (statements) and a conclusion. Syllogisms

You use **deductive reasoning** to move from general to specific—you might expect your Parisian pen pal to be fashion conscious, because you have read that Parisians are.



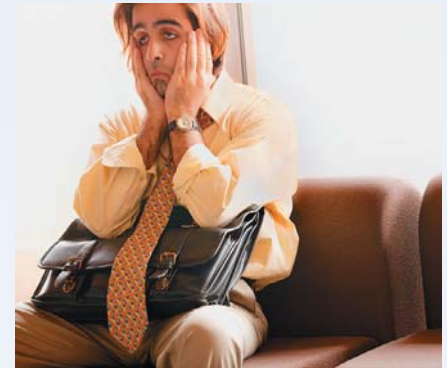
You use **inductive reasoning** to move from specific to general—you might expect people from France to be friendly because you have met several people from there who are friendly.



You use **decision making** to select among options—if you prefer cityscapes to beaches, you might visit Paris instead of Cancún.



You use **problem solving** to overcome obstacles such as getting lost or a delayed flight.



**FIGURE 8.12** Deductive Reasoning, Inductive Reasoning, Decision Making, and Problem Solving

can be *conditional* or *categorical*. In a conditional syllogism, the argument takes the form *If A is true, then B is true*. The argument's conclusion is conditioned on whether the premise—the part that follows *If*—is true. If you can assume the premise is true, you can be certain about the conclusion. If Bonnie has good taste, then the Thai restaurant she recommends will have delicious food. If you like Thai cuisine, then you will enjoy your meal. These conclusions are deductively valid, because they follow the rules of “if, then” reasoning. The conclusion may or may not be true.

In a categorical syllogism, the logical argument contains two premises and a conclusion, which can be determined to be either valid or invalid. Categorical syllogisms take the following form:

All A are B.	All chimpanzees are primates.
All B are C.	All primates are mammals.
Therefore, all A are C.	Therefore, all chimpanzees are mammals.

This conclusion is valid in that it follows logically from the premises. Now consider this syllogism:

All people from Vancouver are friendly.  
Some friendly people like Thai food.  
Therefore, some people from Vancouver like Thai food.

In this case, the conclusion is invalid. After all, since some friendly people might not like Thai food, it is possible that no one in Vancouver likes Thai food, so it is impossible to determine from the information provided if some people from Vancouver like Thai food. Knowing a person is from Vancouver, even accepting the unlikely premise that all people from Vancouver are friendly, does not help us deduce that person's culinary preferences when we reason with categorical syllogisms.

Deductive reasoning allows the reasoner to determine a statement's validity given the premises. However, the reasoner can come up with a valid but incorrect conclusion if the premises use terms inconsistently or ambiguously. Consider the following:

Nothing is better than a piece of warm apple pie.  
A few crumbs of bread are better than nothing.  
Therefore, a few crumbs of bread are better than warm apple pie.

The ambiguity of the word *nothing* causes a logical error in this syllogism.

Categorical syllogisms can have other problems. Although we often assume that deductive reasoning principles should apply equally in all circumstances, research indicates that our prior beliefs (schemas) about typical events and typical situations can influence our performances on reasoning tasks (Klauer, Musch, & Naumer, 2000). For instance, if you were told that *all foods made with spinach are delicious* and that *the cake is made with spinach*, the valid conclusion would be that *the cake is delicious*, but you might have certain ideas about what cakes should be made of, and—in the real world, as opposed to the world of abstract reasoning—those ideas will influence what conclusions you are willing to accept as valid. Even though this conclusion is deductively valid, in the real world a spinach cake is unlikely to be delicious for many people. It is important to understand the difference between a valid conclusion and truth. In deductive reasoning, a conclusion follows logically from its premises, it is valid, but it may or may not be true.

**INDUCTIVE REASONING** In some situations, we can determine the validity of a conclusion about a specific instance based on general premises, or statements we assume to be true. There are few everyday instances, however, in which we can use deductive reasoning. A more common reasoning problem is to determine general principles from specific instances. For example, suppose you have arranged to meet a new friend for lunch, and your friend is late. In this instance, you might conclude that special circumstances resulted in your new friend's tardiness. After a number of such instances, however, you might *induce* the general conclusion that your friend is usually tardy. In this way, you would make a conclusion about your friend's behaviour based on several separate instances.

The use of the scientific method to discover general principles is one example of inductive reasoning. If a group of researchers hypothesize that students involved in school clubs perform better academically, they might select a random sample of students, half of whom participate in school clubs and half of whom do not, and compare their grade point averages. Finding that the students in school clubs have significantly higher GPAs would lead to the general conclusion that, overall, students who participate in school clubs perform better academically. In other words, the researchers would induce a general principle from the specific instances of the students in the experiment.

As discussed in Chapter 2, the scientific method dictates that scientists meet certain standards when inducing general principles from several specific instances. These standards are designed to guard against biases in inductive reasoning. For example, researchers need an adequately large sample size to infer that a hypothesis is likely true. In day-to-day life, however, we may be more likely to reach

inappropriate conclusions when reasoning about general principles from everyday circumstances. Say, for instance, you are considering buying a car that was highly rated by a consumer magazine, but a friend tells you that when his uncle had that type of car, it broke down all the time. Because it is based on a very small sample (one person's experience), this report should have little weight on your purchasing decision. However, using stories as a way of understanding may be hard-wired in us as a result of our evolutionary history (D. Gardner, 2008). We often are strongly influenced by anecdotal reports, especially when an anecdote comes from someone close to us—even from someone we know remotely, such as a friend's uncle—more than a conclusion drawn from a faceless mass of research participants. Indeed, physicians often lament that their patients reject therapies supported by science but gladly accept ones supported by testimonials (Diotallevi, 2008).

## Decision Making Often Involves Heuristics

Research on decision making has been influenced by *normative models* and *descriptive models*. Historically speaking, normative models of decision making have viewed humans as optimal decision makers, who always select the choice that yields the largest gain, which usually means the most money because these theories were developed from traditional economics. More recently, descriptive models have tried to account for humans' tendencies to misinterpret and misrepresent the probabilities underlying many decision making scenarios and to act irrationally even when they understand the probabilities. Psychologists focus on understanding how humans make decisions in everyday life—especially when those decisions fail to comply with the predictions of “rational” behaviour. Because we often need to make decisions without taking time to consider all the possible pros and cons, processes that allow us to make decisions quickly are useful for dealing with many real-world challenges.

*Expected utility theory* is one normative model of how humans should make decisions (von Neumann & Morgenstern, 1947). The theory views decision making as a computation of *utility*, the overall value for each possible outcome in a decision making scenario. Thus, according to this theory, we make decisions by considering the possible alternatives and choosing the most desirable one. To arrive at the most desirable alternative, we first rank the alternatives in order of preference, determining whether each is more desirable, less desirable, or equally desirable compared with each competing alternative. For example, if you were deciding what to do after graduation, you would list the alternatives, which might include getting a job as a ski instructor, going to law school, or trying to make a living as a musician. The rational way to decide would be to rank order these alternatives and select the one with the most utility, or value, to you. But do we always choose the most desirable alternative?

In the 1970s, Amos Tversky and Daniel Kahneman spearheaded descriptive research on both reasoning and decision making. Because of the importance of both reasoning and decision making in economic theory, Kahneman, who was at the University of British Columbia from 1978 to 1986, received the Nobel Prize in Economic Sciences for their research. (Tversky was deceased when the prize was awarded.) In examining how people make everyday decisions, Tversky and Kahneman identified several common **heuristics**, the mental shortcuts or rules of thumb that people typically use to make decisions.

Psychologists distinguish between heuristics and algorithms. An *algorithm* is a procedure that, if followed correctly, will always yield the correct answer. If you wanted to know the area of a circle, for example, you could get the right answer by multiplying pi (3.1416) by the radius squared. This formula is an algorithm because it

**heuristics** In problem solving, shortcuts (rules of thumb or informal guidelines) used to reduce the amount of thinking that is needed to move from an initial state to a goal state.

will always work. Similarly, if you follow a recipe exactly, it should always yield pretty much the same outcome. If you substitute one ingredient for another (say, using honey instead of the sugar the recipe calls for, estimating the sweetness), you are using a heuristic—an informed guide. Your result will likely be fine, but there is no guarantee. Heuristic thinking often occurs unconsciously; we are not aware of taking these mental shortcuts. Indeed, heuristic processing is useful partly because it allows us to focus our attention on other things, since the conscious mind’s processing capacity is limited. Heuristics require minimal cognitive resources.

Heuristic thinking can be adaptive in that it allows us to decide quickly rather than weighing all the evidence each time we have to decide. People might always buy the second-cheapest item, no matter what they are buying, because they believe that by using this strategy they save money but avoid purchasing the worst products. Other people might buy only brand names. Such quick rules of thumb often provide reasonably good decisions. However, as Tversky and Kahneman have demonstrated, heuristics can also result in biases, which may lead to errors or faulty decisions. Consider the commonly believed heuristic that a high price equals high quality. Although laboratory studies show that one type of soap is basically as good as any other, high prices have convinced many consumers that “fancy” soaps are superior.

#### CRITICAL THINKING SKILL

### Understanding How the Availability and Representativeness Heuristics Can Affect Thinking

The **availability heuristic** is the tendency, when we think about events or make judgments (especially judgments regarding frequency), to rely on information that is easy to retrieve. For example, in the study on false fame—discussed in Chapter 7, “Attention and Memory”—the made-up names were available in memory for the participants who had read them aloud the day before, even if the participants could not have said where they heard the names. Based on their familiarity with the names, these participants decided the people were famous. The demonstration, earlier in this chapter, that prototypes come to mind when we think about certain categories shows that prototypes are readily available in memory.

Consider this question: In most industrialized countries, are there more farmers or more librarians? If you do not live in an agricultural area, you probably said librarians; if you live in an agricultural area, you probably said farmers. Most people who answer this question think of the librarians they know (or know about) and the farmers they know (or know about), and if they can retrieve many more instances in one category, they assume it is the larger category. In fact, there are many more farmers than librarians, but people who live in cities and suburbs and may never have met a farmer will likely believe the opposite.

Consider this example: You supervise two people, one introverted and one extroverted, both of whom do comparably outstanding work. If you can promote only one of them, which employee is more likely to come to mind first? For most of us, the extroverted person would come to mind first. However, through more careful analysis we would be able to overcome the availability heuristic and systematically consider the merits of each employee.

**availability heuristic** Making a decision based on the answer that most easily comes to mind.

We use the **representativeness heuristic** when we base a decision on the extent to which each option reflects what we already believe about a situation. For example, say that Helena is intelligent, ambitious, and scientific-minded. She enjoys working on mathematical puzzles, talking with other people, reading, and gardening. Would you guess that she is a cognitive psychologist or a postal worker? Most people would employ the representativeness heuristic; that is, they would guess that Helena is a cognitive psychologist, because these characteristics seem more representative of psychologists than of postal workers.

But the representativeness heuristic can lead to faulty reasoning if you fail to take other information into account, such as the *base rate*, or the frequency of an event's occurring. People pay insufficient attention to base rates in reasoning and instead focus on whether the information presented is representative of one conclusion or another. For example, there are many more postal workers than cognitive psychologists, so the base rate for postal workers is higher than that for cognitive psychologists. Therefore, any given person, including Helena, is much more likely to be a postal worker. Although Helena's traits may be more representative of cognitive psychologists overall, they also likely apply to a large number of postal workers.

We cannot be aware of every heuristic we rely on. Being aware of frequently used ones such as the availability and representativeness heuristics, however, and knowing they can lead us to make faulty judgments, can help us make more rational decisions (FIGURE 8.13).

**representativeness heuristic** A rule for categorization based on how similar the person or object is to our prototypes for that category.

Is *r* more commonly the first letter in a word or the third letter?

*r* \_ \_ \_ \_ ?      \_ \_ *r* \_ \_ ?

How would you determine the answer?

**Result:** If you are like most people, you have concluded that *r* is more often the first letter of a word. You might have tried to think of as many words as you could with *r* as the first letter (e.g., *right* or *read*) or *r* as the third letter (e.g., *care* or *sir*) and decided that *r* is more common at the beginning because those words came most easily to mind. However, *r* is much more likely to be the third letter in a word.

**FIGURE 8.13 Think Critically: Availability Heuristic**

**FRAMING EFFECTS** How information is presented can alter how people perceive it, and that effect is known as **framing**. Framing a decision to emphasize the potential losses or potential gains of at least one alternative can significantly influence the decision making. Consider the following problem:

Imagine that Canada is preparing for the outbreak of a disease that is projected to kill about 600 people. Two alternative programs are proposed to combat the disease. According to scientific estimates, if Program A is chosen, 200 of the 600 people will be saved; if Program B is chosen, there is a one-third probability that all 600 people will be saved and a two-thirds probability that nobody will be saved.

Which program would you choose? When asked a question similar to this, 72 percent of respondents chose Program A (Kahneman & Tversky, 1984). Each program potentially could save 200 people, but respondents clearly preferred Program A's sure gain, as opposed to Program B's chance of a larger gain and additional chance of no gain.

Now consider these alternatives:

If Program A is chosen, 400 people will die. If Program B is chosen, there is a one-third probability that nobody will die and a two-thirds probability that 600 people will die.

When asked a question phrased this way, 78 percent of respondents chose Program B. In this case, most people felt Program A's certain death of 400 people was a worse alternative than Program B's likely but uncertain death of 600 people. A sure loss was less appealing than an uncertain but possibly greater loss. However, the probabilities and outcomes in this second scenario are identical to those in the first, except that the gains are emphasized in the first and the losses are emphasized in

**framing** The effect of presentation on how information is perceived.

## Real World PSYCHOLOGY

the second. Clearly, framing the decision to emphasize gains or losses affects the decision making.

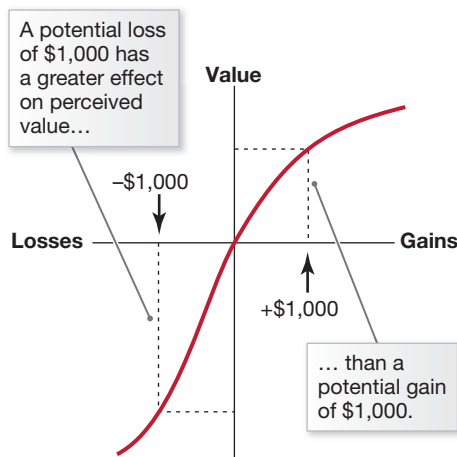
To account for framing's effects, Kahneman (2007) and Tversky came up with *prospect theory*, a major theory in decision making. Their theory has two main components: (1) the need to take into account people's wealth in predicting their choices, and (2) the fact that because losses feel much worse than gains feel good, people try to avoid situations that involve losses.

In most traditional studies of decision making, participants were presented with two choices. One choice was a "sure thing," such as winning \$200; the other choice was associated with a probability, such as having a .20 probability of winning \$1,000. These choices had the same "expected utility"; that is, after numerous trials the first choice would have yielded \$200 each time, while after numerous trials the second choice would have yielded an average of \$200 each time (thanks to the .20 probability of winning \$1,000). On those grounds, participants should have "preferred" the choices equally, since each choice would likely have yielded the same payoff. Because this choice was a one-time opportunity, however, participants who selected the second option would not win an average amount from numerous trials—they would win either \$1,000 or \$0. Given that reality, would you expect poorer people to have made the same selection as richer ones? A student struggling to pay bills and working for \$10 an hour, for example, would likely pick the sure \$200. A student with a high income, or with a rich and generous parent, would likely pick the gamble, because \$200 would have less utility for that student. In other words, all money does not have the same subjective value.

According to the principle of *loss aversion*, the second component of Kahneman and Tversky's prospect theory, losing is much worse than gaining is good. Think how happy you would feel if someone walked over to you right now and handed you \$1,000. Now think how bad you would feel if someone took \$1,000 from your checking account (FIGURE 8.14).

**AFFECTIVE FORECASTING** The American psychologists Daniel Gilbert and Timothy Wilson (2007) have found that people are not good at knowing how they will feel about something in the future; even more important, people generally do not realize how poor they are at predicting their future feelings. Compelling evidence indicates that people overestimate the extent to which negative events, such as breaking up with a romantic partner, losing a job, or being diagnosed with a serious medical illness, will affect them in the future (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998; Wilson & Gilbert, 2003). It seems that when we think about the death of a loved one or the loss of a limb or some other tragic loss, we consider only the immediate, intense pain. Over time, however, life continues, with its daily joys and sorrows, so the pain of the loss becomes less salient against the backdrop of everyday events.

According to Gilbert and Wilson (2007), after a negative event, people engage in strategies that help them feel better, such as rationalizing why it happened and minimizing the event's importance. These strategies are generally adaptive in that they protect the sufferers' mental health—making sense of an event helps reduce its negative emotional consequences. Humans have an amazing capacity for manufacturing happiness, and even after suffering anguish because of a negative event, most people will adapt and return to their typical positive outlook. Consider, for example, a woman who had polio, a crippling disease that has virtually disappeared in most places in the world thanks to the polio vaccine, who is glad that she had polio because it has taught her how to persevere and overcome adversity. Generally, however, people seem unaware that



**FIGURE 8.14 Loss Aversion** Potential losses affect decision making more than potential gains do.



they can find positive outcomes from tragic events, so when asked to predict how they will feel following an aversive event, they overestimate their pain and underestimate how well they will cope with the event (Gilbert, Morewedge, Risen, & Wilson, 2004).

*Affective forecasting* can also influence our perceptions of positive events. How would you feel if you won an Olympic medal? Just about anyone would feel very good, right? Consider, however, the South Korean skater Mo Tae-Bum, who reported feeling “disappointed” about winning only a silver medal at the 2010 Olympics. “I feel a little bit unhappy,” Mo told reporters (**FIGURE 8.15A**). The Canadian figure skater Jamie Salé knows about the agony of finishing second. Salé won a silver medal with her partner, David Pelletier, at the 2002 Olympics, then received a duplicate gold medal with Russian competitors after a controversy over judging. “You’re the first and second loser when you win silver and bronze,” she told Reuters (2010; **FIGURE 8.15B**).

Perhaps ironically, Mo might have been happier if he had won a bronze medal instead of a silver one. According to research by the American social psychologists Victoria Medvec, Scott Madey, and Thomas Gilovich, the subjective outcome of winning a silver medal can be more negative than that of winning a bronze. To test their hypothesis, Medvec and her colleagues (1995) studied videotapes of Olympic athletes’ crucial moments. Observers watched, for instance, heptathlete Jackie Joyner-Kersey complete her last long jump to win the bronze medal, swimmer Matt Biondi receive the silver medal for the 50-metre freestyle, and the Lithuanian men’s basketball team receive bronze medals, and they rated the athletes’ facial expressions on a 10-point emotional scale, “from agony to ecstasy.” The researchers found consistent evidence that, both at the moment of finding out how they did and when they were on the podium, bronze medal winners were happier than those who won silver.

When asked how you would feel if you won an Olympic medal, you probably compared winning a medal to winning no medal. But as discussed in Chapter 5, recognizing the context is crucial to determining the sort of comparison being made. Winning silver or bronze seems like quite an achievement next to winning no medal, but for Olympic athletes such as Jamie Salé winning silver does not measure up to winning gold.

**FIGURE 8.15 Affective Forecasting**

Disappointment is clear from the facial expressions and body language of (a) Mo Tae-Bum (left), who won the silver medal at the 2010 Olympics, and (b) Jamie Salé (middle) and David Pelletier (right), who initially won the silver medal at the 2002 Olympics.

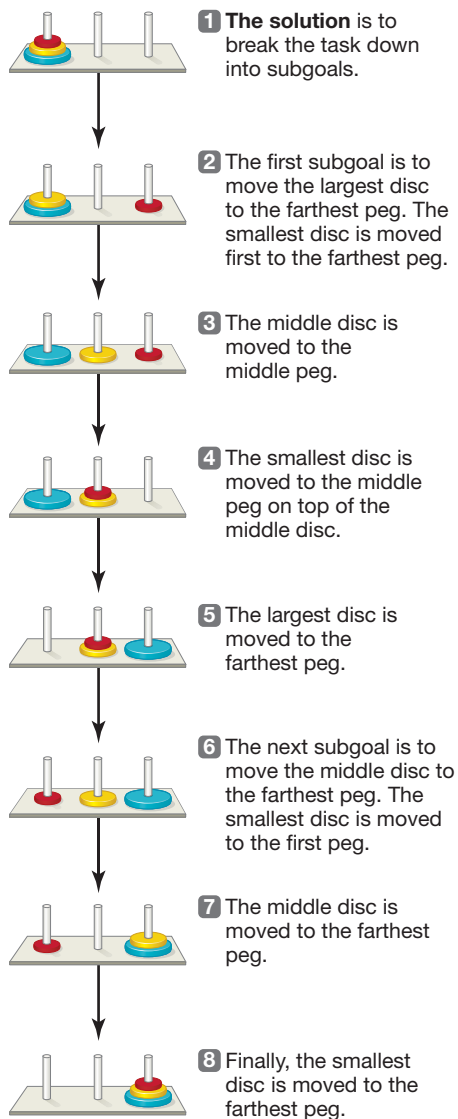


According to Kerry Kawakami and colleagues (2009), affective forecasting errors may also be involved in racism. In their study, at York University, participants estimated how upset they would be if they observed a blatant act of racism or a racist interaction. Although participants said they would be extremely upset by racism, those who experienced it showed very little distress. The researchers noted that those who believe they would take action and condemn racist behaviours respond with indifference when they actually confront those acts.

**GOOD DECISION MAKERS** Do any data support the idea that people who make good decisions have better lives? This question is difficult to answer because of the complexity of measuring the success of a life outcome. However, Wändi Bruine de Bruin, Andrew Parker, and Baruch Fischhoff (2007), three leading researchers in the area of decision making, have studied this difficult question, and their answer is a resounding “Yes!” At Carnegie Mellon University, these researchers recruited a large sample of adults to take a series of tests. One test posed questions that drew on seven thinking skills like the ones in this book’s critical thinking sections. (Among the skills drawn on was recognition of the framing effect, discussed just above. The researchers’ underlying idea regarding the framing effect is that a good thinker should be less affected by a situation’s framing than a poor thinker would be.)

The measurement of good life outcomes was based on a list of activities. In the past year, for example, had participants rented a movie but never watched it? Doing so represented poor decision making, especially if it happened several times in one year. Questions like this tested whether participants generally made good or bad decisions. Participants who performed better on the decision making test reported fewer negative life events than those who performed poorly on the test. In other words, applying critical thinking skills can positively affect multiple areas of a person’s life. Learning and using the critical thinking skills presented in this book, for example, can pay off in a lifetime of better decisions.

The task is to move the discs to the peg on the other end, moving only one disc at a time, and never placing a larger disc on top of a small disc.



You can simulate this problem by stacking a quarter, a nickel, and a penny.

**FIGURE 8.16** The Tower of Hanoi Problem

### Problem Solving Achieves Goals

Our thoughts are often focused on our goals and how to achieve them: How do you get into your car when you have locked the keys inside? How can you make enough money to spend your spring break somewhere nice? What do you have to do to get an *A* in this course? and so on. The following section examines some of the best ways to solve problems. For the purposes of this discussion, a person has a problem when he or she has no simple and direct means of attaining a particular goal. To solve the problem, the person must use knowledge to determine how to move from the current state to the goal state, often by devising strategies to overcome obstacles. How the person thinks about the problem can help or hinder that person’s ability to find solutions.

**ORGANIZATION OF SUBGOALS** One approach to the study of problem solving is to identify people’s steps in solving particular problems. Researchers examine how people proceed from one step to the next, the typical errors people make in negotiating tricky or unintuitive steps, and how people decide on more efficient (or, in some cases, less efficient) solutions. For example, in the classic “Tower of Hanoi” problem, participants are given a board that has a row of three pegs on it; the peg on one end has three discs stacked on it in a descending order of size, such that the largest disc is on the bottom. The task is to move the ordered stack of discs to the peg on the other end. Solving the problem requires breaking the task down into *subgoals* (FIGURE 8.16).

Using subgoals is important for many problems. Imagine a high school senior has decided she would like to become a doctor. To achieve this goal, she needs first to attain the more immediate subgoal of being admitted to a good university. To get into a good university, she needs to earn good grades in high school. This additional subgoal would require developing good study skills and paying attention in class. Breaking down a problem into subgoals is an important component of problem solving, although identifying the appropriate steps or subgoals and their order can be challenging for complex problems in which there is no obvious next step.

**SUDDEN INSIGHT** Problems often are not identified as problems until they seem unsolvable and the problem solver is, more or less, stuck. Only when you spot the keys in the ignition of the locked car, for example, do you know you have a problem. Sometimes, as you stand there pondering the problem, a solution will pop into your head. How does this happen? **Insight** is the metaphorical mental lightbulb that goes on in someone's head when he or she suddenly realizes the solution to a problem.

**insight** The sudden realization of a solution to a problem.

In 1925, the Gestalt psychologist Wolfgang Köhler conducted one of psychology's most famous examples of research on insight. Convinced that some nonhuman animals could behave intelligently, Köhler studied whether chimpanzees could solve problems. He would place a banana outside a chimp's cage, just beyond the chimp's reach, and provide several sticks that the chimp could use. Could the chimp figure out how to move the banana within grabbing distance? In one situation, neither of two sticks was long enough to reach the banana. One chimpanzee, who sat looking at the sticks for some time, suddenly grabbed the sticks and joined them together by placing one stick inside an opening in the other stick. With this longer stick the chimp obtained the banana. Köhler argued that, after pondering the problem, the chimp had the insight to join the sticks into a tool long enough to reach the banana. Having solved that problem, the chimp transferred this solution to other, similar problems and solved them quickly.

In a classic study of insight conducted at the University of Michigan, the researcher Norman Maier (1931) brought participants, one at a time, into a room that had two strings hanging from the ceiling and a table in the corner. On the table were several random objects, including a pair of pliers. Each participant was asked to tie the strings together. However, it was impossible to grab both strings at once—if a participant was holding one string, the other was too far away to grab. The solution was to tie the pliers onto one string and use that string as a pendulum; the participant could then hold the other string and grab the pendulum string as it swung by. Although a few participants eventually figured out this solution on their own, most people were stumped by the problem. After letting these people ponder the problem for ten minutes, Maier casually crossed the room and brushed up against the string, causing it to swing back and forth. Once the participants saw the brushed string swinging, most immediately solved the problem, as if they had experienced a new insight. However, these participants did not report that Maier had given them the solution. They all believed they had come up with it independently.

Maier's study also provides an example of how insight can be achieved when a problem initially seems unsolvable. In this case, most people had failed to see the pliers as a pendulum weight. To solve the problem, these people needed to reconsider the possible functions of the pliers and string. Thus how we view or represent a problem can significantly affect how easily we solve it. When a standard view does not work, the problem might be structured in other, less obvious ways. Often, for example, a student will ponder a problem or listen attentively



**restructuring** A new way of thinking about a problem that aids its solution.

**mental set** A problem solving strategy that has worked in the past.

to a lecture, then suddenly grin and exclaim, “Now I understand!” One successful lawyer reports that she spent the first three-fourths of her first year in law school in an intellectual fog, understanding little about the basic concepts. Then, something “clicked,” and she suddenly understood the reasoning that lay behind legal principles. Although sayings such as “think outside the box” and “think different” have become clichés (at least in Western culture), the ideas they embody about insight have been around for a long time and continue to be of great value. Unfortunately, advice such as “think different”—or, to be grammatically correct, “think differently”—may not be very useful without guidelines for how to get started.

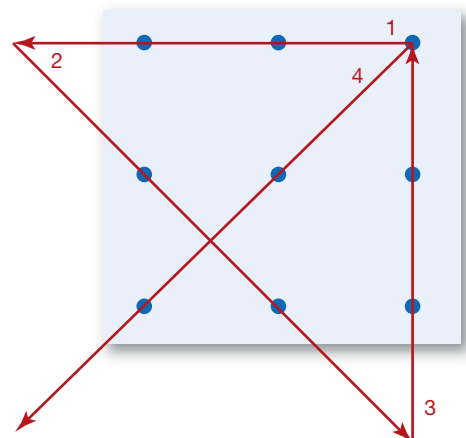
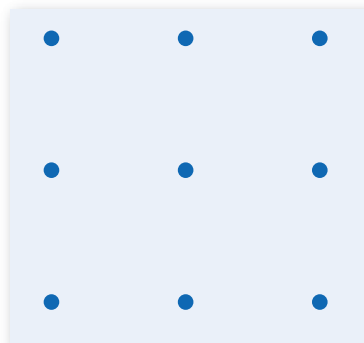
**CHANGING REPRESENTATIONS TO OVERCOME OBSTACLES** *Have you heard about the new restaurant that opened on the moon? It has great food but no atmosphere!* The premise of this joke is that *atmosphere* means one thing when interpreted in light of the restaurant schema but means something else in the context of the moon. Humor often violates an expectation, so “getting” the humor means rethinking some common representation. In problem solving, too, we often need to revise a mental representation to overcome an obstacle.

Among the strategies that problem solvers commonly use to overcome obstacles is **restructuring** the problem—representing it in a novel way. This technique can yield a solution not available under the old problem structure, leading to the sudden “Aha!” moment characteristic of insight. In one now-famous study, Scheerer (1963) gave each participant a sheet of paper that had a square of nine dots on it. The task was to connect all nine dots using at most four straight lines, without lifting the pencil off the page (**FIGURE 8.17A**). As shown in **FIGURE 8.17B**, one solution is to see that keeping the lines within the box is not a requirement, although people tend to think the problem includes that restriction. Another solution is to use one *very* fat line that covers all nine dots. Solving the problem requires restructuring the representation by eliminating assumed constraints.

In trying to solve a problem, we commonly think back to how we have solved similar problems. We tend to persist with previous strategies, **mental sets**, which often are useful but sometimes make it difficult to find the best solution. In 1942, the American Gestalt psychologist Abraham Luchins demonstrated a classic example of a mental set. He asked participants to measure out specified amounts of water,

**FIGURE 8.17** Scheerer’s Nine-Dot Problem

- (a) The task is to connect the dots using at most four straight lines. Most participants consider only solutions that fit within the square formed by the dots.
- (b) One solution is to extend the lines beyond the boundary formed by the dots.



such as 100 cups, using three jars of different sizes. Say, for example, that jar A held 21 cups, jar B held 127 cups, and jar C held 3 cups. The solution to this problem was to fill jar B, use jar A to remove 21 cups from jar B's 127 cups, then use jar C to remove 3 cups of water twice, leaving 100 cups in jar B. The structure to the solution is  $B - A - 2(C)$ . Participants were given many of these problems, in each of which the jar sizes and goal measurements differed but the same formula applied. Then participants were given another problem: They were given jar A, which held 23 cups, jar B, which held 49 cups, and jar C, which held 3 cups, and were asked to measure out 20 cups. Even though the simplest solution was to fill jar A and use jar C to remove 3 cups from jar A's 23, participants usually came up with a much more complicated solution using all three jars. Having developed a mental set of using three jars in combination to solve this type of problem, they had trouble settling on the simpler solution of using only two jars. Surprisingly, when given a problem with a simple solution for which the original formula did not work, many participants failed to solve the problem most efficiently (FIGURE 8.18).

As demonstrated by Maier's experiment with the strings and pliers, discussed above, our mental representations about objects' typical functions can also create difficulties in problem solving. Overcoming *functional fixedness* requires the problem solver to reinterpret an object's potential function. One research example involves the candle problem, developed by the German psychologist Karl Duncker (1945). Participants are given a candle, a box of matches, a bulletin board, a box of tacks, and the following challenge: *Using only these objects, attach the candle to the bulletin board in such a way that the candle can be lit and burn properly* (FIGURE 8.19). Most people have difficulty in coming up with an adequate solution. However, if they reinterpret the function of the box, a solution emerges. The side of the box is tacked to the bulletin board so that it creates a stand; the candle is then placed on the box and lit. In general, subjects have difficulty viewing the box as a possible stand when it is being used as a container for the matches. When participants are shown representations of this problem with an empty box and the matches on the table next to it, they solve it somewhat more easily.

**CONSCIOUS STRATEGIES** Although restructuring mental representations is a valuable way to develop insight into solving a problem, we often find it difficult to enact this strategy consciously when we are stuck. However, we can always apply other strategies that may help lead to a solution.

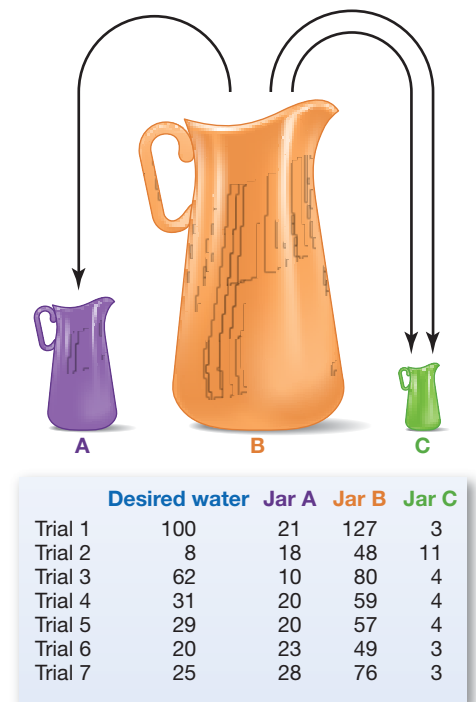
One common heuristic strategy for overcoming obstacles is *working backward*. When the appropriate steps for solving a problem are not clear, proceeding from the goal state to the initial state can generate helpful strategies. Consider the "water lily" problem (Fixx, 1978, p. 50):

Water lilies double in area every 24 hours. On the first day of summer there is only one water lily on the lake. It takes 60 days for the lake to be completely covered in water lilies. How many days does it take for half of the lake to be covered in water lilies?

One way to solve this problem is to work from the initial state to the goal state: You figure that on day 1 there is one water lily, so on day 2 there are two water lilies, on day 3 there will be four water lilies, and so on, until you discover how many water lilies there are on day 60 and see which day had half that many. But if you work backward, from the goal state to the initial state, you realize that if on day 60 the lake is covered in water lilies and that *water lilies double every 24 hours*, then on day 59 half of the lake must have been covered in water lilies.

**FIGURE 8.18** Luchins's Mental Set

The task is to measure out specified amounts of water using the three jars.

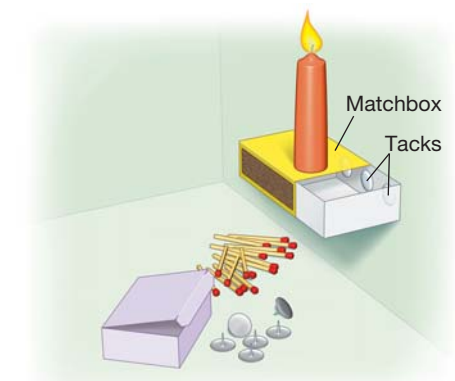


In trials 1–6, the solution to getting the desired amount of water is to fill jar B, use jar A to remove water from jar B, and then use jar C to remove water twice. In the first trial,  $127 - 21 - 2(3) = 100$ ; in the second trial,  $48 - 18 - 2(11) = 8$ ; and so on.

In trial 6, an easier solution would be to fill jar A and remove water with jar C once to get the desired amount. Only this solution will work in trial 7.

**FIGURE 8.19** Overcoming Functional Fixedness

The task is to attach a candle to the bulletin board using only a box of matches and a box of tacks.



The solution requires restructuring our concept of the matchbox by using it as a stand for the candle.

Another common strategy for overcoming a problem solving obstacle is *finding an appropriate analogy* (Reeves & Weisberg, 1994). Say, for example, that a surgeon needs to use a laser at high intensity to destroy a patient's tumour. The surgeon must aim that laser so as to avoid destroying the surrounding living tissue. From his reading, the surgeon remembers a story about a general who wanted to capture a fortress. The general needed to move a large number of soldiers up to the fortress, but all the roads to the fortress were planted with mines. A large group of soldiers would have set off the mines, but a small group could travel safely, so the general divided the soldiers into small groups and had each group take a different road to the fortress, where the groups converged and attacked together. Because his problem had constraints analogous to the general's problem, the doctor got the idea to aim several lasers at the tumour from different angles. By itself, each laser was weak enough to avoid destroying the living tissue in its path, but the combined intensity of all the converging lasers was strong enough to destroy the tumour.

Transferring a problem solving strategy—that is, using a strategy that works in one context to solve a structurally similar problem—requires paying attention to each problem's structure. Analogous problems enhance our ability to solve each one. Some researchers have found that participants who solve two or more analogous problems develop a schema that helps them solve similar problems (Gick & Holyoak, 1983). However, analogous solutions work only if people recognize the similarities between the problem they face and those they have solved (Keane, 1987; Reeves & Weisberg, 1994).

We can also benefit from finding appropriate analogies when we try to discover how to achieve our goals. For example, recent immigrants to Canada often have difficulty navigating the customs and expectations of their new environment. For them, other immigrants with a similar background who have succeeded in the new country and culture can provide examples of paths that lead to success. When we look to role models, we hope that their examples will enable us to follow analogous paths.



(a)



(b)

**FIGURE 8.20 Paradox of Choice** Iyengar and Lepper displayed (a) 6 jams and (b) 24 jams. Bar-code labels on the jars let them know whether people bought more from one group of jams or the other. The results indicated that having many possibilities can make it difficult to choose one item.

**THE PARADOX OF CHOICE** In modern society, many people believe the more options they have, the better. But daily life presents an ever-widening array of choices, from major ones concerning careers and health care plans to minor ones concerning breakfast cereals and beverages (Will that cup of coffee be a latte, a cappuccino, or a mocha? hot or cold? caffeinated or not? with skim or soy or regular milk? and so on). Although some choice is better than none, some scholars note that too much choice can be frustrating, unsatisfying, and ultimately debilitating (Schwartz, 2004).

Imagine if you were told which car to drive, which kind of food to eat, or what brand of shoes to wear. At least in Western cultures, not being able to choose violates our sense of freedom. As discussed in Chapter 9, psychological reactance is people's tendency to respond to being told what to do and not to do by wanting to do exactly what is forbidden to them, even if they had no strong preference before their choices were restricted. Feeling free to make our own choices generally gives us a sense of having control over our lives—and these states are generally viewed as beneficial to mental health. But when too many options are available, especially when all of them are attractive, people experience conflict and indecision. In one study, the Toronto-born psychologist Sheena Iyengar and her colleague Mark Lepper (2000) presented shoppers at a grocery store with a display of either 6 or 24 varieties of jam to sample (FIGURE 8.20). They also gave each shopper a discount coupon for any variety of jam. The greater variety attracted more shoppers, but it

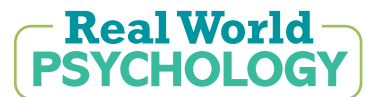
failed to produce more sales; 30 percent of those with the limited choice bought jam, whereas only 3 percent with the greater variety did so. In a subsequent study, the same investigators found that people choosing among a small number of chocolates were more satisfied with the ones they selected than were people who chose from a wider variety.

According to the psychologist Barry Schwartz, having too much choice makes some people miserable. He divides the world into *satisficers* and *maximizers*. Satisficers live according to a philosophy of “good enough.” Schwartz borrowed the term *satisficing* from the late Nobel laureate psychologist Herbert Simon, who described it as choosing an option that sufficiently satisfies needs. Satisficers do not lack standards; rather, they look around until they find something that most closely matches what they want and then buy it, without worrying about whether better or cheaper products are available. They like good things, but they do not care if those things are not the best. They are the people at supermarkets who readily select their produce without going through every apple and tomato to find the very best ones.

By contrast, maximizers always seek to make the best possible choices. They devote time and effort to reading labels, checking consumer magazines, reading Internet reviews, considering alternatives, and comparing prices. They often are frustrated by the countless options available to them and feel paralyzed by indecision when they have to select between equally attractive choices. For maximizers, making the wrong choice can have enormous consequences. Ordering the fish special for dinner means they will not have the pleasure of tasting the chicken special. What if the chicken is better than the fish? Not only do maximizers hesitate in making decisions, but they continue to analyze and question their choices even after they have made their selections, often ruminating about those selections’ negative features. As a result, they generally are more disappointed with their decisions and more likely to experience regret.

The paradox of choice might also be responsible for a cultural shift in the average age at which people are settling into jobs and marriage. Historically, well before age 25 people were set in their career paths and often married and having children. A pattern emerging in industrialized nations is for young adults to delay decisions about these life stages for many years, as they explore their vast career options and seek mates who match their ideals (Grossman, 2005). In countries such as Canada, England, France, Germany, Italy, the United States, and Japan, the average age for marriage is now approaching 30. One possible explanation for this phenomenon is that young adults are trying to maximize their life choices. They want just the right job and just the right marriage, to avoid the serious consequences of picking badly in either area.

According to Schwartz, the consequence of nearly unlimited choice may help explain the increase in clinical depression in modern countries: “If virtually every choice you make fails to live up to expectations and aspirations, and if you consistently take personal responsibility for the disappointments, the trivial looms larger and larger, and the conclusion that you can’t do anything right becomes devastating” (2004, p. 215). Schwartz believes that when decisions are not crucial people should restrict their options and settle for choices that meet their needs even if those choices might not be the absolute best. He also encourages people not to dwell on their choices but instead to focus on the positive aspects of their decisions. Is Schwartz advising people to strive for mediocrity? If he is, perhaps picking mediocre produce is fine, especially if it saves an hour at the supermarket every time you shop.



## SUMMING UP

### How Do We Make Decisions and Solve Problems?

People use deductive and inductive reasoning to draw valid conclusions. In decision making, they use rules to choose among alternatives. When solving problems, people find ways to achieve their goals. Although normative models, such as the expected utility theory, were assumed to be accurate because they describe how humans make decisions when performing optimally, it is increasingly clear that humans are not completely rational in reasoning, decision making, and problem solving. The descriptive approach to these areas shows that people often use heuristics, which can lead to faulty outcomes. Framing defines how an issue is described, highlighting positive or negative information about particular options, and thus it affects a person's choice regarding that issue. To solve a problem, a person often needs to restructure the problem, reconsidering it by breaking out of a mental set. Working backward from the goal and finding an appropriate analogy are useful conscious strategies. Unconscious processes also play an important role in problem solving and decision making. Insight, the sudden recognition of a solution, is one example of the unconscious processing of problems.

## MEASURING UP

1. For each of the following terms, identify the appropriate definition(s). Each term might have more than one definition, and some definitions might not apply to any term.
  - \_\_\_ reasoning
  - \_\_\_ decision making
  - \_\_\_ problem solving
  - a. There are multiple alternatives to select from.
  - b. There is a barrier between the present state and the desired goal.
  - c. Conclusions are deductively valid if they follow from the premises.
  - d. Conclusions are true if they follow from the premises.
  - e. There may be multiple ways to get around a barrier.
  - f. If a premise is assumed to be correct, certain conclusions will follow.
  - g. There is always only one solution.
2. In performing affective forecasting, \_\_\_\_\_.
  - a. most people are poor judges of how they will feel about something in the future
  - b. forecasters predict phenomena such as the weather and the stock market's performance
  - c. most people underestimate the negative emotions they will experience as a result of their decisions
  - d. scientists are more accurate in predicting their future emotions because they work with scientific principles

### LEARNING OBJECTIVES

List various ways of assessing intelligence, along with the strengths and weaknesses of each.

Explain the nature/nurture controversy, and cite evidence for both sides.

Describe stereotype threat and explain how it may be a threat to validity.

## How Do We Understand Intelligence?

So far, this chapter has considered the ways knowledge is represented in the mind and how we use knowledge to reason, make decisions, and solve problems. Among the most hotly debated topics in psychological science are the way knowledge and its application in everyday life translate into intelligence and the degree to which



Is it ethical to enhance your brain function through drugs (FIGURE 8.21)?

Sam is middle-aged and starting to notice age-related memory loss. Sometimes he cannot remember where he puts his keys. Sometimes, in the middle of a presentation at work, he cannot think of the word he is looking for. Would it be acceptable for Sam to take medication that prevents the normal slow loss of brain function? Few people would say no.

The development of most cognition-enhancing drugs has been driven by research on treating Alzheimer's disease and age-related memory loss, but such drugs might be co-opted for other uses as well. What if Sam were a university student with a normal memory who was taking this medication to improve his memory? What if he popped a pill, went to his physics lecture, and came out with the lecture locked in his brain? He would not have to study, use flash cards, practice, or expend real effort apart from paying attention to the lecture. Some people would view that process as cheating—gain without pain. But we all know people who were born able to encode memories faster and better than most of us can. Is that fair? In a sense, the rest of us were cheated by Mother Nature. If we can create a pill to cheat her back, why not take it?

Objections to these drugs centre on concerns about safety and side effects, on the personal and societal levels. Such concerns increase when medications are given to the healthy for enhancement, especially when the full ramifications are unknown. Another objection is that if learning does not involve hard work, virtues such as perseverance will fall by the wayside, but this objection confuses a personality trait with memory function. A person can be perseverant with or without a good memory, or can have a great memory but not the perseverance to apply it. Others foresee decreased admiration for achievement and decreased senses of accomplishment.

However, we admire not simply feats of memory but how memory is used. We admire actors for their delivery of the lines they have memorized, mathematicians for applying the formulae they know. A good memory is just one capacity that may increase a person's achievement; intelligence, personality, and temperament also come into play. A lazy genius can be as unaccomplished as a lazy person with far less brain power.

Another concern is that cognitive enhancements may provide such an advantage that people will be coerced into taking them: Parents will want their children to have every advantage, teachers will find it much easier to teach "enhanced" students, employers

will want to hire employees who require less training, and so on. Eventually, anyone who wants to compete for the best schools and best jobs will need to take them. This proliferation would present problems of distribution and affordability. Would cognition-enhancing medications be expensive? Would insurance companies pay



FIGURE 8.21 Memory Pills

for them? Would government provide them, perhaps with the money it saves in education and in unemployment insurance?

Many of us already use caffeine and sugar, chemicals that enhance memory and performance. Many elementary school children take Ritalin to treat attention deficit hyperactivity disorder (ADHD) and attention deficit disorder (ADD), but in some school districts the proportion of boys taking it is greater than the highest estimates of the prevalence of ADHD (Diller, Tanner, & Weil, 1996). In other words, children within the range of normal behaviour are being given a drug whose long-term side effects are still unknown to change their cognitive states. Among high school and university students who do not have ADHD or ADD, 16 percent take prescription stimulants (such as Ritalin and dextroamphetamine) as study aids.

Perhaps the memory drugs being developed will appeal only to those suffering from Alzheimer's and age-related memory loss. The side effects of an improved memory might not be so appealing. After all, our brains' capacity to forget, as well as their capacity to remember, may have been honed through millions of years of evolution and thus may serve vital purposes. Time may no longer heal all wounds if memories stay as fresh as the day they are forged. The memory of every embarrassing moment, rejection, and faux pas may linger, affecting people's senses of self.

The rich have many advantages the poor do not have. What if rich people could pay for cognition-enhancing drugs but poor people could not? Would a drug-enhanced advantage differ from other learning advantages, such as books, that money can buy? Are there times when cognition-enhancing drugs should always be used, such as when someone has Alzheimer's, and times when they should never be used, such as at the request of a healthy person with a moderately high IQ?

**intelligence** The human ability to use knowledge, solve problems, understand complex ideas, learn quickly, and adapt to environmental challenges.

intelligence is determined by genes and by environment (Neisser et al., 1996). **Intelligence** is the human ability to use knowledge to reason, make decisions, solve problems, understand complex ideas, learn quickly, and adapt to environmental challenges. As modern society becomes more complex, with greater amounts of information available and greater demands on people to understand it all, being able to adapt to change and deal with increasing complexity is becoming more and more important (Gottfredson, 2004a; Lubinski, 2004). To succeed, people need to be innovative and “stay ahead of the curve.” We are all intelligent beings, but individuals differ in terms of intelligence (Vernon et al., 2000), just as we differ physically and psychologically. We observe physical differences and even psychological ones, such as in how shy people are or how much they worry. How do we know someone’s level of intelligence?

The earliest efforts to study intelligence were led by the British scientist Sir Francis Galton (1822–1911) in the late 1800s. Galton believed that intelligence was related to the speed of neural responses and the sensitivity of the sensory/perceptual systems—the quicker our responses and the keener our perceptions, the smarter Galton believed us to be. Today, most intelligence tests are timed, so we still believe quick processing of information suggests higher intelligence. Since Galton’s time, researchers have taken numerous approaches to defining and studying intelligence. Three general approaches to understanding intelligence cross the major levels of analysis: The *psychometric* approach focuses on how people perform on standardized achievement tests, examining what people know and their problem solving skills. The *cognitive* approach examines the particular mental abilities that allow people to operate intelligently: how they process information, the speed at which they react, the amount of information they can hold in memory, and the extent to which they can stay focused on tasks. The *biological* approach is concerned with how the brain processes information and the extent to which differences in brain activity are affected by genes and environment.

### Intelligence Is Assessed with Psychometric Tests

For much of the past century, the psychometric approach to intelligence has been the most dominant and influential, especially in terms of how intelligence is viewed in everyday life. Tests that focus on *achievement* assess current levels of skill and of knowledge. *Aptitude* tests examine whether people will be good at various tasks in the future and may predict what jobs people might be good at—for example, accounting, piloting planes, or even spying. Their performances on these tests can hugely affect people’s lives. How were these high-stakes tests developed?

Although testing people to match them with jobs they might excel in dates back to ancient China, the measurement of intelligence began in earnest just over a century ago. At the encouragement of the French government, the psychologist Alfred Binet developed the first method of assessing intelligence (**FIGURE 8.22**), to identify children in the French school system who needed extra attention and special instruction. Binet proposed that intelligence is best understood as a collection of high-level mental processes—in today’s terms, attributes such as verbal, mathematical, and analytical abilities. Accordingly, with the help of his assistant Théodore Simon, Binet developed a test for measuring each child’s vocabulary, memory, skill with numbers, and other mental abilities, the *Binet-Simon Intelligence Scale*. One assumption underlying the test was that although a child might do better on some specific components by chance, how he or she performed on average across the different components would indicate the child’s overall level of intelligence. Indeed, Binet found that scores



**FIGURE 8.22 Alfred Binet and Intelligence Assessments** Binet launched the psychometric approach to intelligence.

on his tests were consistent with both teachers' beliefs about children's abilities and the children's grades.

A number of other intelligence tests have been developed. In 1919, the psychologist Lewis Terman, at Stanford University, modified the Binet-Simon test and established normative scores for American children (average scores for each age). This test—the *Stanford Revision of the Binet-Simon Scale*, known colloquially as the “Stanford-Binet” test and revised for the fifth time in 2003—remains widely used for children in Canada. In 1939, the psychologist David Wechsler developed a test for use among adults. The *Wechsler Adult Intelligence Scale* (WAIS), the most current version being the WAIS-IV, has two parts, each consisting of several tasks. The *verbal* part measures aspects such as comprehension, vocabulary, and general knowledge. The *performance* part involves nonverbal tasks, such as arranging pictures in proper order, assembling parts to make a whole object, and identifying a picture's missing features.

**INTELLIGENCE QUOTIENT** Binet introduced the important concept of **mental age**, an assessment of a child's intellectual standing compared with that of same-age peers. Binet noticed that some children seem to think like younger or older normal children. For instance, an eight-year-old who reads Shakespeare and knows calculus might score as well as an average 16-year-old and thus would have a mental age of 16. The **intelligence quotient (IQ)**, developed by the German psychologist Wilhelm Stern, is computed by dividing a child's estimated mental age by the child's chronological age and multiplying the result by 100. Today, the average IQ is set at 100. The eight-year-old with a mental age of 16 would have an IQ of 200 ( $16/8 \times 100$ ), an extraordinarily high score!

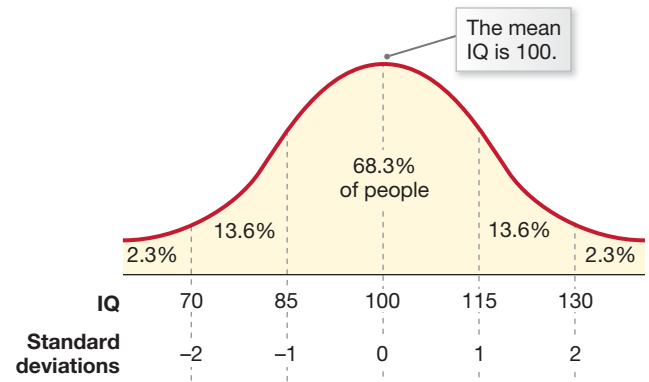
The term *IQ* continues to be used, but the measure is conceptualized differently, because the formula breaks down when used with adults. According to the formula, a 60-year-old would need to get twice as many test items correct as a 30-year-old to have the same IQ. Intelligence in the adult range is better conceptualized as what someone knows relative to the average adult and not to adults at different ages. Across large groups of people, the distribution of IQ scores forms a bell curve, or *normal distribution*. Most people are close to the average, and fewer and fewer people score at the tails of the distribution (FIGURE 8.23).

**VALIDITY** Are intelligence tests valid? That is, do they really measure what they claim to measure? To evaluate the tests, we need to consider what it means to be intelligent. If the word means doing well at school or at a complex career, intelligence tests perform reasonably well: The overall evidence indicates that IQ is a fairly good predictor of such life outcomes (Gottfredson, 2004b). IQ here means a score on a normed test of intelligence—that is, a score relative to those of the large number of people who already took the test. To explore intelligence tests' validity, researchers analyzed data about more than 20,000 people who took the *Miller's Analogy Test*, which requires test takers to complete analogies such as “Fingers are to hands as toes are to \_\_\_\_.” The researchers found that Miller's Analogy Test scores predicted not only graduate students' academic performances but also their productivity, creativity, and job performances (Kuncel, Hezlett, & Ones, 2004). Similarly, people in professional careers, such as attorneys, accountants, and physicians, tend to have high IQs, while those who work as miners, farmers, lumberjacks, barbers, and so on, tend to have lower IQs (Jencks, 1979; Schmidt & Hunter, 2004). While these statistics refer to averages rather than individuals,

**mental age** An assessment of a child's intellectual standing relative to that of his or her peers; determined by a comparison of the child's test score with the average score for children of each chronological age.

**intelligence quotient (IQ)** The number computed by dividing a child's estimated mental age by the child's chronological age, and then multiplying this number by 100.

**FIGURE 8.23 The Distribution of IQ Scores** As discussed in Chapter 2, the statistical concept of standard deviation indicates how far people are from an average. The standard deviation for most IQ tests is 15, such that approximately 68 percent of all people fall within 1 standard deviation (they score from 85 to 115) and just over 95 percent of people fall within 2 standard deviations (they score from 70 to 130).





*"I don't have to be smart, because someday I'll just hire lots of smart people to work for me."*

the data suggest modest correlations between IQ and work performance, IQ and income, IQ and jobs requiring complex skills. Although higher IQ does not predict who will be a better truck driver, it predicts who will be a better computer programmer (Schmidt & Hunter, 2004).

When considering these findings, note that IQ scores typically predict only about 25 percent of the variation in performance at either school or work, so additional factors contribute to individuals' success (Neisser et al., 1996). People from privileged backgrounds tend to have higher IQs, but other advantages—such as family contacts, access to internships, and acceptance to schools that can cater to their needs—also help determine their success. Moreover, people have greatly different amounts of motivation and differ greatly in how much time they are willing to spend to get ahead. One 20-year follow-up study of nearly 2,000 gifted 13-year-olds (those with IQs in the top 1 percent of their age group) revealed huge differences in how much people reported working as well as how much they were willing to work. At age 33,

some individuals refused to work more than 40 hours per week, whereas others reported regularly working more than 70 (Lubinski & Benbow, 2000). Even with factors such as IQ and social background being more or less equal, a person working twice as many hours per week may have that much more chance of accomplishing his or her goals (Lubinski, 2004). In other words, IQ may be important, but it is among several factors that contribute to success in the classroom, the workplace, and life generally.

**CULTURAL BIAS** One important criticism of intelligence tests is that they may penalize people for belonging to particular cultures or particular groups. That is, doing well on intelligence tests often requires knowing the language and culture of the mainstream. For instance, consider this analogy:

STRING is to GUITAR as REED is to

- a. TRUMPET
- b. OBOE
- c. VIOLIN
- d. TROMBONE

Being able to solve this analogy requires specific knowledge of these instruments, in particular knowing that an oboe uses a reed to make music. But unless you were exposed to this information and had an opportunity to learn it, you could not answer the question. Moreover, some words mean different things to different groups, and how a person answers a test item is determined by its meaning in his or her culture. On *American Idol*, when the judge Randy Jackson describes someone's performance as "da bomb," he does not mean she or he "bombed," or did badly. He means it was "cool," which does not mean it was cold. And so on. A person's exposure to mainstream language and mainstream culture affects which meaning of a word comes most quickly to mind, if the person knows the meaning at all.

What it means to be intelligent also varies across cultures. Most measures of IQ reflect values of what is considered important in modern Western culture, such as

being quick witted or speaking well. But what is adaptive in one society is not necessarily adaptive in others. One approach to dealing with cultural bias is to use items that do not depend on language, such as the performance measures on the WAIS. Other tests show a series of patterns and ask the test taker to identify the missing pattern (FIGURE 8.24). Although these tests may be fairer than those that rely on understanding language, most of the proposed substitutes for intelligence tests are also biased. For example, interviews and ratings of job performance are subject to bias in ways difficult to detect and quantify and may exacerbate the problem of cultural bias in intelligence assessments. It is difficult to remove all forms of bias from testing situations; doing well on tests, among them IQ tests, simply matters more to some groups than to others, and tests generally favour those who wish to do well.

### CRITICAL THINKING SKILL

## Recognizing and Avoiding Reification

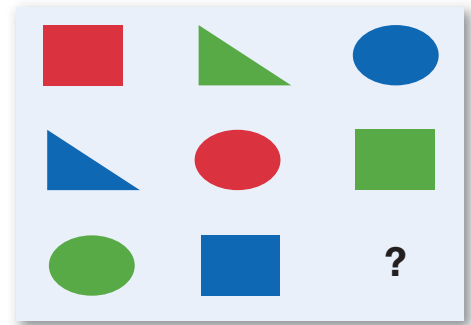
*Reification* is the tendency to think about complex traits as though they have a single cause and an objective reality. A good example of reification is the complex concept of intelligence. Because we measure intelligence with IQ scores, people tend to think intelligence can be understood with these numbers. As discussed above, IQ is a number derived from a normed intelligence test. If you score near the mean, your IQ is close to 100. If you score in the top 2 percent, your score is higher than 130. The number conveys how you scored relative to the people who were in the sample used to norm the test. It is not synonymous with intelligence. For example, if English is your native language but you speak enough French to take an intelligence test in French, you probably would not expect the resulting IQ to reflect your intelligence accurately. Intelligence is a multi-faceted concept defined within a context, not just by a score in isolation.

Compare the concept of intelligence with that of weight. We can measure, gain, and lose weight, which makes it seem similar to intelligence, but weight's physical reality makes it unlike intelligence. When we think about intelligence as having physical reality, we are reifying the concept. Once we think about IQ as though it explains intelligence, we ignore all the problems with intelligence tests, including possible cultural biases. Critical thinkers avoid treating an abstract concept as though it has a tangible reality and recognize the complexity in complex concepts.

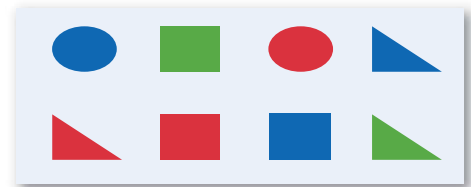
## General Intelligence Involves Multiple Components

Binet viewed intelligence as a general ability. However, we all know people who are especially talented in some areas but weak in others. Some people write great poems, for example, but cannot solve difficult calculus problems—or at least feel more confident doing one than doing the other. The question then is whether intelligence reflects one overall talent or many individual ones. An early line of research examined the correlations among all items using *factor analysis*, a statistical technique that clusters items similar to one another; the clusters are referred to as factors. Using this method, the English psychologist Charles Spearman (1904) found that most intelligence test items tended to cluster as one factor and that people who scored highly on one type of item also tended to score highly on other types of items: In general,

The task is to identify the missing shape in this sequence.



Choose from the eight shapes below to complete the sequence:



The solution is the first triangle in the bottom row.

**FIGURE 8.24 Removing Bias from Tests**

Because it does not rely on verbal knowledge, this test is not culturally biased—or is it?

**general intelligence (g)** The idea that one general factor underlies all mental abilities.

**fluid intelligence** Information processing in novel or complex circumstances.

**crystallized intelligence** Knowledge acquired through experience and the ability to use that knowledge.

**multiple intelligences** The idea that people can show different skills in a variety of different domains.

people who are very good at math are also good at writing, problem solving, and other mental challenges. Spearman viewed **general intelligence**, or **g**, as a factor that contributes to performance on any intellectual task. In a sense, providing a single IQ score reflects the idea that one general factor underlies intelligence. Although most psychological scientists agree that some form of **g** exists, they also recognize that intelligence comes in various forms.

**FLUID VERSUS CRYSTALLIZED INTELLIGENCE** The American psychologist Raymond Cattell (1971) proposed that **g** consists of two types of intelligence. **Fluid intelligence** involves information processing, especially in novel or complex circumstances, such as reasoning, drawing analogies, and thinking quickly and flexibly. It is often assessed in nonverbal, more culture-fair intelligence tests (such as the one in Figure 8.24). In contrast, **crystallized intelligence** involves knowledge we acquire through experience, such as vocabulary and cultural information, and the ability to use this knowledge to solve problems (Horn, 1968; Horn & McArdle, 2007). Distinguishing between fluid intelligence and crystallized intelligence is somewhat analogous to distinguishing between working memory (which is more like fluid intelligence) and long-term memory (which is more like crystallized intelligence). As would be expected because both intelligences are components of **g**, people who score highly on one factor also tend to score highly on the other, a finding that suggests a strong crystallized intelligence is likely aided by a strong fluid intelligence. As discussed in Chapter 11, throughout the adult years crystallized intelligence grows steadily, while fluid intelligence declines steadily.

**MULTIPLE INTELLIGENCES** Whereas Cattell argued that two types of intelligence contribute to **g**, the American psychologist Howard Gardner (1983) proposed a theory of **multiple intelligences**, in which he identified different types of intellectual talents that are independent from one another. For example, he proposed that musical intelligence enables some people to discriminate subtle variations in pitch or in timbre and therefore to have an above average appreciation of music. Among the other intelligences Gardner proposed are bodily-kinesthetic (such as the forms that make athletes and dancers highly attuned to their bodies and able to control their motions with exquisite skill), linguistic (excellent verbal skills), mathematical/logical, spatial (thinking in terms of images and pictures), intrapersonal (or self-understanding), and interpersonal (or social understanding; **FIGURE 8.25**).

Gardner's theory is important partly because it recognizes that people can be average or even deficient in some domains and outstanding in others. Consider the Juilliard School student Jay Greenberg, a typical boy in all regards—except that he has been described as perhaps the greatest prodigy in the last two hundred years; his composing skills are said to rival those of historical greats such as Mozart and Beethoven. Greenberg does not know where the music comes from, but he hears it fully written, as if it were being played by an orchestra in his head (*60 Minutes*, November 28, 2004).

According to Gardner, each person has a unique pattern of intelligences and no one should be viewed as smarter than others, just differently talented, a view that strikes some psychologists as a feel-good philosophy with little basis in fact. These critics have questioned whether being able to control body movements or compose music is truly a form of intelligence or should instead be considered a specialized talent. Is clumsiness or tone deafness a form of unintelligence? There are still no standardized ways to assess many of Gardner's intelligences, in part because Gardner believes the existing tests fail to capture the true essence of intelligence. Instead, Gardner provides exemplars, such as the artist Pablo Picasso, the dancer



**FIGURE 8.25 Multiple Intelligences**

Howard Gardner suggested that intelligence can take many different forms. Here, four different types of intelligence are represented by (a) the athlete Wayne Gretzky, (b) the musician Gordon Lightfoot, (c) the scientist and environmental activist David Suzuki, and (d) the actor Cory Monteith, from the television show *Glee*.

Martha Graham, the physicist Albert Einstein, and the poet T. S. Eliot. Each of these figures was especially talented in his or her field, but they were also talented in many respects, and all were high in general intelligence (Gottfredson, 2004b).

The American psychologist Robert Sternberg (1999) proposed a theory of three intelligences: *Analytical intelligence* is similar to that measured by psychometric tests, as in being good at problem solving, completing analogies, figuring out puzzles, and other academic challenges. *Creative intelligence* involves the ability to gain insight and solve novel problems—to think in new and interesting ways. *Practical intelligence* refers to dealing with everyday tasks, such as knowing whether a parking space is large enough for your vehicle, being a good judge of people, being an effective leader, and so on. Evidence for the existence of such multiple intelligences is that many phenomenally successful public figures did not excel academically. Bill Gates dropped out of university, yet he developed one of the world's largest companies and became the world's richest person. Neither the flamboyant British billionaire Richard Branson nor the American cosmetics giant Estée Lauder attended university. The singer Céline Dion and the actor Michael J. Fox never finished high school. Each of these individuals clearly has talents that might not be measured on standardized intelligence tests.

**EMOTIONAL INTELLIGENCE** Conceived by the psychological scientists Peter Salovey and John Mayer and subsequently popularized by the science writer Daniel Goleman, **emotional intelligence (EQ)** is a form of social intelligence that emphasizes the ability to perceive, understand, manage, and use emotions to guide thoughts and actions (Salovey & Mayer, 1990). Emotional intelligence consists of four abilities: to manage one's own emotions, to use one's own emotions to facilitate activities, to recognize other people's emotions, and to understand emotional language (Salovey & Grewel, 2005). People high in EQ recognize emotional experiences in themselves and others, then respond to those emotions productively. As discussed in Chapter 9, emotions sometimes overwhelm cognition and undermine motivation. For instance, when people are upset, they sometimes act impulsively and thoughtlessly, by lashing out at others, eating a pound of chocolate, or doing other things they later regret. Regulating one's mood, resisting both impulses and temptations as appropriate, and controlling one's behaviour are all important components of EQ. Through a study that compared high school students to their parents and also examined a

**emotional intelligence (EQ)** A form of social intelligence that emphasizes the ability to perceive, understand, manage, and use emotions to guide thoughts and actions.

sample of twins, Tony Vernon and colleagues (2008), at the University of Western Ontario, found that emotional intelligence has a fairly strong genetic component.

Emotional intelligence is correlated with the quality of social relationships (Reis et al., 2007). The idea of emotional intelligence has had a large impact in schools and industry, and programs have been designed to increase students' and workers' emotional intelligence. These efforts may be valuable, since Trent University researchers have demonstrated that emotional intelligence is a good predictor of high school grades (Hogan et al., 2010) and researchers at the University of Calgary have shown that those high in emotional intelligence cope best with the challenges of university exams (Austin, Saklofske, & Mastoras, 2010). At the same time, some critics have questioned whether EQ really is a type of intelligence or whether it stretches the definition of intelligence too far. The concept highlights the idea that many human qualities are important; whether or not EQ is a type of intelligence, it is advantageous for those who have it.

**IMPORTANCE OF G** Intelligence may be defined in different ways, but a general capacity likely lies behind it, namely *g*. Some scholars have viewed *g* as a statistical anomaly that has no factual basis. Within the last few years, however, a growing number of psychological scientists have concluded that *g* exists and that it exerts an important influence over life's outcomes (Conway, Kane, & Engle, 2003; Deary, 2001; Garlick, 2002; Gray & Thompson, 2004; Haier, Jung, Yeo, Head, & Alkire, 2005). Research has shown that *g* predicts not only performance in school and at work but also longevity. Low *g* is related to early death from causes including heart disease, diabetes, stroke, Alzheimer's disease, traffic accidents, and drownings (Gottfredson, 2004a; Gottfredson & Deary, 2004). One study followed Scottish people for 55 years, starting when they were schoolchildren, and examined the influence of intelligence and a personality variable related to emotional intelligence. Those who scored in the lower half on both measures were more than twice as likely to die over the next half century compared to those who scored in the top half on both measures (Deary, Batty, Pattie, & Gale, 2008). These patterns might result from the different environmental forces at work on each of us, such that people who do not perform well in academic settings end up with dangerous jobs, people with less dangerous and/or better-paying jobs have better access to health care, and so on. Indeed, it is possible that factors other than intelligence are responsible for early death. A study that followed Swedish people from age 10 until age 75 found that the more education people received, the longer they lived, independent of their IQ level (Lager, Bremberg, & Vågerö, 2009). Researchers from the UK and Finland found that lower socio-economic status may be the most important predictor of early mortality (Jokela, Elovainio, Singh-Manoux, & Kivimäki, 2009).

According to the American psychologist Linda Gottfredson (2004a), however, *g* may directly affect health. People who score higher on intelligence tests may generally be more literate about health issues: accumulating greater health knowledge, better able to follow medical advice, better able to understand the link between behaviour and health. As medical knowledge rapidly advances and becomes more complex, trying to keep up with and process all this new information is a challenge, and people who are higher in *g* have an advantage in doing so. This provocative idea warrants further investigation. If it is true, it has a number of important implications for the medical system and the way doctors communicate medical advice.

As mentioned above, general intelligence, especially fluid intelligence, seems to predict performance in jobs that require fast and creative thinking. A number of theorists have proposed that *g*'s main value is in allowing people to adapt quickly to environmental challenges, and that the more complex the challenge, the greater



g's importance. Satoshi Kanazawa (2004), of the London School of Economics, suggests general intelligence is relevant only in novel situations. He notes that for most of human evolution, our ancestors were hunter-gatherers who experienced few changes in their daily routines. Indeed, the lives of prehistoric hunter-gatherers remained pretty much the same as their ancestors' lives going back thousands of years. Only during the occasional novel event, such as a drought or other natural disaster, did those high in general intelligence have an advantage.

According to Kanazawa, one's level of intelligence does not matter for recurring adaptive challenges, so it has little influence over many aspects of daily human life, such as figuring out what to eat, finding mates, recognizing friends, and raising children. Indeed, people with high levels of intelligence have no advantage in these domains. For instance, there is no evidence that people with high g make better parents (Herrnstein & Murray, 1994). But today we encounter a multitude of phenomena that scarcely could be imagined even a century or two ago, such as automobiles, airplanes, electric appliances, high-rise buildings, televisions, computers, wireless telephones, and international conglomerates. Such inventions and institutions increase the value of adapting to novel challenges and of thinking creatively. The overall evidence is consistent with the idea that general intelligence is most valuable for tasks that require understanding novel, complex information (Lubinski, 2004). But what aspects of g provide these abilities?

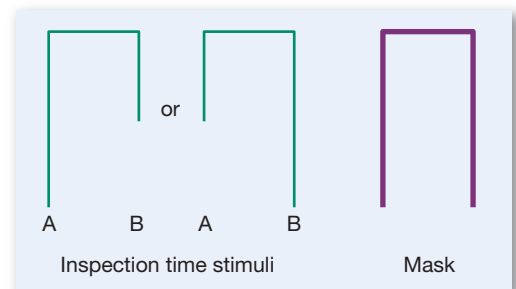
## Intelligence Is Associated with Cognitive Performance

What cognitive processes are involved in producing intelligence? Being able to take a three-hour exam requires us to stay focused and pay attention, for example, whereas recalling the definition of the word *heraldry* requires us to remember information about the Middle Ages. According to Sir Francis Galton, intelligence is related to our brains' efficiency as well as to keen perceptual skills. He has speculated that intelligent people have larger, more efficient brains. Other psychological scientists believe intelligence is supported by low-level cognitive processes, such as mental processing, working memory, and attention. But can we equate these types of brain performance with intelligence?

**SPEED OF MENTAL PROCESSING** People who are not very intelligent are sometimes described as “a bit slow.” That description might be accurate, because people who score higher on intelligence tests respond more quickly and consistently on reaction time tests than those who score lower on intelligence tests (Deary, 2000). A test of *simple reaction time* might require a person to press a computer key as quickly as possible whenever a stimulus (e.g., an X) appears on the screen. A more difficult test might require a person to choose, again as quickly as possible, the right response for the stimulus presented (e.g., press the X key when an X appears, press the A key when an A appears, and so on). Scores on intelligence tests are related even more strongly to this *choice reaction time* (Jensen, 1998). (See the discussion of reaction time measures in Chapter 2, “Research Methodology.”)

Another line of evidence supporting a relation between general intelligence and speed of mental processing comes from *inspection time* tests. If a stimulus is presented and then covered up, how much viewing time does a particular person require to determine which side, A or B, is longer (FIGURE 8.26)? According to research, people who need very little time for this task tend to score higher on psychometric tests of intelligence (Deary, 2001). Additional evidence that highly intelligent people's brains work faster has been found by measuring brains' electrical activity in response to stimuli presentation.

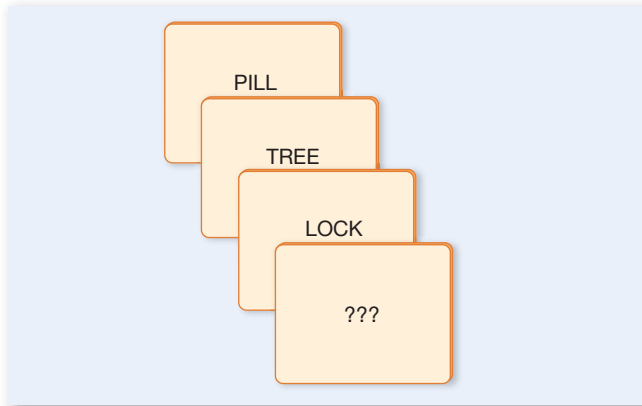
The task is to determine whether side A or side B of the stimulus is longer. The stimulus is presented and then quickly followed by a mask.



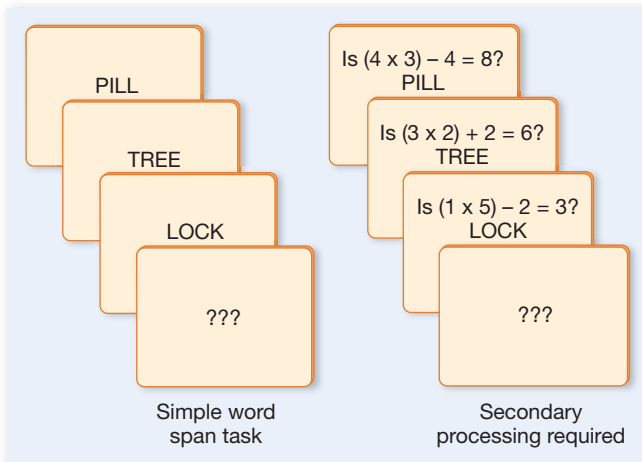
Judging the lengths is easy when you have enough time to view the stimulus but difficult when the mask decreases viewing time severely.

FIGURE 8.26 Inspection Time Tasks

For a simple **word span task**, a participant listens to a short list of words and then repeats them in order.



For a more difficult **secondary processing task**, a participant has to solve simple mathematical operations at the same time the words are presented. Once again, the person has to repeat the words in the order they are presented (adapted from Conway et al., 2003).



**FIGURE 8.27** Memory Span Tasks

secondary processing (**FIGURE 8.27**). Performance on a simpler test of memory, as in listening to a list of words and then repeating the list in the same order, is related weakly to general intelligence (Engle, Tuholski, Laughlin, & Conway, 1999). Memory tests that have dual components, however, show a strong relation between working memory and general intelligence (Gray & Thompson, 2004; Kane, Hambrick, & Conway, 2005; Oberauer, Schulze, Wilhelm, & Süß, 2005).

The link between working memory and intelligence may be attention. In particular, being able to pay attention, especially while being bombarded with competing information or other distractions, allows a person to stick to a task until successfully completing it (Engle & Kane, 2004). The importance of staying focused makes great sense in light of the relationship, discussed above, between general intelligence and the accomplishment of novel, complex tasks. The question, then, is whether brain regions that support working memory are involved in intelligence.

**BRAIN STRUCTURE AND FUNCTION** Intelligent people are sometimes called “brainy,” but how are the brain and intelligence related? Many studies have documented a relationship between head circumference, which researchers use to estimate brain size, and scores on intelligence tests (Vernon, Wickett, Bazana, Stelmack, & Sternberg, 2000). Head circumference also predicts school performance, although

The relation between intelligence and mental speed appears to be involved in the greater longevity of people with high IQs. In a longitudinal study led by the British psychologist Ian Deary, those higher in intelligence and those who had faster reaction times at age 56 were much less likely to die in the next 14 years, even after factors such as smoking, social class, and education were controlled for. The relationship between reaction time and longevity was somewhat stronger than that between scores on standardized intelligence tests and longevity (Deary & Der, 2005). Although the various response time measures lead to the conclusion that intelligence is associated with speed of mental processing, researchers are far from knowing what this finding means. Perhaps being able to process information quickly is just one of the many talents possessed by people high in general intelligence. This ability may allow them to solve problems, or make decisions, quickly when doing so is advantageous. The adaptive value of quick reaction time is obvious when you consider that lives hang on the snap judgments of firefighters (as in an example above), police officers, medical personnel in emergency rooms, soldiers in combat, and so on.

**WORKING MEMORY** Over the past decade, a growing number of researchers have noted that general intelligence scores are closely related to working memory (Conway et al., 2003), although the two are not identical (Ackerman, Beier, & Boyle, 2005). As discussed in Chapter 7, working memory is the active processing system that holds information for use in activities such as reasoning, comprehension, and problem solving. In that capacity, working memory might be related to intelligence (Kyllonen & Christal, 1990; Süß, Oberauer, Wittman, Wilhelm, & Schulze, 2002). Many studies of the relationship between working memory and intelligence differentiate between simple tests of memory span and memory tests that require some form of

the correlation is quite small (Ivanovic et al., 2004). Studies using magnetic resonance imaging have found a small but significant correlation between the size of selected brain structures and scores on intelligence tests (Johnson, Jung, Colom, & Haier, 2008; on MRI, see Chapter 2, “Research Methodology”). A meta-analysis of 37 samples totalling more than 1,500 people found that brain volume, as assessed by MRI, explained about 10 percent of the differences in people’s general intelligence (McDaniel, 2005). However, these findings are correlations, so we cannot infer that brain size necessarily causes differences in intelligence. In fact, people with autism also tend to have larger brains (Piven et al., 1995).

Is intelligence related to the brain’s overall size or to the sizes of certain brain regions (such as those associated with working memory, planning, reasoning, and problem solving)? Studies have found that the volume of neuronal cell bodies (grey matter) in the frontal lobes and in other brain regions that support attentional control is related to fluid intelligence (Frangou, Chitins, & Williams, 2004; Haier et al., 2005; Wilke, Sohn, Byars, & Holland, 2003) but not to crystallized intelligence (Gong et al., 2005). These findings are consistent with evidence that injury to the frontal lobes causes impairments in fluid intelligence but not to crystallized intelligence (Duncan, Burgess, & Emslie, 1995).

Sandra Witelson, a Canadian neuroscientist at McMaster University, has her own personal collection of brains—125 of them, all from Canadians. She also has an enviable specimen from outside Canada—she is the official keeper of Albert Einstein’s brain (FIGURE 8.28). (A pathologist at Princeton Hospital, where Einstein died, stole Einstein’s brain and later gave it to Witelson to study. Although the pathologist lost his job for this famous theft, he reports not regretting his actions [Roberts, 2006].) Einstein’s brain is rather unremarkable in overall size and weight, but Witelson has found some remarkable features that support a relationship between brain size and intelligence. The parietal lobe of Einstein’s brain, the portion used in visual thinking and spatial reasoning, is 15 percent larger than average.

**SAVANTS** How would you like to be able to read a page of this textbook in 8 to 10 seconds? Perhaps less useful but even more impressive would be the ability to recite all the zip codes and area codes in the United States by the region to which they are assigned, or to name hundreds of classical-music pieces just by hearing only a few notes of each? These amazing abilities are just a few of the extraordinary memory feats demonstrated by Kim Peek (Treffert & Christensen, 2006). Mr. Peek, a savant who died in 2008, was the inspiration for the character played by Dustin Hoffman in the movie *Rain Man* (1988). He memorized the contents of over 9,000 books, but he could not button his own clothes or manage any of the usual chores of daily living, such as making change. He scored an 87 on an intelligence test, but this number did not adequately describe his intelligence. Mr. Peek was born, in 1951, with an enlarged head and many brain anomalies, including a missing corpus callosum, the thick band of nerves that connects the brain’s two halves. He also had abnormalities in several other parts of his brain, especially the left hemisphere.

We know very little about *savants*, people who have minimal intellectual capacities in most domains but at a very early age show an exceptional ability in some “intelligent” process, such as related to math, music, or art. Savants are very rare, and while the combination of prodigious memory and the inability to learn seemingly basic tasks is a great mystery, this combination should cause us to rethink the nature of intelligence. The British neurologist Oliver Sacks (1995) recounts the story of Stephen Wiltshire, an artistic savant who could reproduce highly accurate



**FIGURE 8.28 Extraordinary Brain**  
Sandra Witelson with Einstein’s brain in her lab at McMaster University.



**FIGURE 8.29** Stephen Wiltshire Despite his autism, Stephen Wiltshire had published a book of his remarkably accurate, memory-based drawings by the time he was a young teenager. This example is Wiltshire's *Big Ben on a Rainy Day*.

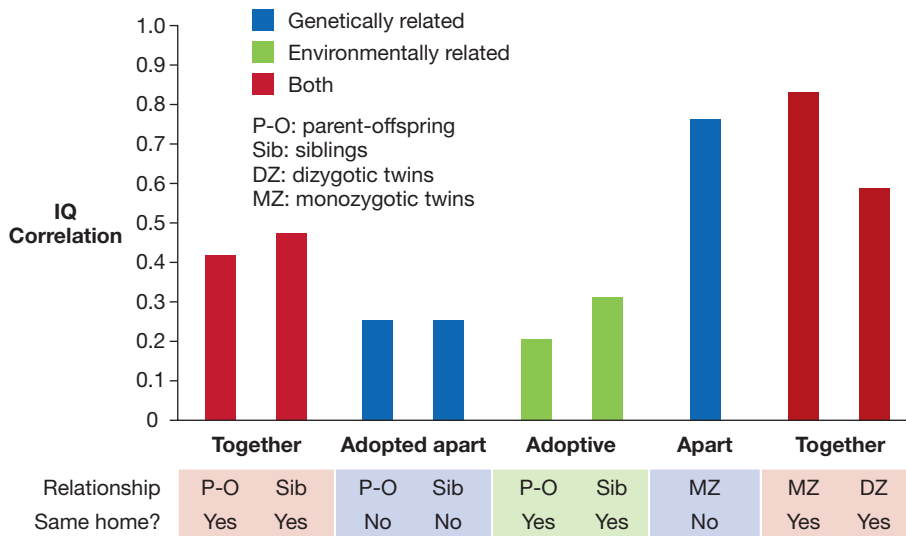
drawings of buildings and of places years after having only glanced at the original pictures. However, Wiltshire has autism, a developmental disorder (discussed further in Chapter 14, “Psychological Disorders”), and only with the utmost effort did he acquire language sufficient for even the simplest verbal communication (**FIGURE 8.29**).

## Genes and Environment Influence Intelligence

One of the most contentious battles in psychological science has been over genes' role in determining intelligence. This battle exemplifies the nature/nurture debate in action: To what extent are individual differences in intelligence due to genes, and to what extent are they due to environment? As emphasized throughout this book, nature and nurture are important for all development, and they are especially so for the development of intelligence. Consider an example that combines a key point from Chapter 3 (that gene expression is strongly influenced by external factors) with a key point from the section just above (that head circumference is correlated with general intelligence). The size of parents' and their children's heads is correlated, yet childhood nutritional status is closely related to head size, such that malnourished children have smaller than expected head circumference and brain growth. Moreover, all the findings linking intelligence to the size and structure of the brain are correlational, so perhaps more education and frequent exposure to intellectual challenges lead to selective increases in some brain regions. (As discussed in Chapter 3, for example, driving a taxi in London seems to enlarge the hippocampus, the portion of the brain linked to spatial cognition.) Perhaps more intelligent individuals seek out mental challenges, which in turn increase their frontal lobes' volume (Gray & Thompson, 2004).

Consider an even more familiar example of the way nature and nurture are inextricably entwined in the development of intelligence: The size of someone's vocabulary is considerably heritable, but every word in it is learned in an environment (Neisser et al., 1996). Moreover, which words are learned is affected by the culture in which an individual is raised and the amount of schooling he or she receives. Thus even if intelligence has a genetic component, the way intelligence becomes expressed is affected by various situational circumstances. Instead of seeking to demonstrate whether nature or nurture is the more important factor, psychological scientists try to identify how each of these crucial factors contributes to intelligence.

**BEHAVIOURAL GENETICS** As discussed in Chapter 3, behavioural geneticists study the genetic basis of behaviours and traits like intelligence. They use twin and adoption studies to estimate the extent to which particular traits are heritable, that is, the portion of particular traits' variance that can be attributed to genes. Numerous behavioural genetics studies have made clear that genes help determine intelligence—but the extent to which genes do so is difficult to determine (**FIGURE 8.30**). For example, studies show that twins raised apart are highly similar in intelligence, and this finding seems to support the importance of genetics in the development of intelligence, but that hasty conclusion fails to consider the way people interact with and alter their environments. Even when raised apart, twins who have inherited an advantage might receive some *social multiplier*, an environmental factor or an entire environment, that increases what might have started as a small advantage (Flynn, 2007). If the twins have inherited a higher than average verbal ability, for example, adults who notice this ability might read to them more often and give them more books. The “intelligence gene” has eluded researchers, probably because thousands of genes contribute to intelligence and each has only a small effect (Plomin & Spinath, 2004).

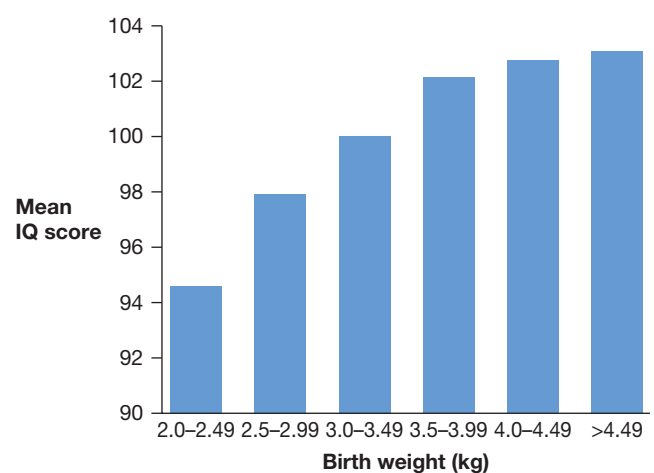


**FIGURE 8.30 Genes and Intelligence** Shown are average IQ correlations for family, adoption, and twin study designs. Siblings raised together show more similarity than siblings raised apart. Parent and child are more similar when the parent raises the child than when the child is raised by someone else. The highest correlations are found among monozygotic twins, whether they are raised in the same household or not. Overall, the greater the degree of genetic relation, the greater the correlation in intelligence.

**ENVIRONMENTAL FACTORS** It is well established that the environments people are raised in profoundly affect those people’s intelligence (Neisser et al., 1996). As mentioned above, poor nutrition can affect brain development and lower intelligence. Other environmental influences on human intelligence include prenatal factors (e.g., the mother’s intake of substances, including toxins) and postnatal factors (e.g., family, social class, education, cultural beliefs about the value of intelligence, and the person’s intake of substances, including toxins). Each factor likely exerts an independent influence during development. For instance, breastfeeding during infancy has been shown to enhance cognitive development. Indeed, two large prospective studies—following more than 3,000 people from birth to age 18 or 27—found that breastfeeding for more than six months produced a 5–7 point difference in IQ, even after adjusting for all sorts of confounds, such as birth weight, mother’s education, social status, and maternal smoking (Mortensen, Michaelsen, Sanders, & Reinisch, 2002). In an experimental study led by Michael Kramer, of McGill University, more than 17,000 infants from 31 Belarusian maternity hospitals were randomly assigned to either a control group or a group that received an intervention. Modelled on recommendations from the World Health Organization and UNICEF, this intervention encouraged prolonged and exclusive breastfeeding. After 6.5 years, the children in the group receiving the intervention had higher means on standardized measures of intelligence (Kramer et al., 2008). There is also an apparent relation between birth weight and intelligence later in life. Even children of normal birth weight (so excluding children who are tiny because they are very premature) show a small positive association between birth weight and intelligence (FIGURE 8.31), although this effect is smaller than that of social class (Shenkin, Starr, & Deary, 2004).

As noted in Chapter 3, rats raised in enriched environments show more synaptic connections and larger neurons than those raised in impoverished environments. Research from numerous laboratories has shown that enriched environments enhance learning and memory as well (Lambert, Fernandez, & Frick, 2005; Tang, Wang, Feng, Kyin, & Tsien, 2001). The implication is that environment influences how genes involved in brain development are expressed. In one

**FIGURE 8.31 Birth Weight and Intelligence** Among children of normal birth weight, mean IQ scores increase with weight.



study, genetically identical mice were split into groups, which were then exposed to different levels of an enriched environment—given toys, tunnels, and the like. These researchers found that enrichment was associated with the activation of genes involved in a number of brain functions, including forming new synapses (Rampon et al., 2000). These results present clear evidence that our environments can affect properties associated with intelligence by influencing the expression of our genes. Research has shown that humans as well as mice gain clear advantages from living in stimulating environments and that these environmental effects can be seen in the brain.

The intellectual opportunities a child receives also affect intelligence. The American psychologist Stephen Ceci (1999) notes that schooling, for instance, makes an important contribution to intelligence. The longer children remain in school, the higher their IQs will be. Students who start school early because of where their birth dates fall on the calendar have higher test scores than their same-age peers who start school a year later. Schooling not only builds knowledge but also teaches critical thinking skills such as being able to think abstractly and learn strategies for solving problems (Neisser et al., 1996).

Taken together, the evidence is considerable that environmental factors contribute to intelligence. For example, IQ scores have risen dramatically during the last century of intelligence testing; this rise has been called the *Flynn effect* after James R. Flynn, the researcher at University of Otago, New Zealand, who first described it (Flynn, 1981, 1987). (The various intelligence tests have been restandardized on numerous occasions over time so that the mean IQ score remains 100.) Since genes cannot have changed much during this period, the increase must be due to environmental factors. One possible explanation for the increase in IQ scores across generations is that, since every generation needs more education than the preceding one, and since work and leisure activities require more complex cognitive processing than in earlier years, cognitive abilities escalate within the span of one generation (Flynn, 2007). Other explanations include better nutrition, better health care, the refinement of education methods, longer school years, and smaller families with more intensive parenting, as well as exposure to technology such as computers.

## Group Differences in Intelligence Have Multiple Determinants

### Real World PSYCHOLOGY

**GENDER** Which is the smarter sex—males or females? A great deal of research literature has addressed this commonly asked question. It might seem that the simplest way to answer this question is to determine whether females or males have the higher average IQ score, but this solution does not work because most of the commonly used intelligence tests were written in ways that would avoid creating an overall sex difference in IQ (Brody, 1992). The American psychologist Arthur Jensen (1998) weighed in on the question of sex differences in intelligence, analyzing tests that “load heavily on g.” In his study, Jensen used only tests that had not deliberately eliminated sex differences, thus making it more likely that he would find evidence for sex differences in intelligence, if they existed. Based on this analysis, Jensen concluded, “No evidence was found for sex differences in the mean level of g or in the variability of g. . . . Males, on average, excel on some factors; females on others” (pp. 531–32). There are differences between females and males, on average, on some measures that presumably reflect intelligence. Females get better grades in school and tend to have the advantage on measures of writing and of language usage; by contrast, males tend to get higher scores on some

standardized tests of math aptitude and of visuospatial processing (Halpern et al., 2007). Therefore, neither sex is “smarter.”

Cross-national data from 18 countries show consistently, however, that females' estimates of their own intelligence tend to be lower than males' estimates of their own intelligence (Furnham, Wytykowska, & Petrides, 2005). In a commentary about these findings, one researcher concluded that females receive modesty training, which emphasizes humility for girls and thus leads them to underestimate their intelligence (Beloff, cited in Furnham et al., 2005). Even if this explanation is true, we still do not know if the females' lower self-estimates reflect genuine beliefs about their intelligence. One reason to think so is that females and males tend to attribute higher IQs to their fathers than to their mothers (Furnham et al., 2005). Modesty training most likely would not affect women's estimates of their parents' intelligence, although it is possible that females generalize their modesty to other females.

**RACE** The most controversial aspect of intelligence testing over the last century has been the idea that genetics can explain overall differences in intelligence scores between racial groups. In a 1969 paper, Arthur Jensen created a firestorm of controversy by asserting that African Americans are, on average, less intelligent than European Americans. Multiple studies over the past 30 years have found that, while many African Americans have higher intelligence scores than most white Americans, whites score about 10 to 15 points higher on average than African Americans on most measures of intelligence. Similar patterns emerge when First Nations Canadians or indigenous Australians are compared to their corresponding Caucasian majorities. At issue is what causes the group differences, not whether the differences exist. Given the importance of intelligence to educational and career attainment, claims that some groups are superior to others require close scrutiny, and it is important to discuss controversial and sensitive topics with an eye to being as fair to all sides as possible.

What is the meaning of such differences, and why can it be so uncomfortable to talk about them? A finding that two or more groups differ with respect to some variable, such as scores on intelligence tests, does not mean the differences are inevitable or immutable. The first issue to be considered is whether “race” is a biologically meaningful concept. Many psychologists and anthropologists believe it is not. Indeed, a special issue of the flagship journal of the American Psychological Association, *American Psychologist* (January 2005), was devoted to the validity of race, and in it various authors noted that the vast majority of genes (perhaps as many as 99.9 percent) are identical among people. We differ in physical attributes such as hair colour and skin colour to varying degrees depending on our entire ancestry, which raises troublesome issues of classification. Is Tiger Woods, for example, black or Asian? He has ancestors from both groups. Most methods of classifying race depend on self-report, in which people group themselves into categories. The rise in interracial families is making it harder for some people to select only one category, and an increasing number of people are identifying themselves as biracial and multiracial. Some genetically based biological differences exist between people who identify themselves as black and those who identify themselves as white. But are differences in biological attributes such as skin colour related to the mental capacities that underlie intelligence?

Whether the effects of race are real or not, it is not scientifically appropriate to conclude that genes cause differences among groups, if there are any environmental differences among those groups. The American biologist Richard Lewontin

(1976) has provided an excellent example of the difficulties of contrasting groups of people who differ in their circumstances. Consider seeds planted in two separate containers. In one container, the soil is rich, and the seeds receive regular watering, all the necessary nutrients, and abundant sunlight. In the other container, the soil is poor, and the seeds receive restricted water, few nutrients, and intermittent sunlight. Within each planter, differences between individual plants' growth can be attributed to the seeds' genetic differences. After all, the environment is identical, so only genes can explain the differences. But in addition, as groups, the plants in one container will differ from those in the other container because of their different environments. The enriched environment will help the seeds reach their potential, whereas the impoverished environment will stunt growth.

On average, First Nations Canadians have very different life circumstances than do white Canadians. On average, First Nations Canadians make less money and more likely live in poverty. On average, they have fewer years of education and lower-quality health care, and they more likely face prejudice and discrimination. Around the world, minority groups that are the targets of discrimination, such as the Maori in New Zealand, the burakumin in Japan, and the Dalits, or "untouchables," in India, have lower intelligence scores on average. The Nigerian anthropologist John Ogbu (1994) argues that poor treatment of minority-group members can make them pessimistic about their chances of success within their cultures, potentially making them less likely to believe that hard work will pay off for them; such attitudes may lower their motivational levels and therefore their performances. This explanation is plausible, but it is not a clear-cut basis—indeed, at this time there is no clear-cut basis—for understanding the differences in test scores between racial groups (Neisser et al., 1996).

Research over the past decade has provided an important reason why some racial groups may score lower on standardized tests of intelligence. **Stereotype threat** is the apprehension or fear that some people might experience if they believe that their performances on tests might confirm negative stereotypes about their racial group (Steele and Aronson, 1995). As noted by the psychologist Toni Schmader (2010), at the University of British Columbia, stereotype threat causes distraction and anxiety, interfering with performance by reducing the capacity of short-term memory and undermining confidence and motivation.

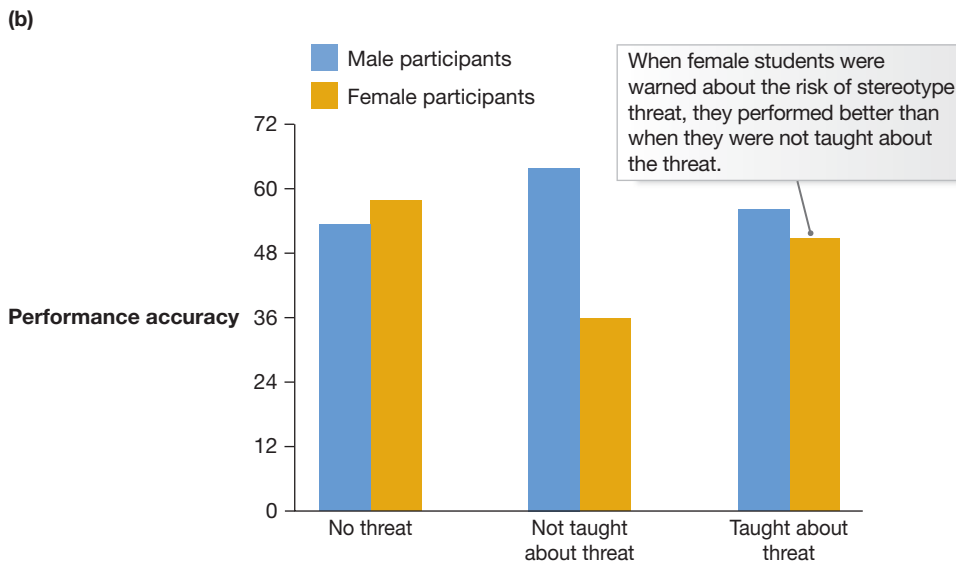
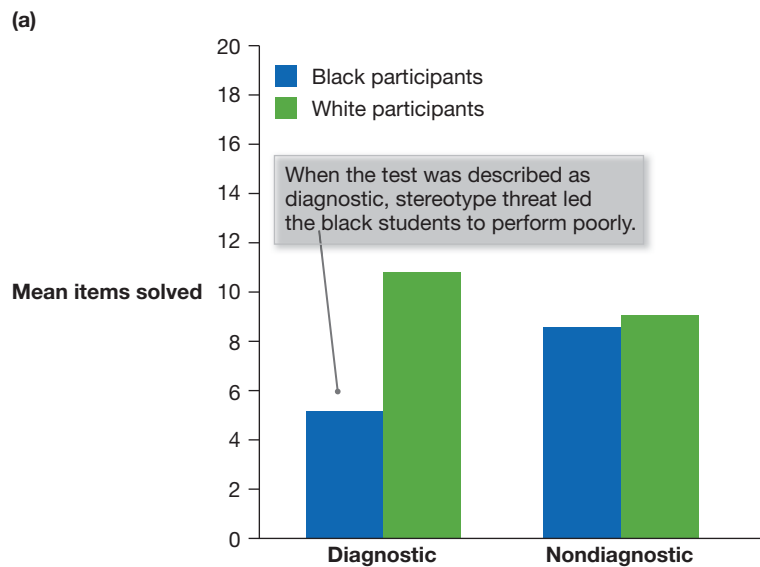
Stereotype threat applies to any group about which there is a negative stereotype, including women, who tend to perform less well on some standardized tests (such as those that involve math) than men. Women tend to do more poorly than men when taking an exam on which they believe men typically outscore women, but they often perform as well as men on the same test if they do not hold such a belief (Schmader, Johns, & Forbes, 2008; Spencer, Steele, & Quinn, 1999). In an especially intriguing example of stereotype threat, Asian American women did well on a math test when the "Asians are good at math" stereotype was primed by having them respond to questions about racial identity, but they did poorly when the "women are bad at math" stereotype was primed by having them respond to questions about gender (Shih, Pittinsky, & Ambady, 1999). In this same study, however, women from Vancouver showed a slightly different pattern. The stereotype that Asians perform at a superior level is less strong in Canada than in the United States. Thus the researchers predicted and found that although being primed as women reduced these women's test scores on math items, being primed as Asians did not lead to increased performance. These findings demonstrate the power of sociocultural stereotypes on individual performance.

One leading researcher on stereotype threat is Steven Spencer, at the University of Waterloo. Spencer and his colleague Gregory Walton, at Stanford University, per-

**stereotype threat** Apprehension about confirming negative stereotypes related to one's own group.



formed a meta-analysis on stereotype threat studies and reached two general conclusions. First, they examined 39 independent laboratory studies, which together included 3,180 participants from five countries (Canada, France, Germany, Sweden, and the United States). The participants came from a range of stereotyped groups (e.g., blacks, Hispanic Americans, Turkish Germans, women). The researchers found that stereotyped groups perform worse than nonstereotyped groups in evaluative conditions, but this effect is reversed when the threat is reduced, such as when an exam is presented as nonevaluative (Walton & Spencer, 2009). Second, in studies involving nearly 16,000 research participants, Walton and Spencer found that interventions to reduce stereotype threat effects are often successful. For instance, even simply informing people about the negative consequences of stereotype threat can inoculate them from the negative effects (Johns, Schmader, & Martens, 2005; **FIGURE 8.32**). In another study, encouraging African American students to write about important personal values appeared to protect them from stereotype threat, perhaps because it led them to focus on positive aspects of their lives rather than on stereotypes of their groups (Cohen, Garcia, Apfel, & Master, 2006). Other studies have found that bolstering peer relations and social connections can help prevent stereotype threat. Indeed, school environments that provide opportunities to



**FIGURE 8.32** Stereotype Threat

(a) Stereotype threat may lead black students to perform poorly on some standardized tests. (b) But stereotype threat can also be counteracted when people are warned about it.

develop social skills and create friendships are associated with better academic performance among Canadian aboriginal children (Baydala et al., 2009).

A recent study used fMRI to examine the neural mechanisms underlying stereotype threat. Krendl, Richeson, Kelley, and Heatherton (2008) recruited a group of women who believed it was important to do well in math. Half the women were assigned to a stereotype threat condition in which they were reminded of the stereotype that women perform poorly in math, and half the women served as a control group and were not given these reminders. The women who had been reminded about the negative stereotypes concerning women's abilities to do math solved fewer math problems correctly and responded more slowly. Most important, they had more activation in the brain regions involved in social and emotional processing, a result that suggests they were anxious about their performances and the anxiety led to poorer performances. By contrast, the women in the control group showed greater activation in neural networks associated with mathematical learning. These results confirm the idea that anxiety about confirming stereotypes interferes with performance.

## **SUMMING UP**

### **How Do We Understand Intelligence?**

Intelligence is the ability of humans to reason, solve problems, think quickly and efficiently, and adapt to environmental challenges. The psychometric approach reveals multiple components to intelligence but also a central dimension that has been called general intelligence, or *g*. Fluid intelligence is the type of intelligence we use when faced with novel problems that do not have solutions we can simply pull from memory; it is related to cognitive measures, such as working memory and speed of mental processing. By contrast, crystallized intelligence reflects knowledge we have already acquired, as in finding the area of a triangle after having been taught the formula. Multiple forms of intelligence have been identified, including emotional, although debate continues as to whether they reflect the same kind of intelligence captured in traditional definitions. Intelligence is measured through standardized psychometric tests, reaction times, inspection times, and responses to situations. Both genes and environment influence intelligence, and researchers seek to understand how environmental factors lead to differential gene expression in regard to intelligence. Data from twin and adoption studies are often used to garner evidence for the contributions of nature and nurture to intelligence. Group differences in intelligence cannot be attributed to genetic differences when those groups have experienced environmental differences. Group differences in intelligence, specifically by sex and race, can be altered somewhat by inducing or removing the threat posed by societal stereotypes about particular groups' intelligence. Members of groups stereotyped as being less intelligent may improve their scores when the stereotype is not activated or is removed. Considerable controversy exists over whether stereotype threat changes scores on intelligence and aptitude tests, but the possibility that it does creates concerns about test scores' validity.

## **MEASURING UP**

1. While discussing with his grandmother what he has been studying at university, Dave was impressed by how much she knows. When he showed her

his new cellphone, she quickly understood its complexities. His grandmother's general knowledge exemplifies her \_\_\_\_\_ intelligence, whereas her ability to figure out the cellphone exemplifies her \_\_\_\_\_ intelligence.

- a. verbal, spatial
- b. crystallized, fluid
- c. fluid, spatial
- d. g, multiple

2. If you wanted to reduce the effects of stereotype threat, you could \_\_\_\_\_.

- a. make the assessment as difficult as possible to create a threat for all test takers.
- b. include only information not taught in school.
- c. use members of groups with which no negative stereotypes are associated.
- d. tell test takers the upcoming test will not reflect group differences.

## CONCLUSION

Thought has allowed humans to all but eradicate dread diseases such as polio, create technologies that simplify our lives, travel to the moon and beyond. By thinking, humans can take in and use vast quantities of information. Our cognitive talents include reasoning, thinking critically, solving problems, and making important decisions, but our thought processes often draw on biases that compromise the quality of our conclusions. Using knowledge effectively, to solve problems and achieve goals, is not always easy, and even very smart people can act irrationally.

How do we make people more intelligent? Apparently, we are doing it already. By emphasizing the importance in early childhood of both nutrition and education, by building good schools that stimulate and challenge, and by developing new technologies, society makes possible considerable gains in intelligence. An important but as yet unfulfilled goal is ensuring that each person can benefit from these circumstances, irrespective of sex, race, ethnicity, or social group.

## CHAPTER SUMMARY

### How Does the Mind Represent Information?

- **Mental Images Are Analogical Representations:** Thoughts can take the form of visual images. The primary visual cortex is activated proportionately to the size of an image in the mind's eye; therefore, mental visual imagery involves the same underlying brain processes involved in seeing the external world. Symbolic knowledge affects the ways we use visual imagery.
- **Concepts Are Symbolic Representations:** Concepts are mental representations of subtypes of broad knowledge categories; the concept of *cat*, for example, is a subcategory of *animals*. Concepts may be formed by defining attributes, prototypes, or exemplars. Many categories have fuzzy boundaries; we have no simple way of telling a cat from a dog or a rat, for example, since conceptually they are similar (*four-legged, hairy animals*).
- **Schemas Organize Useful Information about Environments:** We develop schemas based on our real-life experiences. Scripts are schemas that allow us to form expectations about the sequence of events in a given context.

### How Do We Make Decisions and Solve Problems?

- **People Use Deductive and Inductive Reasoning:** Deductive reasoning proceeds from a general statement to specific applications. Syllogisms are formal structures of deduction. For example: If all psychology textbooks are fun to read and this is a psychology textbook, then this textbook will be fun to read. Inductive reasoning proceeds from specific instances to general conclusions. For example: If you read many psychology textbooks and find them interesting, you can infer that psychology books generally are interesting.
- **Decision Making Often Involves Heuristics:** Expected utility models assume people behave according to logical processes, such as always selecting the outcome that will yield the greatest reward. Descriptive models highlight reasoning shortcomings, specifically the use of mental shortcuts (i.e., heuristics) that sometimes lead to faulty decisions. We select information to confirm our conclusions, to avoid loss or regret or both, and to be consistent with a problem's framing.
- **Problem Solving Achieves Goals:** Problem solving involves reaching a goal, which usually is broken down into subgoals. Insights come suddenly, when we see elements of a problem in new ways. Restructuring aids solutions; mental sets and functional fixedness inhibit solutions.

### How Do We Understand Intelligence?

- **Intelligence Is Assessed with Psychometric Tests:** The Binet-Simon Intelligence Test was the first modern test of mental ability and led to the concept of IQ as a ratio of mental age and chronological age. This test was later normed to a distribution with a mean of 100 and standard deviation of 15; therefore, average ability is between 85 and 115. The question of the validity of intelligence tests persists, and one significant criticism is cultural bias. Other ways of assessing intelligence also have the potential for bias, as when interview questions are ambiguous.
- **General Intelligence Involves Multiple Components:** Charles Spearman concluded that a general intelligence component exists, known as *g*. Fluid intelligence is involved when people solve novel problems, whereas crystallized intelligence is accumulated knowledge retrieved from memory. Howard Gardner has proposed a theory of multiple intelligences that include linguistic, mathematical/logical, spatial, bodily-kinesthetic, intrapersonal, and interpersonal abilities. Robert Sternberg has proposed that there are three types of intelligence: analytical, creative, and practical. Emotional intelligence is the ability to understand emotions and use them appropriately.
- **Intelligence Is Associated with Cognitive Performance:** Speed of mental processing (e.g., reaction time, inspection time) is part of intelligence. The relationship of working memory to intelligence seems to involve attention. The size and activity of the brain's frontal lobes are related to qualities of intelligence, but since brain size is altered by experience, we cannot infer cause from this correlation.
- **Genes and Environment Influence Intelligence:** Behavioural genetics has revealed genes' substantial influence in setting the limits of the expression of intelligence. Environmental factors, including nutrition, parenting, schooling, and intellectual opportunities generally, seem to establish where IQ falls within the genetic limits.
- **Group Differences in Intelligence Have Multiple Determinants:** One of the most contentious areas in psychology concerns group differences in intelligence. Females and males score differently, on average, on different measures of intelligence, with some measures favouring males and others favouring females. Thus there is no overall sex difference in intelligence. Race differences in intelligence are confounded with a multitude of environmental differences, including income, discrimination, and health care. Additionally, many scientists question the idea of race as referring to anything more than a small number of human differences, such as skin colour.

## KEY TERMS

analogical representation, p. 344	deductive reasoning, p. 352	general intelligence ( <i>g</i> ), p. 372	mental age, p. 369	restructuring, p. 362
availability heuristic, p. 356	defining attribute model, p. 347	heuristics, p. 355	mental set, p. 362	stereotype threat, p. 382
cognition, p. 343	emotional intelligence (EQ), p. 373	inductive reasoning, p. 352	multiple intelligences, p. 372	symbolic representation, p. 344
concept, p. 347	exemplar model, p. 348	insight, p. 361	problem solving, p. 352	
crystallized intelligence, p. 372	fluid intelligence, p. 372	intelligence, p. 368	prototype model, p. 348	
decision making, p. 352	framing, p. 357	intelligence quotient (IQ), p. 369	reasoning, p. 352	
			representativeness heuristic, p. 357	

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.

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## ■ PRACTICE TEST

- Which of the following statements reflect incorrect assumptions in the *defining attribute model* of concepts? Select all that apply.
  - All attributes of a category are equally salient.
  - All members of a category fit equally well into that category.
  - An understanding of the category requires knowing a list of typical attributes of members of that category.
  - An understanding of the category requires knowing the most common example of a member of that category.
  - Membership within a category is on an all-or-none basis.
- Which of the following fruits will most likely be considered prototypical? Which will least likely be considered prototypical?
  - apple
  - pineapple
  - tomato
  - strawberry
- On the first day of the semester, students enter a new class. On each desk is a handout that lists a couple of thought-provoking questions with the instruction “Discuss in groups of 3 to 4 people.” It is time for class to begin, yet the teacher is not there. Based on our script for the first day of class, what will students most likely do?
  - Students will settle into their seats and perhaps glance over the handout. People who already know each other might converse, but they most likely will not discuss the questions.
  - Students will settle into their seats, quietly read the handout, and jot some ideas in their notebooks to prepare for the discussion they imagine will happen once class begins.
  - Students will settle into their seats, read the handout, organize themselves into groups, and begin discussing the questions.
- Label each of the following statements as an example of deductive reasoning or inductive reasoning.
  - “I love my new pen! From now on, I’m going to buy all my pens from this company.”
  - “I’m not sure I’m in the mood for a concert. It’s a ska band? Well, I do like ska. I’m sure I’ll like the band.”
  - “She must be at least 18 years old, since she’s in the club and the club only admits people who are over 18.”
  - “This restaurant is horrible. There’s not a healthy item on this entire menu. Actually, we probably won’t be able to find a decent meal in this entire town.”
  - “Yeah, I took a class from her last semester. It was pretty brutal. I bet all of her classes are tough.”
- Label each of the following scenarios as an example of affective forecasting, the availability heuristic, a framing effect, or the representativeness heuristic.
  - Two candidates are running for office. One claims, “My administration will promote international trade and commerce.” The other claims, “My opponent wants to send Canadian jobs—your jobs—overseas.”
  - Two friends come up with a hypothesis that married couples in their town seem much more likely to get divorced than couples in Canada in general. Their hypothesis seems bolstered when they quickly name five or six couples they know who got divorced over the past year.
  - Jason, a sophomore at a university in Saskatchewan, is tan and has blonde, shaggy hair. He spends a lot of time hanging out at the beach. When people meet him, they typically assume he is from British Columbia, although few people from B.C. attend university in Saskatchewan.
- \_\_\_\_\_ is an indicator of current levels of skill or knowledge, whereas \_\_\_\_\_ is an indicator of future potential.
  - achievement, aptitude
  - achievement, intelligence
  - aptitude, achievement
  - aptitude, intelligence
- Casey is very empathic. It is as if he can read the minds of the people around him, knowing instantly if someone is uncomfortable with a topic of conversation, interested in garnering someone’s affections, stressed out, and so on. We would expect Casey to score well on which indicators of intelligence? Check all that apply.
  - creative intelligence
  - EQ
  - fluid intelligence
  - g
  - interpersonal intelligence
  - IQ
- Which one of the following comments most accurately reflects the facts about the roles of nature and of nurture in intelligence?
  - “There’s overwhelming evidence that genes are the most important predictor of intelligence.”
  - “Give any child a stimulating environment, early schooling, and good health care, and he or she can evidence genius.”
  - “About 50 percent of intelligence is a function of what you’re born with, and 50 percent is a function of the environment in which you’re raised.”
  - “Group differences in intelligence cannot be attributed to genetic differences if there are environmental differences between the groups.”

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## ■ PSYCHOLOGY AND SOCIETY

- Write a script for a daily task such as ordering lunch at a restaurant or getting onto an elevator. Then carry out the task, but violate the culturally expected norms in some way (make sure the violation is safe and legal). For example, invite the server at the restaurant to sit down with you; stand in the elevator facing the rear wall or sit on the elevator’s floor. Write an essay that describes the cultural script for the task you engaged in, explains how you violated that script, and analyzes the reactions of yourself and others to this violation.

How did it feel to go against the grain? How did other people respond to you, whether explicitly or through their body language?
- Imagine you see the following post on a blog: “Let’s face it, whites simply aren’t as good at math as Asians, and girls simply aren’t as good at math as boys. End of story.” Compose a comment to post on the blog, using ideas from this chapter to address the author’s claims.





# Motivation and Emotion

IN HIS EARLY THIRTIES, ELLIOT BEGAN SUFFERING from severe headaches. He was happily married, a good father, and doing well professionally. His headaches increased until he could no longer concentrate, so he went to see his doctor. Sadly, as it turned out, a tumour the size of a small orange was growing behind Elliot's eyes (FIGURE 9.1). The tumour grew, forcing his frontal lobes upward into the top of his skull. When a group of skilled surgeons removed the noncancerous tumour, they could not avoid removing some of the surrounding frontal lobe tissue. At first, the surgery appeared to be a great success—Elliot's physical recovery was quick, and he continued to be an intelligent man with a superb memory. But Elliot changed in a way that baffled his friends and family: He no longer experienced emotion.

The Portuguese neurologist Antonio Damasio was asked to examine Elliot to find out whether his emotional problems were caused by the surgery. Damasio noted that Elliot displayed few emotional responses: "I never saw a tinge of emotion in my many hours of conversation

## How Does Motivation Activate, Direct, and Sustain Behaviour?

- Multiple Factors Motivate Behaviour
- Some Behaviours Are Motivated for Their Own Sake
- Critical Thinking Skill: Recognizing When Psychological Reactance May Be Influencing Your Thinking
- People Set Goals to Achieve
- People Have a Need to Belong

## What Determines How We Eat?

- Time and Taste Play Roles

- Culture Determines What We Eat
- Multiple Neural Processes Control Eating

## What Factors Motivate Sexual Behaviour?

- Biological Factors Influence Sexual Behaviour
- Cultural Scripts and Cultural Rules Shape Sexual Interactions
- Mating Strategies Differ between the Sexes
- People Differ in Sexual Orientation

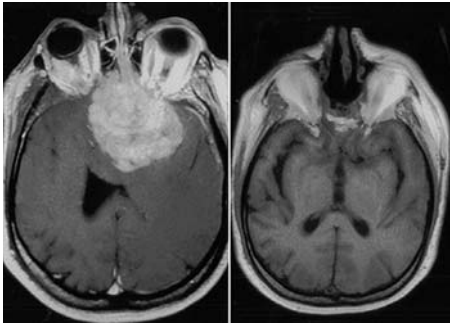
## How Are Emotions Adaptive?

- Facial Expressions Communicate Emotion

- Emotions Serve Cognitive Functions
- Critical Thinking Skill: Recognizing and Correcting for Belief Persistence in Your Own Thinking and in That of Others
- Emotions Strengthen Interpersonal Relations

## How Do People Experience Emotions?

- Emotions Have a Subjective Component
- Emotions Have a Physiological Component
- Emotions Have a Cognitive Component
- People Regulate Their Moods



**FIGURE 9.1 Orbitofrontal Tumour**

Elliot suffered from a brain tumour in the frontal lobe, behind his eye. The brain scan on the left shows a similarly placed tumour (the light-grey mass is the tumour). On the right is a follow-up brain scan, taken two years after the tumour was removed.

with him: no sadness, no impatience, no frustration with my incessant and repetitious questioning” (Damasio, 1994, p. 45). Damasio’s research team showed Elliot a series of disturbing pictures, such as severely injured bodies, and observed no emotional reaction from him. Elliot was not oblivious to his loss of emotion. He knew the pictures were disturbing and believed that before the surgery he would have had an emotional response, but now he had none.

On the surface, Elliot seemed a reasonable, intelligent, charming man—and yet his life fell apart. The absence of emotions also sabotaged Elliot’s ability to make rational decisions. He lost his job; entered a doomed business venture with a sleazy character against his family’s advice and lost all his savings; divorced, remarried, and then quickly divorced again; and so on. He was incapable of making even trivial decisions, and he failed to learn from his mistakes. Once he was a caring and compassionate man; now, he was detached from his problems and reacted to them as if they were happening to someone he did not care that much about. Elliot’s brain surgery left his intellect intact, but it robbed him of his ability to function as a member of society.

Elliot apparently suffered impairments in motivation and emotion: He just did not care. Imagine living without feelings or aspirations to make something of yourself. What sort of life would that be? Emotions are a primary source of motivation, as we seek objects and activities that make us feel good and avoid doing things that make us feel bad. Together, motivation and emotion make things happen (both words are from the Latin *movere*, “to move”).

Emotions permeate human life, as we fall in love, achieve success, feel inspired to work out at the gym, and so on. They also underlie the painful episodes most of us try to avoid—and, when they happen, try to forget. As Chapter 8 emphasizes, everyday cognition is far from cold and rational. Our decisions and judgments are affected by how we feel. Psychological science increasingly focuses on understanding how emotion influences our daily lives and how it motivates certain types of behaviour. Psychological researchers are studying motivation and emotion across all levels of analysis, and the biological revolution in psychological science is producing exciting new findings about how neural and cognitive processes are involved. Case studies of people such as Elliot provide ample evidence about how various brain regions produce and regulate emotional responses as well as how emotions affect daily lives.

## How Does Motivation Activate, Direct, and Sustain Behaviour?

### LEARNING OBJECTIVES

Describe Maslow’s need hierarchy and give an example of a motivated behaviour for each level of the hierarchy.

Explain how intrinsic motivation and extrinsic motivation affect behaviour.

**Motivation** is the area of psychological science concerned with the factors that energize, or stimulate, behaviour. It focuses on what produces behaviour—for instance, what makes you get up in the morning and go to class. Theories of motivation seek to answer questions such as *Where do needs come from? How are goals established? How are motives converted into action?* More concrete questions are *Why do you choose to eat what you do? Does being involved in a sexual relationship interest you, or do you not think about it very much? What grade do you want in this course?* Most of the general theories of motivation emphasize four essential qualities of motivational states. First, motivational states are *energizing*. They activate or arouse behaviours—they cause animals to do something. For instance, the desire for fitness might motivate you to get up and go for a run on a cold morning. Second, motivational states are *directive*—they guide behaviours toward satisfying specific goals or specific needs.

**motivation** Factors that energize, direct, or sustain behaviour.



Hunger motivates eating; thirst motivates drinking; pride (or fear, or many other feelings) motivates studying hard for exams. Third, motivational states help people *persist* in their behaviour until goals are achieved or needs are satisfied. Hunger gnaws at you until you find something to eat; a desire to win drives you to practice foul shots until you succeed. Fourth, most theories agree that motives differ in *strength*, depending on internal and external factors. The next section looks at a wider range of forces that motivate people's behaviours.

## Multiple Factors Motivate Behaviour

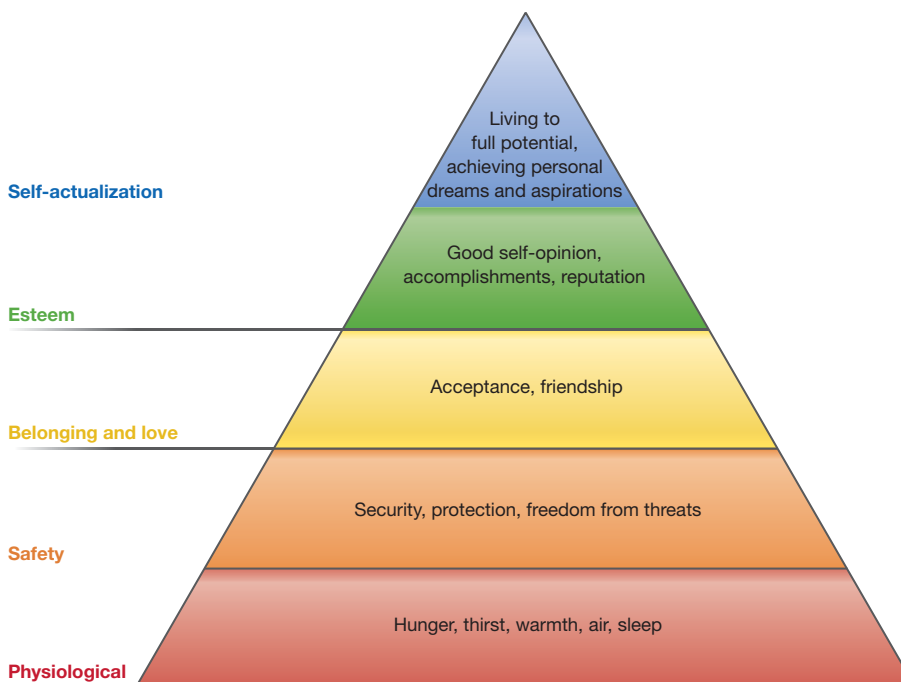
What do we really need to do to stay alive? For one, we have to satisfy our biological needs. We all *need* air and food to survive. But satisfying our basic biological needs is not enough to live a fully satisfying life. We also have social needs, including the need for achievement and the need to be with others. People *need* other people, although our preferences to be solitary or social vary. A **need**, then, is a state of deficiency, which can be either biological (e.g., water) or social (e.g., to be with other people). Either way, needs lead to goal-directed behaviours. Failure to satisfy a particular need leads to psychosocial or physical impairment.

In the 1940s, the American psychologist Abraham Maslow proposed an influential “need theory” of motivation. Maslow believed that humans are driven by many needs, which he arranged into a **need hierarchy** (FIGURE 9.2). He placed survival needs (such as hunger and thirst) at the base of the hierarchy, believing they had to be satisfied first, and personal growth needs at the pinnacle. Maslow believed that to experience personal growth, people must fulfill their biological needs, feel safe and secure, feel loved, and have a good opinion of themselves. Maslow's theory is an example of *humanistic psychology*, viewing people as striving toward personal fulfillment. Humanists focus on the *person* in motivation—it is you who desires food, not your stomach. From the humanist perspective, human beings are unique among animals because we continually try to improve ourselves. A state of **self-actualization** occurs when someone achieves his or her personal dreams and aspirations. A self-actualized person is living up to his or her potential and therefore is truly happy. Maslow writes,

**need** State of biological or social deficiency.

**need hierarchy** Maslow's arrangement of needs, in which basic survival needs must be met before people can satisfy higher needs.

**self-actualization** A state that is achieved when one's personal dreams and aspirations have been attained.

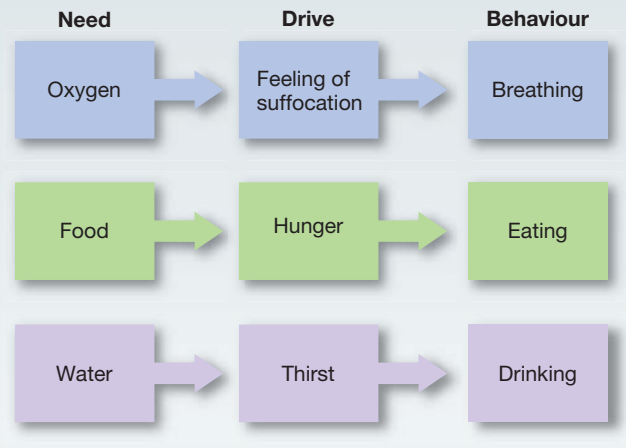


**FIGURE 9.2 Need Hierarchy** Maslow's hierarchy of needs indicates that basic needs, such as for food and water, are satisfied before higher needs, such as for achievement.

**FIGURE 9.3 Try for Yourself: Needs and Drives**

Hold your breath as long as you can.

**Results:** Eventually you will breathe, satisfying your need for oxygen. Before that, after a minute or so of not breathing, you probably will start feeling a strong sense of urgency, even anxiety. This state of arousal is a drive. Needs create drives that motivate specific behaviours, as diagrammed below with other examples.



**arousal** Physiological activation, such as increased brain activity, autonomic responses, sweating, or muscle tension.

**drive** Psychological state that motivates an organism to satisfy its needs.

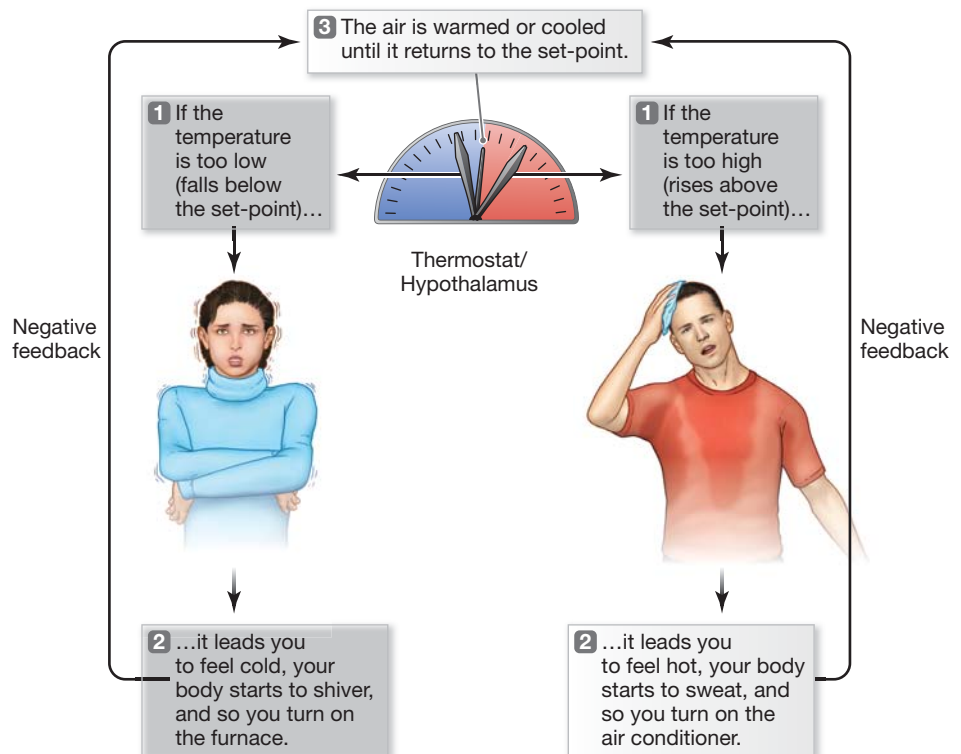
**homeostasis** The tendency for bodily functions to maintain equilibrium.

“A musician must make music, an artist must paint, a poet must write, if he is ultimately to be at peace with himself. What a man *can* be, he *must* be” (Maslow, 1968, p. 46).

Maslow’s need hierarchy has long been embraced in education and business, but it generally lacks empirical support. Independent of whether self-actualization is a requirement for being happy, the ranking of needs is not as simple as Maslow suggests. For instance, some people starve themselves in hunger strikes to demonstrate the importance of their personal beliefs, whereas others who have satisfied physiological and security needs prefer to be left alone. Maslow’s hierarchy, therefore, is more useful as an indicator of what might be true about people’s behaviours than of what actually is true about them.

**DRIVES AND INCENTIVES** What motivates us to satisfy our needs? Needs create *arousal*, which motivates behaviour. **Arousal** is a generic term used to describe physiological activation (such as increased brain activity) or increased autonomic responses (such as quickened heart rate, increased sweating, or muscle tension). **Drives** are psychological states that encourage behaviours that satisfy needs. To experience one of your own needs and a drive in response to it, see **FIGURE 9.3**.

For biological states such as thirst or hunger, basic drives help animals maintain steadiness, or *equilibrium*. In the 1920s, the American physiologist Walter B. Cannon coined the term **homeostasis** to describe the tendency for bodily functions to maintain equilibrium. A good analogy is a home heating and cooling system controlled by a thermostat set to some optimal level, or *set-point*, a hypothetical state that indicates homeostasis. If the actual temperature is different from the set-point, the furnace or air conditioner operates to adjust the temperature (**FIGURE 9.4**).



**FIGURE 9.4 A Negative Feedback Model of Homeostasis**

Similarly, the human body regulates a set-point of around 37° C. When people are too warm or too cold, brain mechanisms, particularly the hypothalamus, initiate responses such as sweating (to cool the body) or shivering (to warm the body). At the same time, behaviours such as taking off or putting on clothes are motivated. Negative feedback models such as these are useful for describing various basic biological processes, among them eating, fluid regulation, and sleep.

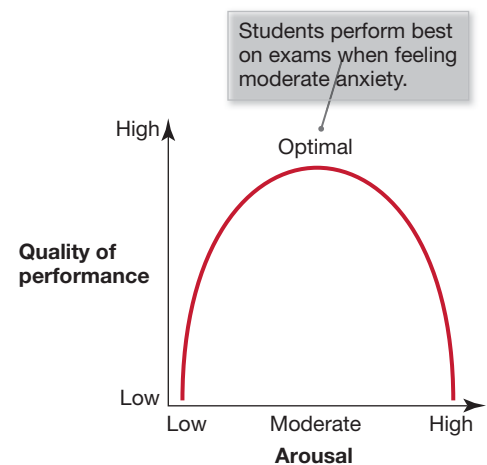
Building on Cannon's work, Clark Hull proposed that when an animal is deprived of some need (such as water, sleep, or sex), a drive increases in proportion to the amount of deprivation. The hungrier you are, the more driven you are to find food. The drive state creates arousal, which encourages you to do something to reduce the drive, such as having a late-night snack. Although the initial behaviours the animal engages in are arbitrary, any behaviour that satisfies a need is reinforced and therefore is more likely to reoccur. Over time, if a behaviour consistently reduces a drive, it becomes a *habit*; the likelihood that a behaviour will occur is due to drive and habit. For example, you might find that watching television makes you forget your troubles—an outcome that reinforces further television viewing. Over time, you might develop the habit of watching television, especially when you are stressed.

In some situations, people choose to engage in actions that do not satisfy biological needs. Why, for instance, does a person stay up all night studying for an exam? Why does a person have a second piece of pumpkin pie at Thanksgiving dinner, even if that person was not hungry when eating the first piece? Drive states push us to reduce arousal, but we are also pulled toward certain things in our environments. **Incentives** are external objects or external goals, rather than internal drives, that motivate behaviours. Getting a good grade on the exam is an incentive for studying hard; the comforting, sweet taste of the pumpkin pie is an incentive for eating two pieces; having money to buy a car or help pay your tuition is an incentive for working during summer vacation; and so on.

Forces outside our conscious awareness can provide incentives for us to behave in particular ways. Smokers sometimes develop cravings for cigarettes, for example, after watching people smoke onscreen. In some cases, the viewers have not even consciously registered that the onscreen figures are smoking. As discussed in Chapter 4, subliminal cues influence behaviour, even though they appear so quickly that people cannot report what they saw. Researchers from France and England found that study participants worked harder for a larger financial reward—in this case, a subliminally presented pound coin versus a real penny coin—even when they were unable to report how much money was at stake (Pessiglione et al., 2007). Likewise, psychologists at Utrecht University, in the Netherlands, found that pairing a positive word, such as *good*, with a subliminal cue, such as the word *exert*, led people to squeeze a lever harder than when the cue was presented without the positive word (Aarts, Custers, & Marien, 2008). Researchers at Yale University found that preschool children who were exposed to food advertising ate 45 percent more snack foods than did preschool children who did not see the advertising (Harris, Bargh, & Brownell, 2009).

**AROUSAL AND PERFORMANCE** If drives create arousal and motivate behaviour, it seems to follow that more arousal will lead to more motivation and thus to better performance. However, the **Yerkes-Dodson law** (a psychological principle named after the two researchers who formulated it in 1908) dictates that performance increases with arousal up to an optimal point and then decreases with increasing arousal. A graph of this relationship is shaped like an *inverted U* (FIGURE 9.5). The Yerkes-Dodson law predicts, for instance, that students perform best on exams

**incentives** External stimuli (as opposed to internal drives) that motivate behaviours.



**FIGURE 9.5 The Yerkes-Dodson Law** According to this law, performance increases with arousal until an optimal point, after which arousal interferes with performance.

when feeling moderate anxiety. Too little anxiety can make them inattentive or unmotivated; too much anxiety can interfere with their thinking ability. Likewise, athletes have to “get up” for the game, but they can fall apart under too much stress.

All of us, athletes included, function better with some arousal. That we prefer to be somewhat aroused goes against the idea that motivation always lowers tension and arousal. Instead, we are motivated to seek an *optimal level of arousal*, the level of arousal we most prefer. Too little, and we are bored; too much, and we are overwhelmed. Arousal theories help explain why we choose exciting activities—those that arouse us and absorb our attention. Thus we might dance, listen to music, read exciting books, watch horror or adventure movies, and so on, but (as discussed further in Chapter 13) we differ in how stimulating or exciting or frightening we like these and other forms of entertainment.

**PLEASURE** Sigmund Freud proposed that drives are satisfied according to the *pleasure principle*, which drives people to seek pleasure and avoid pain. This idea is central to many theories of motivation. Originating with the ancient Greeks, the concept of *hedonism* refers to humans’ desire for pleasantness. We do things that feel good; and if something feels good, we do it again. Chewing sugarless gum is a good example of hedonism, in that many people chew gum for its sweetness even though it contains no actual nutrients.

The idea that pleasure motivates behaviour helps us understand a criticism of biological drive theories (such as Clark Hull’s)—that animals engage in behaviours that do not necessarily satisfy biological needs. These behaviours, such as eating dessert when you are not hungry, commonly occur because they are pleasurable. From an evolutionary perspective, behaviours associated with pleasure often promote the animals’ survival and reproduction, whereas behaviours associated with pain interfere with survival and reproduction. A good example of this principle is the finding that animals prefer to eat sweets. Infants given sweet solutions seem to find them pleasurable, as revealed by their facial expressions (Steiner, 1977; **FIGURE 9.6**). Sweetness usually indicates that food is safe to eat. By contrast, most poisons and toxins taste bitter, so it is not surprising that animals avoid bitter tastes.



**FIGURE 9.6 Early Motivation** Even newborns prefer sweet tastes to bitter ones.

## Some Behaviours Are Motivated for Their Own Sake

The discussion so far has centred on the pleasure associated with reducing drive and sustaining biological needs. However, many of the activities people find most satisfying, such as reading a good novel, seem to fulfill no obvious purpose other than enjoyment. **Extrinsic motivation** emphasizes the external goals an activity is directed toward, such as reducing drive or obtaining a reward—for example, working to earn a paycheck. **Intrinsic motivation** refers to the value or pleasure that is associated with an activity that has no apparent external goal—for example, playing, solving crossword puzzles, or listening to music. Intrinsically motivated behaviours are performed for their own sake. They simply are enjoyable.

Some intrinsically motivated activities may satisfy our natural curiosity and creativity. After playing with a new toy for a long time, children start to lose interest and will seek out something new. Playful exploration is characteristic of all mammals and especially primates. As the University of Wisconsin–Madison psychologist Harry Harlow and his colleagues have shown, for example, monkeys have a strong exploratory drive; they will work hard, without an external reward, to solve relatively complex puzzles (Harlow, Harlow, & Meyer, 1950). One function of play is that it helps us learn about the objects in an environment. This outcome clearly has survival value, since knowing how things work allows us to use those objects for more serious tasks.

Similarly, many of us are driven toward creative pursuits: Whether we are visiting an art museum or creating artwork ourselves, we may do so simply because we enjoy activities that enable us to express our creativity. *Creativity* is the tendency to generate ideas or alternatives that may be useful in solving problems, communicating, and entertaining ourselves and others (Franken, 1988). Although many creative pursuits are not adaptive solutions, creativity is an important factor in solving adaptive problems.

In his presidential address at the 2007 Canadian Psychological Association Annual Convention, in Ottawa, the psychologist Robert Vallerand (2008), of the Université du Québec à Montréal, discussed behaviours that satisfy needs for autonomy, competence, and relatedness. If these activities are consistent with how people see themselves, Vallerand argued, they may bring about not only enjoyment but also true passion. These passionate activities then shape personal identity. For example, those who have a passion for hockey do not just play the game—they are “hockey players.”

**REWARDING INTRINSIC MOTIVES** As discussed in Chapter 6, a basic principle of learning theory is that rewarded behaviours increase in frequency. You might expect that rewarding intrinsically motivated behaviours would reinforce them. Surprisingly, consistent evidence suggests that extrinsic rewards can undermine intrinsic motivation. In a classic study, Mark Lepper and his colleagues allowed children to draw with coloured marking pens—an activity most children find intrinsically motivating (Lepper, Greene, & Nisbett, 1973). One group of children was extrinsically motivated to draw by being led to expect a “good player award.” Another group of children was rewarded unexpectedly following the task. A third group was neither rewarded nor led to expect a reward. During a subsequent free-play period, children who were expecting an extrinsic reward spent much less time playing with the pens than did the children who were never rewarded or the children who received an unexpected reward. The first group of children responded as though it was their job to draw with the coloured pens: Why would they play with them for free when they were used to being paid?

**extrinsic motivation** Motivation to perform an activity because of the external goals toward which that activity is directed.

**intrinsic motivation** Motivation to perform an activity because of the value or pleasure associated with that activity, rather than for an apparent external goal or purpose.



**FIGURE 9.7 Think Critically: Reverse Psychology** Which of these promotional offers conveys more urgency?

## Recognizing When Psychological Reactance May Be Influencing Your Thinking

Imagine you are thinking about declaring your university major. You have enjoyed your classes in English and computer science, and you cannot decide which field to choose. You discuss the decision with your parents, who insist that you major in computer science because it will lead to better job opportunities after university. They even hint that they are not willing to help pay your tuition if you do not major in the field they prefer. How would this conversation make you feel about the two majors? Would it make the English major seem more attractive? In general, when another person tells you not to do or have something, does that very something become more desirable? Scientific studies and daily experience show that, for most of us, it does.

*Psychological reactance* is a motivational state aroused when our feelings of personal freedom are threatened (Woller, Buboltz, & Loveland, 2007). Often, we act in ways to regain that freedom, trying to obtain whatever is being withheld. You may be familiar with the common notion of reverse psychology, which is based on psychological reactance. For example, you might play hard to get if you want someone to be romantically interested in you. Similarly, a company might advertise a product as available only to a select few, thus making consumers eager to buy it so they are not left out (FIGURE 9.7).

Why is recognizing psychological reactance a critical thinking skill? This motivational state often affects how we make choices—even when, in fact, there is no reason to prefer an alternative just because it has been denied. By noticing if your thinking has been influenced by this potentially irrelevant variable, you will find it easier to make better-informed and more-rational choices.

**SELF-DETERMINATION THEORY AND SELF-PERCEPTION THEORY** According to *self-determination theory*, people are motivated to satisfy needs for competence, relatedness to others, and autonomy, which is a sense of personal control. Self-

determination theory argues that extrinsic rewards may reduce intrinsic value because such rewards undermine people's feeling that they are choosing to do something for themselves. In contrast, feelings of autonomy and competence make people feel good about themselves and inspire them to do their most creative work (Deci & Ryan, 1987). Another explanation is based on Daryl Bem's (1967) *self-perception theory*, which states that people seldom are aware of their specific motives and instead draw inferences about their motivations according to what seems to make the most sense. Imagine, for example, somebody gives you a big glass of water; after drinking the whole thing, you exclaim, "Wow, I must have been thirsty." You believe you were thirsty because you drank the whole glass, even though you were unaware of any physical sensations of thirst. When people cannot come up with obvious external explanations for their



"What do you think . . . should we get started on that motivation research or not?"

behaviours—such as that they acted with the expectation of being rewarded or to satisfy a biological drive—they conclude that they simply like the behaviours. Rewarding people for engaging in an intrinsic activity, however, gives them an alternative explanation for engaging in it: not because the behaviour is fun, but because of the reward. Therefore, without the reward, they have no reason to engage in the behaviour. The reward has replaced the goal of pure pleasure.

## People Set Goals to Achieve

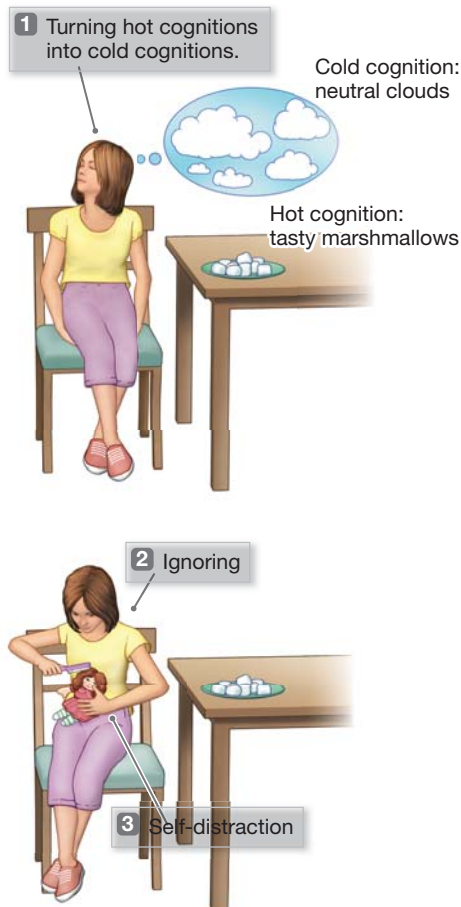
A *goal* is a desired outcome, usually associated with some specific object (such as tasty food) or some future behavioural intention (such as getting into medical school). So far, this chapter has focused on motivation to fulfill short-term goals, such as satisfying our hunger or spending a pleasurable afternoon. But we have long-term aspirations as well. What motivates us to fulfill those goals? For instance, what would you like to be doing in 10 years? What things about yourself would you change? In the 1930s, the personality psychologist Henry Murray proposed 27 basic *psychosocial needs*, including the needs for power, autonomy, achievement, and play. The study of psychosocial needs has yielded important insights into what motivates human behaviour. A key insight is that people are especially motivated to achieve personal goals. *Self-regulation* of behaviour is the process by which people alter or change their behaviour to attain personal goals.

Good goals motivate people to work hard. But what is a good goal? According to an influential theory developed by the organizational psychologists Edwin Locke and Gary Latham (1990), *challenging*—but not overly *difficult*—and *specific* goals are best. Challenging goals encourage effort, persistence, and concentration. In contrast, goals that are too easy or too hard can undermine motivation and therefore lead to failure. Dividing specific goals into concrete steps also leads to success. If you are interested in running the Ottawa Marathon, for instance, your first goal might be gaining the stamina to run one kilometre. When you can run a kilometre, you can set another goal and thus build up to running the 42-kilometre marathon. Focusing on concrete, short-term goals facilitates achieving long-term goals.

**SELF-EFFICACY AND ACHIEVEMENT MOTIVATION** Albert Bandura argued that people's personal expectations for success play an important role in motivation. For instance, if you believe studying hard will lead to a good grade on an exam, you will be motivated to study. *Self-efficacy* is the expectancy that your efforts will lead to success; this belief helps mobilize your energies. If you have low self-efficacy—that is, if you do not believe your efforts will pay off—you may be too discouraged even to study. People with high self-efficacy often set challenging goals that lead to success. However, sometimes people whose self-views are inflated set goals they cannot possibly achieve. Goals that are challenging but not overwhelming usually are most conducive to success.

People differ in how insistently they pursue challenging goals. The *achievement motive* is the desire to do well relative to standards of excellence. Compared with those low in achievement need, students high in achievement need sit closer to the front of classrooms, score higher on exams, and obtain better grades in courses relevant to their career goals (McClelland, 1987). Students with high achievement need are more realistic in their career aspirations than are students low in achievement need. Those high in achievement need set challenging but attainable personal goals; those low in achievement need often set extremely easy or impossibly high goals.

### Techniques for delaying gratification



**FIGURE 9.8** Delaying Gratification

Ignoring, self-distraction, and turning hot cognitions into cold cognitions are among the techniques children use to delay gratification.

**need to belong theory** The need for interpersonal attachments is a fundamental motive that has evolved for adaptive purposes.

**DELAYED GRATIFICATION** One common challenge in self-regulation is postponing immediate gratification in the pursuit of long-term goals. Students who want to be accepted to medical school often have to stay home and study while their friends are out having fun. Delay of gratification is the process of transcending immediate temptations to achieve long-term goals. In a series of now-classic studies, the developmental psychologist Walter Mischel gave children the choice of waiting to receive a preferred toy or food item or having a less preferred toy or food item right away. Mischel found that some children are better at delaying gratification than others are, and that the ability to do so is predictive of success in life. Children able to delay gratification at age four were rated 10 years later as being more socially competent and better able to handle frustration. The ability to delay gratification in childhood has been found to predict higher SAT scores and better school grades (Mischel, Shoda, & Rodriguez, 1989).

How did some children manage to delay gratification? Given the choice between eating one marshmallow right away or two after several minutes, some four-year-olds waited and engaged in strategies to help them not eat the marshmallow while they waited. One strategy was simply ignoring the tempting item rather than looking at it. Older children, who on average were better at delaying gratification, covered their eyes or looked away. Very young children tended to look directly at the item they were trying to resist, making the delay especially difficult. A related strategy was self-distraction, through singing, playing games, or pretending to sleep. The most successful strategy involved what Mischel and his colleague Janet Metcalfe refer to as turning *hot cognitions* into *cold cognitions*. This strategy involves mentally transforming the desired object into something undesired; children reported imagining a tempting pretzel as a brown log or imagining marshmallows as clouds (**FIGURE 9.8**). Hot cognitions focus on the rewarding, pleasurable aspects of objects, whereas cold cognitions focus on conceptual or symbolic meanings. Metcalfe and Mischel (1999) proposed that this hot/cold distinction is based on how the brain processes the information. As discussed in Chapter 3, subcortical brain regions such as the amygdala and nucleus accumbens are important for motivating behaviour, whereas the prefrontal cortex performs cold cognitive processes, such as the control of thought and of behaviour.

### People Have a Need to Belong

Over the course of human evolution, those who lived with others were more likely to survive and pass along their genes. Children who stayed with adults (and resisted being left alone) were more likely to survive until their reproductive years because the adults would protect and nurture them (see Chapter 11, “Human Development”). Similarly, adults capable of developing long-term, committed relationships were more likely to reproduce and to have offspring who survived to reproduce. Effective groups shared food, provided mates, and helped care for offspring (including orphans). Some survival tasks (such as hunting large mammals or looking out for predatory enemies) were best accomplished by group co-operation. It therefore makes great sense that, over the millennia, humans have committed to living in groups. Roy Baumeister and Mark Leary (1995) formulated the **need to belong theory**, which states that the need for interpersonal attachments is a fundamental motive that has evolved for adaptive purposes.

**MAKING AND KEEPING FRIENDS** The need to belong theory explains how easily most people make friends (**FIGURE 9.9A**). University students often make lifelong friendships within days of arriving on campus. Societies differ in their types of





(a)



(b)

**FIGURE 9.9 Making Friends** (a) Friends are an important part of most people's daily lives. (b) However, some people choose to be alone for reasons of autonomy, and they report being quite happy on their own.

groups, but all societies have some form of group membership (Brewer & Caporael, 1990). Not belonging to a group increases a person's risk for various adverse consequences, such as illnesses and premature death (Cacioppo et al., 2006). Such ill effects suggest that the need to belong is a basic motive driving behaviour, just as hunger drives people to seek food and avoid dying from starvation. One exception to this rule comes from a study done at McGill University. Researchers there found that students who autonomously chose to spend time alone reported lower levels of loneliness than did students who preferred not to be alone or were forced by circumstances to be alone. (Chua & Koestner, 2009; **FIGURE 9.9B**).

If humans have a fundamental need to belong, they ought to have mechanisms for detecting whether they are included in particular groups (MacDonald & Leary, 2005). In other words, given the importance of being a group member, humans need to be sensitive to signs that the group might kick them out. Indeed, evidence indicates that people feel anxious when facing exclusion from their social groups. Further, people who are shy and lonely tend to worry most about social evaluation and pay much more attention to social information (Gardner, Pickett, Jefferis, & Knowles, 2005). The take-home message is that just as a lack of food causes hunger, a lack of social contact causes emptiness and despair. In the movie *Cast Away*, Tom Hanks's character becomes stranded on a deserted island and has such a strong need for companionship that he begins carrying on a friendship with a volleyball he calls Wilson (named for the manufacturer, whose name is on the ball). As noted by the film reviewer Susan Stark (2000), this volleyball convinces us that "human company, as much as shelter, water, food and fire, is essential to life as most of us understand it."

**ANXIETY AND AFFILIATION** Do you like to be around other people when you are anxious, or do you prefer to avoid them? In a classic study, the American social psychologist Stanley Schachter and his colleagues (1959) manipulated anxiety levels and then measured how much the participants, all female, preferred to be around others. The participants in these studies thought they were taking part in a routine psychological study. "Dr. Zilstein," a serious- and cold-looking man with a vaguely European accent, greeted them at the lab. After explaining that he was from the neurology and psychiatric school, the doctor said the study involved measuring "the physiological effects of electric shock." Zilstein told the participants he would hook

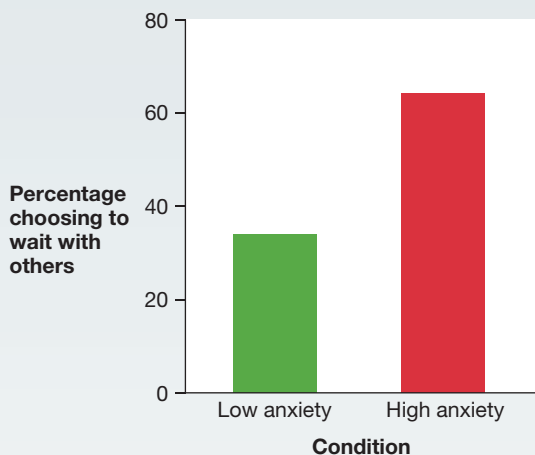
**FIGURE 9.10 Scientific Method: Schachter's Study on Anxiety and Affiliation**

**Hypothesis:** Feeling anxious makes people want to be with others.

**Research Method:**

- 1 The participants, all female, were told they would be hooked up to equipment that would administer electric current to their skin.
- 2 Some participants were told the shocks would be painless. Others were told the shocks would be quite painful.
- 3 All participants were then asked if, while the experiment was being set up, they wanted to wait alone or with others.

**Results:** The participants who were told the shocks would be painful (the high-anxiety condition) were much more likely to want to wait with others.



**Conclusion:** Increased anxiety led to increased motivation to be with others, at least for females.

them up to some electrical equipment and then administer electric current to their skin. Those in the low-anxiety condition were told the shocks would be painless—no more than a tickle. Those in the high-anxiety condition were told, “These shocks will hurt; they will be painful. As you can guess, if we’re to learn anything that will really help humanity, it is necessary that our shocks be intense. These shocks will be quite painful, but, of course, they will do no permanent damage.” As you might imagine, the participants who heard this speech were quite fearful and anxious.

Zilstein then said he needed time to set up his equipment, so there would be a 10-minute period before the shocks began. At that point, the participants were offered a choice: They could spend the waiting time alone or with others. This choice was the critical dependent measure, and after the choice was made, the experiment was over. Schachter found that increased anxiety led to increased affiliative motivations: Those in the high-anxiety condition were much more likely to want to wait with other people (FIGURE 9.10). Thus misery appears to love company. But does misery love just any company? A further study revealed that high-anxiety participants wanted to wait only with other high-anxiety participants, not with people who supposedly were waiting just to see their research supervisors. So misery loves miserable company, not just any company.

Why do people in a stressful situation prefer to be around other people in the same situation? According to Schachter, other people provide information that helps us evaluate whether we are acting appropriately. According to Leon Festinger’s *social comparison theory* (1954), we are motivated to have accurate information about ourselves and others. We compare ourselves with those around us to test and validate personal beliefs and emotional responses, especially when the situation is ambiguous and we can compare ourselves with people relatively similar to us.



## SUMMING UP

### How Does Motivation Activate, Direct, and Sustain Behaviour?

Researchers study motivation to understand how people set goals for themselves and how they achieve those goals. Maslow described an idealized need hierarchy, in which people first must satisfy lower needs, such as hunger and thirst, then turn to safety needs, which are followed by social needs, esteem, and self-actualization. Needs arise from states of deficiency, such as not having enough food or enough human contact; drives are the physiological states that lead us to engage in behaviours that satisfy needs. Our bodies tend toward homeostasis, a balanced state. Each of us prefers an optimal level of arousal, and people’s optimal levels vary widely. If we are underaroused or overaroused, our performance will suffer. When we do something for the sheer joy of it, such as listening to music or drawing, we are intrinsically motivated. People with high self-efficacy, the belief that with hard work they will achieve their goals, set reasonably high goals for themselves because they are confident in their ability to succeed. Social motives are also important: People have a need to belong. For example, when they are anxious, females tend to prefer being with others.



## MEASURING UP

1. Arrange the levels of Maslow's need hierarchy in the correct order, with lowest needs at the bottom, and then match each example with the correct level.  
Needs:
  - a. belonging and love
  - b. self-actualization
  - c. physiological
  - d. esteem
  - e. safetyExamples:
  1. You are sleep deprived.
  2. You are being physically threatened by a bully.
  3. You are about to take an exam in a class you are failing.
  4. You have just moved to a new city, where you know few people.
  5. You are an accomplished poet engaged in writing a new book of poems.
2. Indicate whether the motivation in each of the following scenarios is intrinsic or extrinsic.
  - a. Mary enjoys reading her psychology textbook so much that she is even reading the chapters her teacher did not assign.
  - b. Natasha is reading her psychology textbook to get a good grade on the exam and would never read an unassigned chapter.
  - c. Most children love to read and will do so for the sheer joy of reading.
  - d. As part of a plan to increase children's reading, a librarian will award prizes to the children who read the most books over the summer.

## What Determines How We Eat?

One of life's greatest pleasures is eating, and we do a lot of it: Most people in industrialized countries consume between 80,000 and 90,000 meals during their lives—more than 40 tons of food! Everyone needs to eat to survive, but eating involves much more than simply survival. Around the globe, special occasions often involve elaborate feasts, and much of the social world revolves around eating. Common sense dictates that most eating is controlled by hunger and *satiety*. People eat when they feel hungry and stop eating when they are full. However, some people eat a lot even when they are not hungry, whereas others avoid eating even though they are not full. What complex interactions between biology, cultural influences, and cognition determine human eating behaviour?

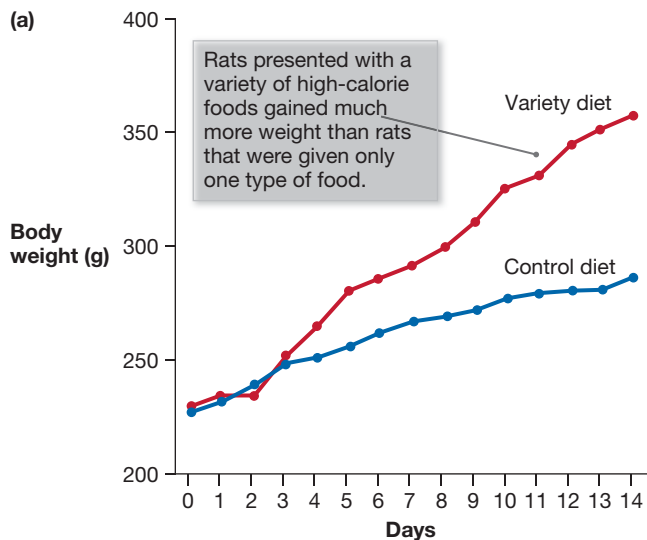
### Time and Taste Play Roles

Eating is greatly affected by learning. Have you ever noticed that most people eat lunch at approximately the same time—somewhere between noon and 2:00 PM? On a physiological level, this practice makes little sense because people differ greatly in their metabolic rates, the amounts they eat for breakfast, and the amounts of fat they have stored for long-term energy needs. We eat not because we have deficient energy stores but because we have been classically conditioned to associate eating with regular mealtimes. The clock indicating mealtime is much like Pavlov's metronome—it leads to various anticipatory responses that motivate eating behaviour



### LEARNING OBJECTIVES

List those aspects of eating that are more influenced by learning or culture and those that are more influenced by biology.



**FIGURE 9.11 The Impact of Variety on Eating Behaviour**

(a) Rats will become obese if given ample opportunity. (b) This trend appears to be true for humans as well.

and prepare the body for digestion. For instance, an increase in insulin promotes glucose use and increases short-term hunger signals. The sight and smell of tasty foods can have the same effect, and simply thinking about treats—freshly baked bread, pizza, a decadent dessert—may initiate bodily reactions that induce hunger.

A main factor that motivates eating is flavour—not just good-tasting food but variety. Animals presented with a variety of foods tend to eat much more than animals presented with only one food type. For instance, rats that normally maintain a steady body weight when eating one type of food eat huge amounts and become obese when presented with a variety of high-calorie foods, such as chocolate bars, crackers, and potato chips (Sclafani & Springer, 1976; **FIGURE 9.11**). Humans show the same effect, eating much more when various foods are available than when only one or two types of food are available. People also eat more when portions are larger (B. Rolls, Roe, & Meengs, 2007), a finding that suggests the large portions served by many restaurants may help explain the increase in obesity in industrialized nations over the past few decades.

One reason rats and people eat more when presented with a variety of foods is that they quickly grow tired of any one flavour. *Sensory-specific satiety* is a phenomenon in which animals will stop eating relatively quickly if they have just one type of food to eat, but they will eat more if presented with a different type of food. Research in England found that the frontal lobe regions involved in assessing food's reward value exhibit decreased activity when the same food is eaten over and over but increased activity when a new food is presented (E. Rolls, 2007). This increased activity, in encouraging people to continue eating, may explain people's behaviour during celebration feasts: As discussed above, even though we cannot imagine eating another bite of turkey, we often can find room for a piece—or two—of pumpkin pie to finish the meal. From an

evolutionary perspective, sensory-specific satiety may be advantageous because animals that eat many types of food are more likely to satisfy nutritional requirements and thus to survive than are those that rely on a small number of foods. In addition, eating large meals may have been adaptive when the food supply was scarce or unpredictable.

## Culture Determines What We Eat

Would you eat a bat? In the Seychelles, bat is a delicacy—it tastes something like chicken. What we will eat has little to do with logic and everything to do with what we believe is food. Some of the most nutritious foods are not eaten in North America because they are viewed as disgusting. For instance, fried termites, a favorite in Zaire, have more protein than beef does; spiders are nutritious and in many countries are eaten as tasty treats. At the same time, people from other cultures might be nauseated by some of the favourite foods in North America, such as pizza and ice cream. Even when people are starving to death, they will refuse to eat perfectly nutritious substances. People died in Naples in 1770 because they were suspicious of the potatoes sent to relieve their famine; in Ireland, many of those who died in the potato famine refused to eat corn sent from America. Three million people died in Bengal in 1943 despite being supplied with wheat, which they rejected because it was not familiar as food.

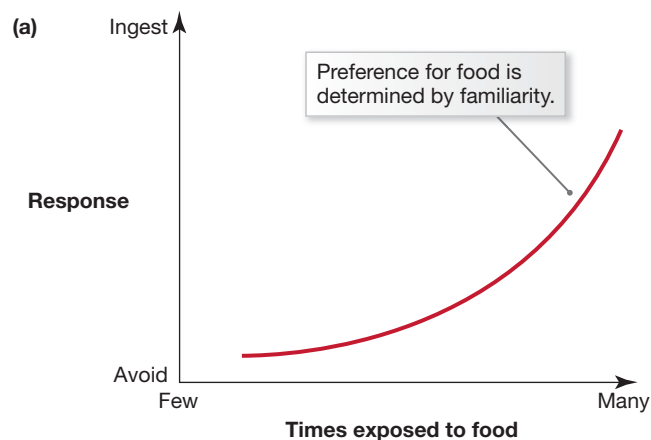
## Real World PSYCHOLOGY

What people will eat is determined by a combination of personal experience and cultural beliefs. Infants have an inborn preference for sweets, but they can learn to like just about anything. Generally, familiarity determines food preferences (FIGURE 9.12). The avoidance of unfamiliar foods is an example of *neophobia*, the fear of novel things. This behaviour makes great sense because unfamiliar foods may be dangerous or poisonous, so avoiding them is adaptive for survival (Galef & Whiskin, 2000). Getting children to like new foods often involves exposing them to small amounts at a time, until they get used to the taste. Infants and toddlers also learn to try foods by observing their parents and siblings—if Mom eats something, it must be okay. Children will much more likely eat a new food offered by their mothers than the same food offered by a friendly stranger. This behaviour, too, makes great sense from an evolutionary standpoint.

Of course, what a mother or father prefers to eat is determined by his or her own upbringing and experiences, and therefore families tend to like specific types of food. Ethnic differences in food preference often continue when a family moves to a new country. Although people often enjoy novel ethnic foods, in their regular diets most people prefer the foods of their own culture. Moreover, as Paul Rozin (1996) has pointed out, cultural rules govern which foods are appropriate in different contexts. For example, most people in North America like chocolate and french fries, but few people like them combined. Local norms for what to eat and how to prepare it—guidelines that Rozin calls *cuisine*—reinforce many food preferences. Moreover, religious and cultural values often tell people which foods to avoid: Kosher Jews eat beef but not pork, and Hindus eat pork but not beef. Taboos on certain types of food may have been adaptive because those foods were likely to contain harmful bacteria. However, many food taboos and preferences are idiosyncratic and have nothing to do with avoiding harm. They simply reflect a group preference for specific foods, prepared and eaten in certain ways. Culturally transmitted food preferences powerfully affect what foods people eat.

### Multiple Neural Processes Control Eating

The hypothalamus (see Figure 3.24) is the brain structure that most influences eating. Although it does not act alone to elicit eating, the hypothalamus integrates the various inhibitory and excitatory feeding messages and organizes behaviours involved in eating. In the first half of the twentieth century, research revealed that, depending on the specific area injured, damage to the hypothalamus dramatically changes eating behaviour and body weight. One of the first observations occurred in 1939, when researchers discovered that patients with tumours of the hypothalamus became obese. To examine whether obesity could be induced in animals of normal weight, researchers selectively damaged specific hypothalamic regions. Damaging the middle, or *ventromedial*, region of the hypothalamus (*VMH*) causes rats to eat great quantities of food—a condition called *hyperphagia*. Rats with VMH damage grow extremely obese. In contrast, damaging the outer, or *lateral*, area of the hypothalamus (*LH*) is associated with a condition called *aphagia*, in which diminished eating behaviour leads to weight loss and eventual death unless the animal is force-fed (FIGURE 9.13).



**FIGURE 9.12 The Impact of Culture on Eating Behaviour** (a) As this graph illustrates, animals like the food they know, and they tend to avoid unfamiliar food. (b) How eagerly would you eat the fried cricket being offered by this vendor in Phnom Penh? Crickets are a popular snack among Cambodians.

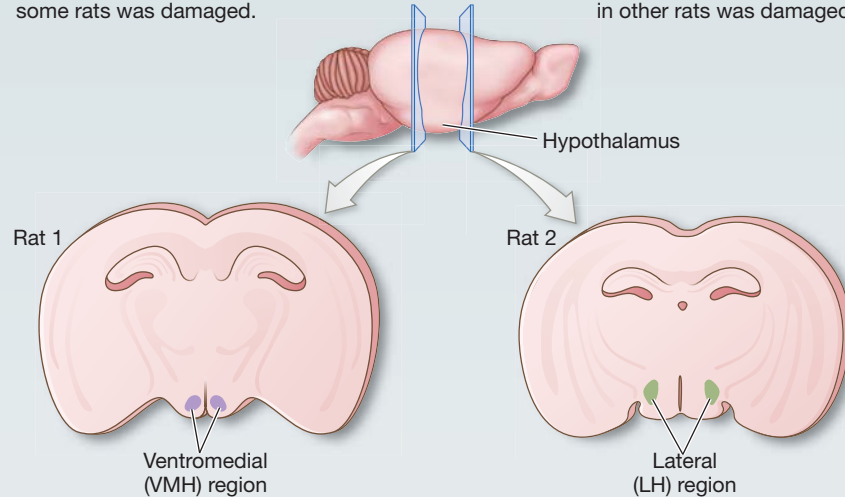
## FIGURE 9.13 Scientific Method: The Relationship between the Hypothalamus and Eating

**Hypothesis:** Damage to the hypothalamus affects eating behaviour and body weight.

**Research Method:**

**1** The ventromedial region of the hypothalamus (VMH) in some rats was damaged.

**2** The outer, or lateral, area of the hypothalamus (LH) in other rats was damaged.



**Results:** Damage to the VMH caused rats to eat large quantities of food, leading to extreme obesity. Damage to the LH caused diminished eating, leading to weight loss and eventual death.



**Conclusion:** Damage to the hypothalamus produces dramatic changes in eating and body weight.

Brain structures other than the hypothalamus are involved in eating behaviour. For instance, a region of the prefrontal cortex processes taste cues such as sweetness and saltiness (E. Rolls, 2007). This prefrontal region appears to process information about the potential reward value of food. Recent brain imaging studies have found that the craving triggered by seeing good-tasting food is associated with activity in the limbic system (Volkow, 2007), which (as discussed in Chapter 3) is the main brain region involved in reward. Indeed, overweight people show more activity in reward regions of the brain when they look at good-tasting foods than do

normal-weight individuals (Rothenmund et al., 2007). Damage to the limbic system or the right frontal lobes sometimes produces *gourmand syndrome*, in which people become obsessed with fine food and food preparation (FIGURE 9.14). One 48-year-old stroke patient, who before his stroke had not been a finicky eater, grew preoccupied with food and eventually left his job as a political correspondent to become a food critic (Regard & Landis, 1997). Despite their fascination with good-tasting food, those who have gourmand syndrome do not necessarily become overweight; they are obsessed not with eating but with the quality and variety of the food itself and how it is prepared. In other words, the obsession seems to centre on food's reward properties.

**INTERNAL SENSATIONS** As discussed above, negative feedback processes contribute to homeostasis. For a long time, scientists believed eating was a classic homeostatic system, in which some sort of detector would notice deviations from the set-point and would signal that an animal should start or stop eating. But where do hunger signals come from? The search for energy-depletion detectors has led scientists from the stomach to the bloodstream to the brain. Although you might assume the stomach is important, research over the past century has established that stomach contractions and distensions (which can make your stomach growl) are relatively minor determinants of hunger and eating. Eating a small amount of food stops stomach contractions, but usually leads people to eat more. Indeed, people who have had their stomachs removed continue to report being hungry. Other research has pointed to the existence of receptors in the bloodstream that monitor levels of vital nutrients. One of the best-known explanations of hunger is the *glucostatic theory*, which proposes that the bloodstream is monitored for its glucose levels. Because glucose is the primary fuel for metabolism and is especially crucial for neuronal activity, it makes sense for animals to be sensitive to deficiencies in glucose. Similarly, the *lipostatic theory* proposes a set-point for body fat in which deviations from the set-point initiate compensatory behaviours to return to homeostasis. For instance, when an animal loses body fat, hunger signals motivate eating and a return to the set-point.

The hormone *leptin* is involved in fat regulation. Leptin is released from fat cells as more fat is stored. Leptin travels to the hypothalamus, where it acts to inhibit eating behaviour. Leptin acts slowly, so it takes considerable time after eating before leptin levels change in the body. Therefore, leptin may be more important for long-term body fat regulation than for short-term eating control. However, some recent evidence indicates that leptin might also influence the reward properties of food and make it less appetizing (Farooqi et al., 2007), so leptin might have short-term effects. Researchers know that animals lacking the gene necessary to produce leptin become extremely obese and that injecting leptin into these animals leads to a rapid loss of body fat. Other hormones, including *ghrelin*, seem to affect eating (Abizaid, 2009). First identified in 1999, ghrelin originates in the stomach and surges before meals; it then decreases after people eat and so may play an important role in triggering eating (Higgins et al., 2007). When people lose weight, an increase in ghrelin motivates additional eating in a homeostatic fashion (Zorrilla et al., 2006). How much any of these hormones contribute to human obesity is unclear, but considerable research is under way to find out whether manipulating them can help prevent or treat obesity. As you will learn in Chapter 10, many factors—from genes to culture to bad eating habits—contribute to obesity. You will also learn why most people who diet have trouble losing weight and keeping it off.



**FIGURE 9.14 Gourmand Syndrome** At what point does a healthy interest in fine food become an obsession?

## **SUMMING UP**

### **What Determines How We Eat?**

To survive, animals need to eat. A number of redundant physiological systems motivate eating behaviour to satisfy nutritional requirements. The motivation for variety helps animals achieve nutritious diets, whereas fear of new foods and aversions to certain tastes help animals avoid potential harm. People consume a great variety of substances as food and learn from those around them to like certain flavours. Different brain mechanisms are involved in determining how much we eat, but glucose in our blood and hormones released from our stomachs and from fat cells are also involved.

## **MEASURING UP**

Imagine you are asked to design a program for people who need to lose weight. Based on the information in this chapter about the processes that regulate eating, what suggestions would you make in each of the following areas?

1. Time effects on eating
  - a. To make late-night snacking less likely, create a cultural expectation about eating meals further apart during the day, perhaps by serving meals at 8 AM, 2 PM, and 8 PM.
  - b. Vary meal times so people eat at different times every day.
2. Cultural effects on eating
  - a. Teach cultural and ethnic groups how to prepare lower-calorie versions of their usual foods.
  - b. Teach cultural and ethnic groups how to prepare low-calorie foods from a range of cuisines.
3. Sensory-specific satiety
  - a. Do not present much variety in the foods you serve.
  - b. Be sure that every meal includes a variety of foods.
4. What research would you recommend based on findings with leptin?
  - a. Study ways to get the body to produce more leptin.
  - b. Study ways to get the body to produce less leptin.

### **LEARNING OBJECTIVE**

Compare biological, cultural, and evolutionary perspectives on sexual behaviour.

Describe the human sexual response cycle.

## What Factors Motivate Sexual Behaviour?

Sexual desire has long been recognized as one of humanity's most durable and powerful motivators. Most human beings have a significant desire for sex, but sex drives vary substantially among individuals and across circumstances. Variation in sexual frequency can be explained by individual differences and by society's dominating influence over how and when individuals engage in sexual activity.

For much of the history of psychological science, the study of sex was taboo. The idea that women were motivated to have sex was almost unthinkable; many theorists even believed women were incapable of enjoying sex. In the 1940s, the pioneering work of the American researcher Alfred Kinsey and his colleagues provided—for the times—shocking evidence that women's sexual attitudes and behaviours were in many ways similar to those of men. In Kinsey's surveys of thousands of Americans, he found that more than half of both men and women reported premarital sexual behaviour, that masturbation was common in both sexes, that women enjoyed orgasms, and that homosexuality was much more common than



most people believed. Very little was known about human sexuality when Kinsey began his work, and Kinsey's approach exemplified psychology's empirical nature. His surveys were controversial, but Kinsey showed a deep respect for collecting data as a way of answering a research question. More than 50 years later, we know a great deal more about sexual behaviour, but the topic still makes many people uncomfortable. Public discussion of sexual activity is rare, except perhaps on talk radio and daytime television shows. This section examines what psychological science has learned about the motivation for sex.

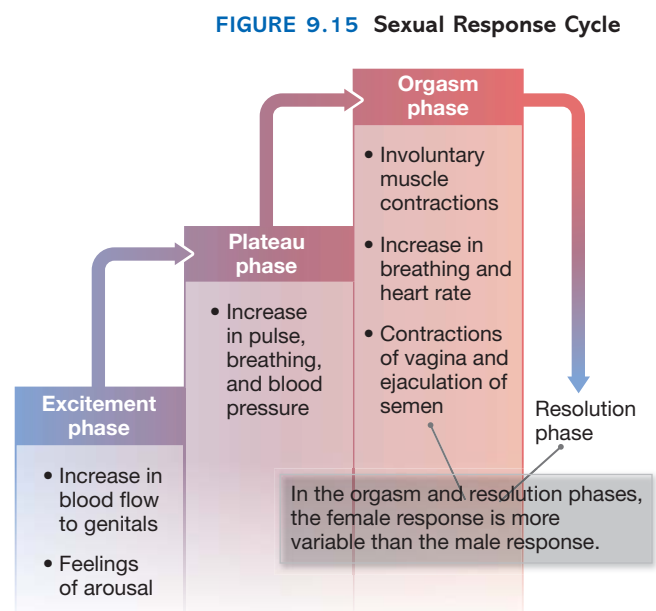
## Biological Factors Influence Sexual Behaviour

Kinsey's research during the 1940s demonstrated how little most people knew about human sexual behaviour. Despite his eye-opening contributions, ignorance about the physiology of sex persisted into the 1960s, when William Masters and Virginia Johnson began laboratory studies of sexual behaviour. Their sample was somewhat biased, in that only people willing to be filmed while having intercourse or masturbating served as research participants. Nonetheless, Masters and Johnson gained considerable insight into the physiology of human sexual behaviour. The most enduring contribution of their research was the identification of the **sexual response cycle**—a predictable pattern of physical and psychological responses that occur in four stages (FIGURE 9.15). The *excitement phase* occurs when people contemplate sexual activity or begin engaging in behaviours such as kissing and touching in a sensual manner. During this stage, blood flows to the genitals, and people report feelings of arousal. For men, the penis begins to become erect. For women, the clitoris becomes swollen, the vagina expands and secretes fluids, and the nipples enlarge.

As excitement continues into the *plateau phase*, pulse rate, breathing, and blood pressure increase, as do the various other signs of arousal. For many people, this stage is the frenzied phase of sexual activity, in which inhibitions are lifted and passion takes control. The plateau phase culminates in the *orgasm phase*, consisting of involuntary muscle contractions throughout the body, dramatic increases in breathing and heart rate, rhythmic contractions of the vagina for women, and ejaculation of semen for men. For healthy males, orgasm nearly always occurs; for females, orgasm is more variable. When it occurs, however, women and men report nearly identical pleasurable sensations. Following orgasm, there is a dramatic release of sexual tension and a slow return to a normal state of arousal. In this *resolution phase*, the male enters a refractory period, during which he is temporarily unable to maintain an erection or have an orgasm. The female does not have such a refractory period and may experience multiple orgasms with short resolution phases between each one. Again, the female response is more variable than the male response.

**HORMONES** As discussed in Chapter 3, hormones are involved in producing and terminating sexual behaviours. In nonhuman animals, hormones profoundly influence sexual activity. In many species, females are sexually receptive only when fertile, and estrogen is believed to control reproductive behaviours. Estrogen appears to play only a small role in human female sexuality, but hormones affect human sexual behaviour in two ways. First, they influence physical development of the brain and body. In the developmental phase of *puberty*, hormone levels increase throughout the body and stimulate physical changes—the development of

**sexual response cycle** A pattern of physiological responses during sexual activity.



*secondary sexual characteristics*, including pubic hair, body hair, and, for females, breasts. Puberty typically begins around age 11 or 12 for most males and often earlier for females.

The second way hormones influence sexual behaviour is through motivation; they activate reproductive behaviour. As noted in Chapter 3, sex hormones are released from the gonads (testes and ovaries), and females and males have some amount of all the sex hormones. But males have a greater quantity of androgens than females do, and females have a greater quantity of estrogens and progesterone. Androgens are apparently much more important for reproductive behaviour than estrogens are, at least for humans. In men and women, testosterone—a type of androgen—is involved in sexual functioning (Sherwin, 2008). Males need a certain amount of testosterone to be able to engage in sex, although they do not perform better if they have more testosterone. The availability of testosterone, not large quantities of it, apparently drives male sexual behaviour. The more testosterone women have, the more likely they are to have sexual thoughts and desires—although normal females have relatively low levels of testosterone (Meston & Frohlich, 2000). Adolescent females with higher than average testosterone levels for their age are more likely to engage in sexual intercourse (Halpern, Udry, & Suchindran, 1997). Another important hormone in men and women is *oxytocin*, which is released during sexual arousal and orgasm. (As discussed in Chapter 10, oxytocin also is associated with trust.) Some researchers believe oxytocin may promote feelings of love and attachment between partners; it also seems to be involved in social behaviour more generally (Bartels & Zeki, 2004). Given the important role of the hypothalamus in controlling the release of hormones into the bloodstream, it is no surprise that the hypothalamus is the brain region considered most important for stimulating sexual behaviour. Studies have shown that damaging the hypothalamus in rats interrupts sexual behaviour, although which damaged brain area has the greatest effect differs slightly for males and females.

**NEUROTRANSMITTERS** Neurotransmitters can affect various aspects of the sexual response. For instance, dopamine receptors in the limbic system are involved in the physical experience of pleasure. Serotonin also is implicated in sexual behaviour. The most common pharmacological treatments for depression enhance serotonin function, but they seriously reduce sexual interest, especially for women. Small doses of drugs that enhance serotonin are also useful for treating premature ejaculation. Researchers currently do not know why these effects occur.

One chemical that acts as a neurotransmitter in the brain and is critical for sexual behaviour is *nitric oxide*. Sexual stimulation leads to nitric oxide production, which then promotes blood flow to both the penis and the clitoris and subsequently plays an important role in sexual arousal, especially penile erections. When this system fails, males cannot maintain an erection. Various drugs that enhance this system, such as Viagra, have been developed to treat erectile disorders. It is not clear whether such drugs can be used to treat women's sexual disorders, but they appear to enhance the sexual experience for healthy women (Caruso, Intelisano, Farina, Di Mari, & Agnello, 2003).

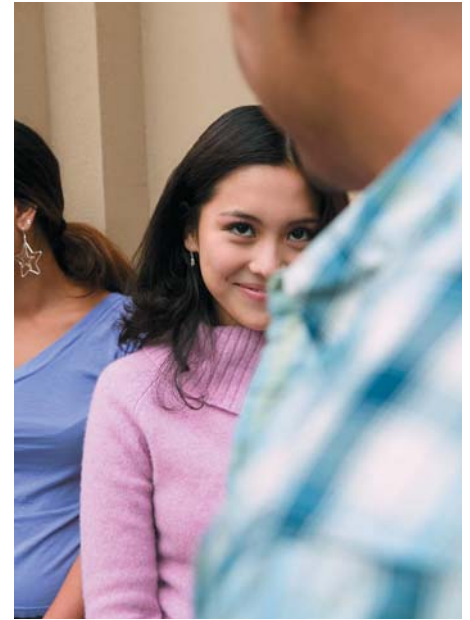
**VARIATIONS ACROSS THE MENSTRUAL CYCLE** Women differ from men in how the hypothalamus controls the release of sex hormones. Whereas in men hormones are released at the same rate over time, in women the release of hormones varies according to a cycle that repeats itself approximately every 28 days—the menstrual

cycle. Although research has found only minimal evidence that women's sexual behaviour varies across the menstrual cycle, recent evidence indicates that women may process social information differently depending on whether they are in a fertile phase of the cycle. For instance, when researchers used a computer program to alter masculinity and femininity in male faces, they found that compared with preferences expressed in other phases of the menstrual cycle, during ovulation women preferred the more masculine faces (Penton-Voak et al., 1999). In another study, in which women watched videotapes of men, women who were ovulating rated self-assured men as more desirable potential sex partners, but women who were not ovulating did not (Gangestad et al., 2004). These studies add to a growing literature suggesting that women evaluate men differently across the menstrual cycle, although the everyday effects of these differences on women, and on the men they interact with, are unknown.

**NEURAL CORRELATES OF VIEWING EROTICA** Some brain imaging studies indicate that viewing erotica activates reward regions in the brain, such as various limbic structures. This effect is greatest for men who have higher blood levels of testosterone (Stoleru et al., 1999). As noted in Chapter 4, Hamann and colleagues (2004) found that when men and women viewed sexually arousing stimuli, such as film clips of sexual activity or pictures of opposite-sex nudes, men showed more activation of the amygdala—activation that, the authors suggest, increases the arousal caused by the stimulus. Men are more likely than women to report visual erotic stimulation as pleasurable (Herz & Cahill, 1997), but this finding might simply mean that more erotica is produced for men than for women. Research has shown that women prefer erotica produced specifically for women, which tends to emphasize more of the emotional factors of sexual interaction. One study found that although both sexes prefer viewing erotic movies aimed at their own sex, men were aroused by both types of movies (Janssen, Carpenter, & Graham, 2003). Finally, one brain imaging study conducted in Germany found that women's reactions to viewing erotica varied according to the phases of their menstrual cycles, indicating once again that women's responses will likely be more variable (Gizewski et al., 2006).

### Cultural Scripts and Cultural Rules Shape Sexual Interactions

In the movies, sexual relationships often start when one attractive young person meets another by chance, they spend some exciting time together, an attraction develops, and sexual behaviour ensues—often within a day or two. In real life, however, the course of action is often quite different. For one thing, most people rely on social networks to meet their sex partners. In addition, people generally do not fall into bed together as fast as they do in the movies; most people know someone a long time before having sex. But the depiction of sexual behaviour in movies and other media shapes beliefs and expectancies about what sexual behaviours are appropriate and when they are appropriate. *Sexual scripts* are cognitive beliefs about how a sexual episode should be enacted (on scripts, see Chapter 8, “Thinking and Intelligence”). For instance, the sexual script indicates who should make the first move, whether the other person should resist, the sequence of sexual acts, and even how the partners should act afterward (FIGURE 9.16). In Westernized societies, the sexual script involves initial flirtation through non-verbal actions, the male initiating physical contact, the female controlling whether sexual activity takes place, and refusals typically being verbal and direct (Berscheid &



**FIGURE 9.16 Sexual Scripts** Sexual scripts influence behaviours such as flirting, pursuing romantic interest, and dating.

Regan, 2005). The scripts differ in many places in the world, such as in countries where arranged marriages are common.

**DOUBLE STANDARDS** At the social level, the double standard is a well-known pattern of cultural influence. It stipulates that certain activities (such as premarital or casual sex) are morally and socially acceptable for men but not for women. The sexual revolution of the late twentieth century significantly changed sexual behaviours in many, but not all, countries. Most of these behaviours must be attributed to changing cultural pressures and expectations. Although sexual customs and norms vary across cultures, all known cultures have some form of sexual morality—indicating the importance to society of regulating sexual behaviour. Cultures may seek to restrain and control sex for various reasons, including maintaining control over the birth rate, establishing paternity, and reducing conflicts.

**SEX DIFFERENCES IN SEXUAL MOTIVES** A noticeable and consistent finding in nearly all measures of sexual desire is that men, on average, have a higher level of sexual motivation than women do—allowing for many individual exceptions. Research studies have found that in general men masturbate more frequently than women, want sex earlier in the relationship, think and fantasize about sex more often, spend more time and money (and other resources) in the effort to obtain sex, desire more different sexual activities, initiate sex more and refuse sex less, and rate their own sex drives as stronger than women's (Baumeister, Catanese, & Vohs, 2001). In one study, researchers asked university-age men and women how many sex partners they ideally would like to have in their lives, if they were unconstrained by fears about disease, social pressures, and the like (Miller & Fishkin, 1997). Most women wanted one or two partners, whereas men's average answer was several dozen. A study of more than 16,000 people from 10 major regions around the world found that the greater male motivation for sexual activity and sexual variety occurs in all cultures (Schmitt et al., 2003).

The relative influence of nature and culture on sexual motivation may vary with gender. Roy Baumeister's (2000) term *erotic plasticity* refers to the extent that sex drive can be shaped by social, cultural, and situational factors. Evidence suggests that women have higher erotic plasticity than men. A woman's sexuality may evolve and change throughout her adult life; a man's desires remain relatively constant (except for a gradual decline with age). Women's sexual desires and behaviours depend significantly on social factors such as education and religion, whereas men's sexuality shows minimal relationships to such influences.

According to the **sexual strategies theory** of the evolutionary psychologist David Buss, these differences are due to the different adaptive problems faced throughout human history by men and by women (Buss & Schmitt, 1993). From this perspective, women differ from men in how they maximize the passing along of their genes to future generations. Women's basic strategy is intensive care of a relatively small number of infants. Their commitment is to nurture offspring rather than simply maximize production. Once a woman is pregnant, additional matings are of no reproductive use; and once she has a small child, an additional pregnancy can put her current offspring at risk. Thus biological mechanisms—for example, nursing typically makes ovulation less likely to occur—ensure spacing between children. On purely reproductive grounds, men have no such sexual interludes. For them, all matings may have a reproductive payoff; they bear few of the personal costs of pregnancy, and their fertility is unaffected by getting a woman pregnant.

According to the sexual strategies theory, because having offspring is a much more intensive commitment for women, they likely are more cautious about having sex. Indeed, evidence indicates that women are much less willing than men to

**sexual strategies theory** Evolutionary theory that suggests men and women rank the importance of qualities in their relationship partners differently because of gender-specific adaptive problems.

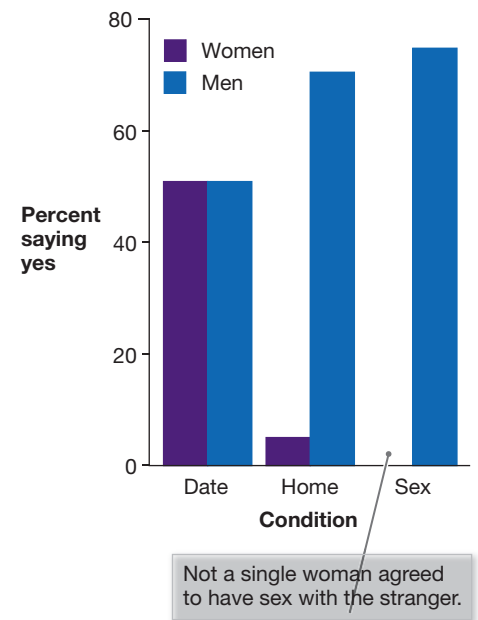
have sex with someone they do not know well. In one study of 96 university students, an attractive stranger approached people of the opposite sex and said, “I have been noticing you around campus. I find you attractive. Would you go to bed with me tonight?” Not one woman said yes, but three-quarters of the men agreed to the request (FIGURE 9.17). Indeed, the men were less likely to agree to go on a date with the attractive woman than they were to agree to have sex with her (Clark & Hatfield, 1989). In another study, people were asked how long a couple should be together before it would be acceptable for them to have sexual intercourse, given mutual desire. Women tend to think couples should be together for at least a month or more before sex is appropriate; men believe that even after relatively short periods of acquaintanceship, such as on the first or second date, sex is acceptable (Buss & Schmitt, 1993).

### Mating Strategies Differ between the Sexes

Humans generally desire to enter into romantic relationships, and for the most part they want the same things in their mates. Men and women seek mates who are attractive, kind, honest, and good-natured. In addition to wanting the same basic qualities in potential mates, both sexes avoid certain characteristics, such as insensitivity, bad manners, loudness or shrillness, and the tendency to brag about sexual conquests (Cunningham, Barbee, & Druen, 1996). Despite these similarities, males and females differ in the relative emphases they place on physical appearance and social status, at least for long-term relationships. Men are more concerned with appearance, and women are more concerned with status. How does psychological science explain these differences? Women’s preference for status over attractiveness depends on several factors, such as whether the relationship is short or long term (looks are more important in the short term) and whether the woman perceives herself as attractive. Women who view themselves as very attractive appear to want it all—status and good looks (Buss & Shackelford, 2008). In one study, men and women reported kindness and intelligence as necessary in their selection of mates, but their views of status and attractiveness differed. For the average woman seeking a long-term mate, status was a necessity and good looks were a luxury. In contrast, men viewed physical attractiveness as a necessity rather than a luxury in mate selection—looks matter most when men are searching for mates (Li, Bailey, Kenrick, & Linsenmeier, 2002).

In one study, Buss asked 92 married couples which characteristics they valued in their spouses. Women generally preferred men who were considerate, honest, dependable, kind, understanding, fond of children, well liked by others, good earners, ambitious, career oriented, from a good family, and fairly tall. Men tended to value good looks, cooking skills, and sexual faithfulness. Across some 37 cultures studied, females valued a good financial prospect more than did men (Buss, 1989). In addition, women in all 37 cultures tended to marry older men, who often are more settled and financially stable. In general, men and women value physical attractiveness highly, but their relative emphases conform to evolutionary predictions.

The evolutionary account of human mating is controversial. Some researchers believe that behaviours shaped by evolution have little impact on contemporary relationships. We must consider two important factors. First, the modern era is a tiny fraction of human evolutionary history, and the modern mind resides



**FIGURE 9.17 Sexual Motives and Responses** When men and women were propositioned by an attractive stranger of the opposite sex, both sexes were equally likely to accept a date. Men were much more willing than women to agree to have sex or to go home with the stranger.



in a Stone Age brain, solving adaptive problems that have faced our species for thousands of years. Thus remnants of behaviours that were adaptive in prehistoric times may linger even if they are not adaptive in contemporary society. More important, however, natural selection bestows biological urges as well as a strong sensitivity to cultural and group norms, so instinctive behaviours are constrained by social context. The frontal lobes work to inhibit people from breaking social rules, which are determined largely by culture. The current social context differs greatly from that of millions of years ago, and human mating strategies are influenced by these contemporary norms. For example, from a biological view, it might seem advantageous for humans to reproduce as soon as they are able. But many contemporary cultures discourage sexual behaviour until people are older and better able to care for their offspring. The critical point is that human behaviour emerges to solve adaptive problems, and to some degree the modern era introduces new adaptive challenges based on societal standards of conduct. These standards shape the context in which men and women view sexual behaviour as desirable and appropriate.

## Real World PSYCHOLOGY

### People Differ in Sexual Orientation

Why are some people homosexual and others heterosexual? Homosexual behaviour, more commonly known as lesbian (for women) and gay (for men) behaviour, has been noted in various forms throughout recorded history. From an evolutionary perspective, homosexuality appears to make little sense; exclusive homosexuality would not lead to reproduction and therefore would not survive in the gene pool. Many theories of homosexuality have emerged, but none has received conclusive support. One evolutionary theory is that lesbians and gays often act as “spare” parents to their siblings’ offspring, and anecdotal evidence suggests they are sensitive and caring aunts and uncles; in this way, they might ensure the continuation of family genes. Of course, many gays and lesbians are parents—sometimes from earlier marriages and sometimes through artificial insemination or adoption. In the nineteenth and much of the twentieth century in Western cultures, homosexuality was regarded as deviant and abnormal, a psychological disorder. Until 1973, psychiatrists officially viewed homosexuality as a mental illness. Classic psychoanalytic theories of homosexuality emphasized the importance of parenting practices. Families with a domineering mother and a submissive father were thought to cause the children to identify with the opposite-sex parent (e.g., a boy with his mother). Such identification translated into a sexual attraction toward the gender opposite of their identification—that is, a same-sex attraction. However, the overwhelming majority of studies have found little or no evidence that how parents treat their children has anything to do with sexual orientation. Likewise, no other environmental factor has been found to account for homosexuality. Does biology determine sexual orientation?

Remember that when we ask whether something is biological, we really are talking about the relative contributions of biological factors compared with those of environmental factors. Every behaviour results from biological processes, such as gene expression, that are themselves influenced by events in environment. One approach to examining the extent to which biological factors contribute to sexual orientation explores the effect of hormones. For instance, early theorists speculated that lesbians had higher levels of testosterone and gay males had higher levels of estrogen, but those speculations were wrong; the levels of circulating hormones do not differ between heterosexual and homosexual same-sex individuals. Rather, the best available evidence suggests that exposure to hormones, especially androgens, in the prenatal environment might play some role in sexual orientation

(Mustanski, Chivers, & Bailey, 2002). For example, because of a mother's medical condition, some females are exposed to higher than normal levels of androgens during prenatal development. These girls often have masculine characteristics, at birth and throughout life, and later in life are more likely to report being lesbians. An intriguing finding is that compared to heterosexual males, gay males are more likely to have older male siblings. One explanation is that the mother's body responds in some way to being pregnant with a boy, and this response alters the level of hormones in the prenatal environment when the mother becomes pregnant with another boy (Blanchard & Ellis, 2001; Bogaert, 2006). But most males with older brothers are not homosexual, so why would this response affect only some males?

A second approach to understanding the biological contribution to sexual orientation is through behavioural genetics. The idea that gene expression might be involved in sexual orientation is supported by a recent study using fruit flies. Researchers found that altering the expression of a single "master" gene reversed the sexual orientations of male and female flies (Demir & Dickson, 2005). But what about in humans? In 1993, the American biologist Dean Hamer reported finding a link between a marker on the X chromosome and sexual orientation in males, and the media quickly dubbed the marker "the gay gene." Other researchers have failed to find any specific genes for sexual orientation. Is homosexuality inherited? Twin studies have provided some support for the idea of a genetic component to homosexuality, particularly for males. As discussed in Chapter 3, identical twins are most similar in genetic makeup, but they also are likely to have had similar environments, and it is difficult to pull apart these two types of contributions. In a review of previous studies, Mustanski and colleagues (2002) report the heritability of homosexuality as being greater for males than for females but with a significant genetic component for both. It remains unclear how human sexual orientation might be encoded in the genes.

Some research suggests the hypothalamus may be related to sexual orientation. In post-mortem examinations, the neuroscientist Simon LeVay (1991) found that an area of the hypothalamus that typically differs between men and women was only half as large in homosexual men as in heterosexual men. In fact, the size of this area in homosexual men was comparable to its size in heterosexual women. Likewise, in a recent Swedish brain imaging study, heterosexual males showed greater activation of the hypothalamus when they sniffed a female pheromone substance (a hormonal secretion that travels through the air) than they did when they sniffed a male pheromone substance, whereas females showed greater activation when they sniffed a male rather than female pheromone substance (Savic, Berglund, & Lindström, 2005). Male homosexuals showed a pattern more similar to that of women than of heterosexual men—greater activation of the hypothalamus in response to the male pheromone substance.

Although intriguing, both of these studies can be criticized on the grounds that correlation does not equal causation. That is, a size difference or activation difference in any one part of the brain cannot establish whether this area determines sexual orientation, whether being heterosexual or homosexual results in changes to brain structure or function, or whether a third variable is responsible for all these effects. For instance, some researchers believe that the size of the hypothalamus is determined by prenatal exposure to androgens. Thus although these studies' findings are suggestive, evidence currently is insufficient to establish a causal connection between brain regions and sexual orientation. Considered together, the evidence is consistent that biological processes play some role in sexual orientation. The question is how and when biology contributes, and to what degree. Many

**FIGURE 9.18 Sexual Orientation** The complexity of contemporary society—as illustrated by these gay and straight wedding announcements—mirrors the complexity of factors underlying humans' sexual orientation.



psychological scientists believe it likely that multiple processes affect a person's sexual orientation in subtle ways (FIGURE 9.18).

In determining sexual orientation, biology might interact in various ways with aspects of environment. Daryl Bem (1996) has proposed that feeling different from opposite- or same-sex peers predicts later sexual orientation. A notable finding in the literature is that homosexuals report preferring the leisure activities of their opposite-sex peers—a tendency Bem believes may be due to biological differences in temperament. Children tend to play in same-sex groups, so boys and girls often are segregated. Regarding sexual orientation, Bem believes people are attracted to what is different. The difference creates arousal, and this arousal is the essence of sexual attraction—in Bem's words, "the exotic becomes erotic." Because the opposite sex is different, it becomes attractive; so most girls are attracted to boys, and vice versa. However, to some children, peers of their own sex seem different, so members of the same sex ultimately become erotic. Bem's model is interesting because it is based on the idea of initial biological differences in temperament but then proposes that the social environment shapes what is sexually attractive. Although the theory is supported by anecdotal evidence, so far no concrete evidence supports it. But how can researchers ever really test such theories in humans? What evidence is needed to conclude whether sexual orientation is determined or chosen?

Sexual orientation is not easy to change. Indeed, although there are Web reports of effective homosexual conversion therapies, there is little empirical evidence that these programs do any more than suppress behaviour. No good evidence exists that sexual orientation can be changed through therapy. Moreover, being with people whose sexual orientation differs from yours does not change your sexual orientation. In some cultures and subcultures, people may engage in same-sex behaviours for a period and then revert to heterosexual behaviours, as in jail, where men and women often engage in same-sex relationships but do not consider themselves homosexuals. For reasons such as these, few psychologists or physicians believe sexual orientation—as opposed simply to sexual activity—is a choice or that it can be changed. Modern society, too, is increasingly acknowledging homosexuals' rights to express their sexuality: Canada, Spain, Norway, Sweden, South Africa, and Portugal allow homosexuals to marry, and other places around the world recognize same-sex relationships in varying ways. In some ways, the contemporary world is catching up with human history, within which homosexuals have always existed, whether or not they were free to be themselves.



## SUMMING UP

### What Factors Motivate Sexual Behaviour?

Pioneering research by Alfred Kinsey launched the study of human sexual behaviour and shattered many myths regarding men's and women's sexual lives. Masters and Johnson identified four stages in the sexual response cycle that are very similar for men and women: excitement, plateau, orgasm, and resolution. Sexual behaviour involves physiological and psychological factors. Hormones influence the development of secondary sex characteristics as well as motivate sexual behaviour. However, behaviours are constrained by sexual scripts, which dictate appropriate actions for men and women. Men and women look for similar qualities in potential partners, but men are more concerned about a potential partner's attractiveness, and women are more concerned with a potential partner's status. These differences in relative importance may be due partly to the different adaptive problems the sexes faced over the course of human evolution. On average, and across nearly all measures, men have a higher level of sexual motivation and engage in more sexual activity, especially masturbation, than women do. Many theories have been devised to explain sexual orientation. Leading among them is the possibility that hormones during the individual's development while still in utero have important effects on the brain and subsequent sexual orientation, but these data are correlational and cannot be used to make causal inferences. Other theories, such as the psychoanalytic perspective (that sexual orientation is caused by parental behaviours) or that sexual orientation is carried on a specific gene, have not been supported.

## MEASURING UP

1. Identify whether each of the following statements about human sexual behaviour best describes a biological, cultural, or evolutionary perspective. Some statements may describe more than one perspective.
  - a. Researchers have found that women prefer masculine-looking faces more during ovulation than in other phases of the menstrual cycle.
  - b. Across 37 cultures, women preferred men who could earn a good living, and men rated a future mate's physical attractiveness as more important than women did.
  - c. Across religious groups and in different countries, there are differences in women's willingness to engage in premarital sex.
  - d. Women tend to prefer erotica that is more relationship oriented than men do.
  - e. Many drugs used for depression also reduce sex drive, especially in women.
  - f. Male sex function requires a minimal level of androgens.
  - g. In general, men have higher levels of sexual motivation than women do.
2. Arrange the stages of the human sexual response cycle in order, and match each stage with its description.  
Stages: plateau, excitement, resolution, orgasm, refractory.
  - a. occurs only in men
  - b. increasing signs of arousal, including blood pressure and breathing rate
  - c. contractions of the vagina for women and ejaculation of semen for men
  - d. swelling of genitals in response to blood flow
  - e. return to prestimulation state

### LEARNING OBJECTIVE

Summarize the ways culture and gender affect the expression of emotions.

Provide examples of emotional states and explain how they might have an adaptive function.

**emotion** Feelings that involve subjective evaluation, physiological processes, and cognitive beliefs.

## How Are Emotions Adaptive?

How we feel about things profoundly affects what we think and do. Almost everyone has an intuitive sense of what *emotion* means, but the term is difficult to define precisely. For psychological scientists, **emotion** (sometimes called *affect*) refers to feelings that involve subjective evaluation, physiological processes, and cognitive beliefs. Emotions are immediate responses to environmental events, such as being cut off in traffic or getting a nice gift. It is useful to distinguish emotion from *mood*, since the two often are used equivalently in everyday language. Moods are diffuse, long-lasting emotional states that influence rather than interrupt thought and behaviour. Often people who are in good or bad moods have no idea why they feel the way they do. Thus emotions tend to be specific, in response to events in the particular environment, and they typically interrupt whatever is happening or trigger changes in behaviour. Moods, by contrast, refer to a vague sense that people feel certain ways. So people feel irritated (emotion) for particular reasons (e.g., getting cut off in traffic), but they sometimes feel irritable (mood) for no apparent reasons.

Research on emotions clearly illustrates that the mind helps solve adaptive problems. Negative and positive experiences guide behaviour that increases the probability of surviving and reproducing. Emotions are adaptive because they prepare and guide behaviours, such as running when you encounter dangerous animals. Emotions provide information about the importance of stimuli to personal goals and then prepare people for actions aimed at achieving those goals (Frijda, 1994). Because humans are social animals, many emotions involve interpersonal dynamics. People feel hurt when teased, angry when insulted, happy when loved, proud when complimented, and so on. Moreover, people interpret facial expressions of emotion to predict other people's behaviour. Facial expressions provide many clues about whether our behaviour is pleasing to others or whether it is likely to make them reject, attack, or cheat us. Thus both emotions and emotional expressions provide adaptive information.

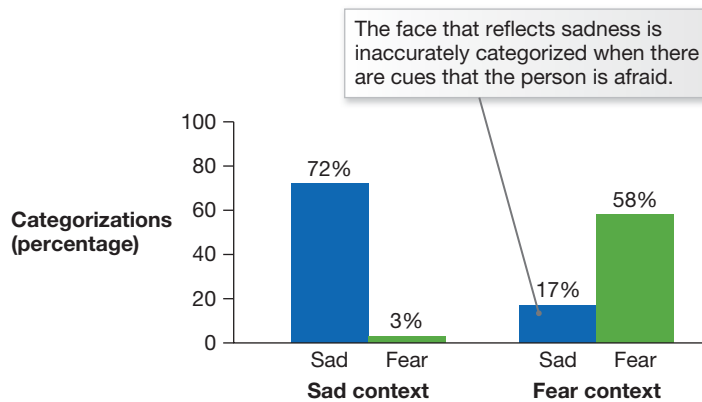
### Facial Expressions Communicate Emotion

In his 1872 book *Expression of Emotion in Man and Animals*, Charles Darwin argued that expressive characteristics were adaptive in all forms of life, from the dog's hard stare and exposed teeth when defending territory to the human's red face when preparing to fight. Being able to tell when other people or other species are threatening has obvious survival value.

Emotional expressions are powerful nonverbal communications. English alone includes over 550 words that refer to emotions (Averill, 1980), but humans can communicate emotions quite well without verbal language. Consider human infants. Because infants cannot talk, they must communicate their needs largely through nonverbal action and emotional expressions. At birth, infants are capable of expressing joy, interest, disgust, and pain. By two months of age, infants can express anger and sadness. By six months, they can express fear (Izard & Malatesta, 1987). The social importance of emotional expressions can be seen even in 10-month-old infants, who have been found to smile more while their mothers are watching (Jones, Collins, & Hong, 1991). Thus, in the absence of verbal expression, nonverbal displays of emotions signal inner states, moods, and needs. The lower half of the face may be more important than the upper half in communicating emotion. In a classic study, Knight Dunlap (1927) demonstrated that the mouth better conveys emotion than the eyes, especially for positive affect. However, the eyes are extremely important in communicating emotion. If people are presented with pictures of just eyes or just mouths and asked to identify the emotion expressed, they are more accurate when using the eyes (Baron-Cohen, Wheelwright, & Jolliffe,



(a)



(b)

**FIGURE 9.19 Contextual Effects on Categorizing Emotional Expression**

Research participants were shown images such as these and asked to categorize them as showing anger, fear, pride, sadness, disgust, surprise, or happiness. **(a)** The photo on the left pairs a sad face with a sad posture (context). The photo on the right pairs a sad face with a fearful posture. **(b)** Most participants categorized the sad face correctly when it was presented with the sad posture, but most categorized the face incorrectly, as fearful, when it was presented with the fearful posture.

1997). But if the whole face is presented at once, the mouth appears to be most important in determining how people perceive the emotional expression (Kontsevich & Tyler, 2004).

Much of the research on facial expression is conducted by showing people isolated faces. Yet in the real world faces appear in contexts that provide cues as to what emotion a person is experiencing. In an intriguing study, researchers from the Hebrew University of Jerusalem and the University of Toronto showed identical facial expressions in different contexts and found that the context profoundly altered how people interpreted the emotion (Aviezer et al., 2008). For instance, a sad face shown in a fear context leads people to incorrectly label the expression as fear (**FIGURE 9.19**).

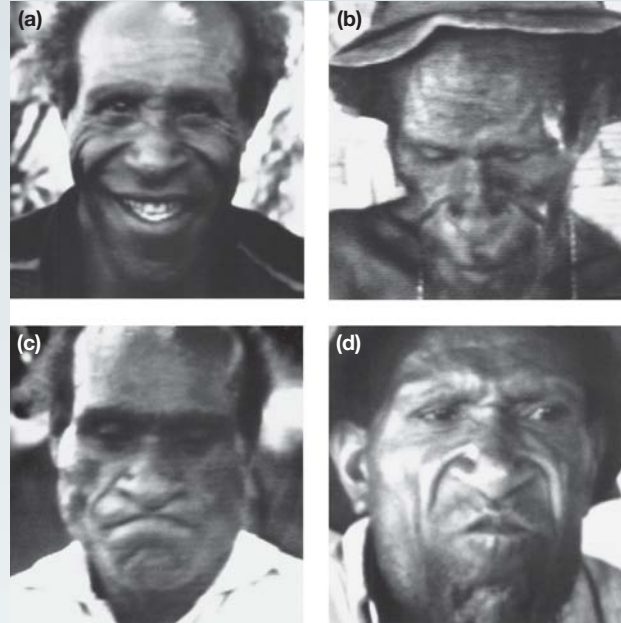
**FACIAL EXPRESSIONS ACROSS CULTURES** Darwin argued that the face innately communicates emotions to others and that these communications are understandable by all people, regardless of culture. To test this hypothesis, Paul Ekman and colleagues (1969) went to Argentina, Brazil, Chile, Japan, and the United States and asked people to identify the emotional responses displayed in photographs of posed emotional expressions. They found that people from all these countries recognized the expressions as anger, fear, disgust, happiness, sadness, and surprise. However,

## FIGURE 9.20 Scientific Method: Ekman's Study of Facial Expressions across Cultures

**Hypothesis:** The face innately communicates emotions to others, and these communications are understandable by all people, regardless of culture.

### Research Method:

- 1** In the second part of this study, participants in New Guinea were photographed displaying certain facial expressions, such as if they had come across a rotting pig or one of their children had died.
- 2** Participants from other countries were asked to identify the emotions being expressed by the New Guineans.



**Results:** People across cultures largely agreed on the meaning of different facial expressions, such as (a) happiness, (b) sadness, (c) anger, and (d) disgust.

**Conclusion:** Recognition of facial expressions may be universal and therefore biologically based.

critics could argue that, because people in these countries have extensive exposure to each other's cultures, learning and not biology is responsible for the cross-cultural agreement. The researchers then travelled to a remote area in New Guinea that had little exposure to outside cultures and where the people received only minimal formal education. The New Guinea natives were able to identify the emotions seen in the photos fairly well, although agreement was not quite as high as in other cultures. The researchers also asked participants in New Guinea to display certain facial expressions and found that evaluators from other countries identified the expressions at a level better than chance (Ekman & Friesen, 1971; FIGURE 9.20). Subsequent research finds general support for cross-cultural congruence in identifying some facial expressions; support is strongest for happiness and weakest for fear and disgust (Elfenbein & Ambady, 2002). Some scholars believe the cross-cultural consistency results may be biased by cultural differences in the use of emotion words and by the way people are asked to identify emotions (Russell, 1994). Overall, however, the evidence is sufficiently consistent to indicate that some facial expressions are universal and therefore likely biologically based.

Researchers have recently provided evidence that the physical expression of pride is biologically based. The psychologist Jessica Tracy, at the University of British Columbia, has found that young children can recognize when a person feels pride and that isolated populations with minimal Western contact also accurately identify the physical signs, which include smiling face, raised arms, expanded chest, and torso pushed out (Tracy & Robins, 2008). Tracy and colleague David Matsumoto (2008)



(a)



(b)

**FIGURE 9.21 Pride Expressions** In response to victory in a judo match, (a) a sighted athlete and (b) a congenitally blind athlete showed similarity in behavioural expression. Displays such as these suggest that the pride response is innate.

examined pride responses among those competing in judo matches in the 2004 Olympic and Paralympic Games, in which sighted and blind athletes from 37 nations competed. After victory, the behaviours displayed by sighted and blind athletes were very similar, suggesting that the pride responses are innate rather than learned by observing them in others (FIGURE 9.21).

**DISPLAY RULES AND GENDER** Although basic emotions seem to be expressed similarly across cultures, the situations in which they are displayed differ substantially. **Display rules** govern how and when emotions are exhibited. These rules are learned through socialization and dictate which emotions are suitable to given situations. Differences in display rules help explain cultural stereotypes, such as the loud and obnoxious Americans, the cold and bland British, and the warm and emotional Italians. Display rules also may explain why the identification of facial expressions is much better within cultures than between cultures (Elfenbein & Ambady, 2002).

Gender differences in display rules also guide emotional expression, particularly for smiling and crying. It is generally believed that women more readily, frequently, easily, and intensely display emotions (Plant, Hyde, Keltner, & Devine, 2000), and the current evidence suggests they do—except perhaps for emotions related to dominance, such as anger (LaFrance & Banaji, 1992). Men and women may vary in their emotional expressiveness for evolutionary reasons: The emotions most closely associated with women are related to caregiving, nurturance, and interpersonal relationships, whereas emotions associated with men are related to competitiveness, dominance, and defensiveness. Women may be more likely to display emotions, but they do not necessarily experience them more intensely. Although the evidence generally indicates that women report more intense emotions, this finding might reflect societal norms

**display rules** Rules learned through socialization that dictate which emotions are suitable to given situations.

about how women are supposed to feel (Grossman & Wood, 1993). Moreover, perhaps because of differences in upbringing, in modern Western society, women tend to be better than men at articulating their emotions (Feldman Barrett, Lane, Sechrest, & Schwartz, 2000), and this ability might account for their more intense descriptions.

## Emotions Serve Cognitive Functions

For a long time, psychological scientists studied cognitive processes without considering emotional processes. Studies on decision making, memory, and so on were conducted as if people were evaluating the information from a purely rational perspective. Yet our immediate affective responses arise quickly and automatically, colouring our perceptions at the very instant we notice an object. As Polish-born psychologist Robert Zajonc pointed out, “We do not just see ‘a house’: We see a *handsome* house, an *ugly* house, or a *pretentious* house” (1980, p. 154). These instantaneous evaluations subsequently guide decision making, memory, and behaviour. Therefore, psychological scientists now generally acknowledge that it is unrealistic to try to separate emotion from cognition (Phelps, 2006).

Clearly, people’s moods can alter ongoing mental processes. When people are in good moods, they tend to use heuristic thinking (see Chapter 8, “Thinking and Intelligence”), which allows them to make decisions more quickly and more efficiently. Positive moods also facilitate creative, elaborate responses to challenging problems and motivate persistence (Isen, 1993). During the pursuit of goals, positive feelings signal that satisfactory progress is being made, thereby encouraging additional effort. One recent theory proposes that increased dopamine levels mediate the effects of positive affect on cognitive tasks (Ashby, Isen, & Turken, 1999). According to this view, positive affect leads to higher levels of dopamine production, which subsequently lead to heightened activation of dopamine receptors in other brain areas; this activation of dopamine receptors appears crucial for the advantageous cognitive effects of positive affect.

### CRITICAL THINKING SKILL

## Recognizing and Correcting for Belief Persistence in Your Own Thinking and in That of Others

A primary reason the United States declared war on Iraq in March 2003 was the suspicion that the Iraqi government had active programs for developing weapons of mass destruction (WMDs). The assertion that Iraq had WMDs was immediately controversial and sparked a 15-month investigation by the Iraq Survey Group, organized by the Pentagon and the U.S. Central Intelligence Agency (CIA). On September 30, 2004, Charles Duelfer of the CIA submitted a much publicized report (often referred to as the Duelfer Report) concluding that Iraq had neither WMDs nor significant programs for developing them. However, despite the Duelfer Report findings and previous statements expressing similar conclusions, an October 2004 survey found that among supporters of President George W. Bush, many “continued to believe that Iraq had actual WMD (47%) or a major program for developing them (25%)” (Program on International Policy Attitudes, 2004, p. 1). According to that same survey, supporters of John Kerry, the 2004 Democratic presidential candidate, believed that Iraq had neither the weapons nor the program.

How might we explain the difference in perceptions between Bush and Kerry supporters in the face of information such as that presented in the Duelfer Report? Bush supporters in the survey likely were demonstrating *belief persistence*, the tendency to hold onto previous ideas even when presented with evidence that the belief is questionable or just plain wrong. Belief persistence is sometimes called “my side bias” to denote that regardless of the evidence, people tend to believe information consistent with the side of an issue they already believe true. One study of belief persistence found that once participants had generated their own explanations for their beliefs, they were resistant to information discrediting the beliefs they had just explained (Davies, 1997).

With practice and the desire to make the most-informed decisions possible, however, you can become aware of this pervasive bias. You can be more open to examining all sides of an issue fairly and altering your beliefs when the evidence supports the change. In fact, deliberately seeking evidence that disconfirms a belief is a good way to reduce the effects of belief persistence bias.

**DECISION MAKING** In the face of complex, multifaceted situations, emotions are heuristic guides that provide feedback for making quick decisions (Slovic, Finucane, Peters, & MacGregor, 2002). Would you rather go rock climbing in the Alps or attend a performance by a small dance troupe in Paris? Anticipated emotional states are an important source of information and a guide in decision making (see Chapter 8, “Thinking and Intelligence”). Moreover, emotion appears to have a direct effect that does not depend on cognitive processes. For instance, people might decide to cancel air travel shortly after hearing about a plane crash, even if the news does not change their outward belief about the likelihood that their own plane will crash. Recent or particularly vivid events have an especially strong influence on behaviour. Thus risk judgments are strongly influenced by current feelings, and when cognitions and emotions are in conflict, emotions typically have more impact on decisions (Loewenstein, Weber, Hsee, & Welch, 2001).

According to the *affect-as-information* theory, posited by Norbert Schwarz and Gerald L. Clore (1983), people use their current mood states to make judgments and appraisals, even if they do not know the sources of their moods. For instance, Schwarz and Clore asked people to rate their overall life satisfaction—a question that potentially involves considering a multitude of factors from a lifetime, including situations, expectations, personal goals, and accomplishments. As the researchers noted, however, in arriving at their answers people did not labour through all these elements but instead seemed to rely on their current moods. People in good moods rated their lives as satisfactory, whereas people in bad moods gave lower overall ratings. Likewise, people’s evaluations of plays, of lectures, of politicians, and even of strangers are influenced by their moods, which are influenced by day of the week, weather, health, and the like. However, if people are made aware of the sources of their moods (as when the researcher suggests that a good mood might be caused by the bright sunshine), their feelings no longer influence their judgments.

**SOMATIC MARKERS** Antonio Damasio has suggested that reasoning and decision making are guided by the emotional evaluation of an action’s consequences. In his

**somatic markers** Bodily reactions that arise from the emotional evaluation of an action's consequences.

influential book *Descartes' Error* (1994), Damasio sets forth the *somatic marker theory*, which posits that most self-regulatory actions and decisions are affected by bodily reactions called **somatic markers**. Have you ever had a queasy feeling in your stomach when you looked over the edge of a tall building? For Damasio, the term *gut feeling* can be taken almost literally. When you contemplate an action, you experience an emotional reaction based partly on your expectation of the action's outcome, an expectation influenced by your history of performing either that action or similar actions. For example, to the extent that driving fast has led to speeding tickets, which made you feel bad, you may choose to slow down when you see a speed limit sign. Damasio has found that people with damage to the frontal lobes tend not to use past outcomes to regulate future behaviour. For instance, in studies using a gambling task, patients who had damage to their frontal lobes continued to follow a risky strategy: They selected a card from a stack that had rare big rewards but frequent bad losses. The strategy had proven faulty in previous trials, partly because the participants failed to show the more typical response of increased arousal when contemplating selecting a card from the risky deck. That is, the somatic marker that would tell most people that something is a bad idea is absent among those with frontal lobe damage.

In terms of adaptiveness, emotional reactions help us select responses likely to promote survival and reproduction. Thus if we anticipate that an event, action, or object will produce a pleasurable emotional state, we will be motivated to approach it; conversely, anticipation of negative emotions motivates us to avoid other situations. Hence somatic markers may guide us to engage in adaptive behaviours.

## Emotions Strengthen Interpersonal Relations

For most of the twentieth century, psychologists paid little attention to interpersonal emotions. Guilt, embarrassment, and the like were associated with Freudian thinking and therefore not studied in mainstream psychological science. However, recent theories have reconsidered interpersonal emotions in view of humans' evolutionary need to belong to social groups. Given that survival was enhanced for those who lived in groups, those who were expelled would have been less likely to survive and pass along their genes. According to this view, people were rejected primarily because they drained group resources or threatened group stability. The fundamental need to belong, described earlier, indicates that people will be sensitive to anything that might lead them to be kicked out of the group, and social emotions may reflect reactions to this possibility. Thus social emotions may be important for maintaining social bonds.

**GUILT STRENGTHENS SOCIAL BONDS** Guilt is a negative emotional state associated with anxiety, tension, and agitation. The experience of guilt rarely makes sense outside the context of interpersonal interaction. For instance, the typical guilt experience occurs when someone feels responsible for another person's negative affective state. Thus when people believe something they did directly or indirectly harmed another person, they experience feelings of anxiety, tension, and remorse, feelings that can be labelled as guilt. Guilt occasionally can arise even when individuals do not feel personally responsible for others' negative situations (for example, survivor guilt).

Although excessive feelings of guilt may have negative consequences, guilt is not entirely negative. One theoretical model of guilt outlines its benefits to close relationships. Roy Baumeister and colleagues (1994) contend that guilt protects and



Using physiological evidence to determine whether someone is lying is not a new phenomenon in the Canadian judicial system; the polygraph, or lie detector test, has long been used for police investigations, although the Supreme Court of Canada ruled in 1987 that it cannot be used as evidence in criminal cases. As discussed in Chapter 2, a polygraph is used during questioning to measure physiological responses that indicate emotional arousal, such as heart and breathing rate. The theory behind polygraphs is that lying is stressful and that when people are stressed they are aroused. To determine a person's nonaroused physiological responses, the polygrapher asks the participant control questions designed not to be arousing, such as "Are you a student?", interspersed with critical questions pertinent to the investigation, such as "Did you steal the necklace?" The difference between the responses to the control and critical questions is the measure used to determine if the subject is lying (FIGURE 9.22). The problem is, people may also be aroused if they have been falsely accused or framed, if they are afraid, if they are attracted to the person administering the test, or for any number of other reasons. Also, participants can increase their arousal states for control questions by tensing up, biting their tongues, or tightening their anal sphincter muscles; they then can make an effort to relax for critical questions. University students who were taught these methods could avoid detection by experienced polygraphers 50 percent of the time. One study has shown that polygraphy identifies guilty subjects 76 percent of the time and wrongly accuses someone of lying 37 percent of the time (Kleinmuntz & Szucko, 1984).

Because polygraphs can be unreliable, more-sophisticated methods are being pursued. One such technology, computerized knowledge assessment (CKA), measures the increases and decreases in an EEG brain wave response called P300. The P300 wave has greater amplitude when a person recognizes a familiar sound, smell, or sight. Hypothetically, a suspected terrorist could be shown pictures of a terrorist training camp, or a suspected criminal could be shown pictures of a crime scene, and the suspect's P300 response would indicate either familiarity or unfamiliarity with the scene. CKA was developed by Lawrence Farwell, who calls his method *brain fingerprinting* (Farwell & Donchin, 1991; Farwell & Smith, 2001) and has formed a company to market it. In 2000, brain fingerprinting was ruled admissible evidence by one Iowa court. However,

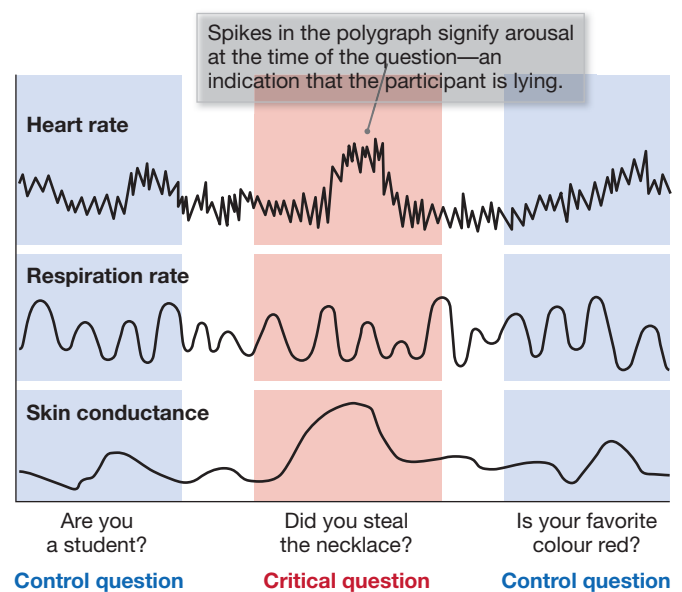


FIGURE 9.22 Polygraph Questioning

opponents of its use point out that it has not received adequate and objective testing (Wolpe, Foster, & Langleben, 2005). The case of CKA raises the question of whether judges are qualified to decide when scientific research has been adequately verified and peer-reviewed. The court relies on expert witnesses, but who decides which of these so-called experts are qualified? Should there also be specific criteria or a peer-reviewed process to approve expert witnesses?

Another lie detection technology uses fMRI to compare the brain activity of liars with that of truth tellers. Daniel Langleben and colleagues (2002) have found cognitive differences between deception and truth telling that have neural correlates detectable by fMRI. Two companies, No Lie MRI and Cephos, are working on improving the accuracy of fMRI lie detection so the technology can be admitted in court.

Lie detecting technology has huge potential, ranging from local law enforcement and courts to screening for terrorists. Private industries would be interested in screening future employees. Scout troops, schools, and daycare centres would be interested in screening applicants for child molesters. Are these uses of the technology legitimate and justified? Where do we draw the line?



**FIGURE 9.23 Blushing** The United Kingdom's Prince William is blushing, but his straightforward gaze and sly grin do not tell us why.

strengthens interpersonal relationships in three ways. First, feelings of guilt keep people from doing things that would harm their relationships—such as cheating on their partners—while encouraging behaviours that strengthen relationships, such as phoning their parents regularly. Second, displays of guilt demonstrate that people care about their relationship partners, thereby affirming social bonds. Third, guilt is an influence tactic that can be used to manipulate others. Guilt is especially effective when people hold power over us and it is difficult to get them to do what we want. For instance, you might try to make your boss feel guilty so you do not have to work overtime. Children may use guilt to get adults to buy them presents or grant them privileges.

Evidence indicates that socialization is more important than biology in determining specifically how children experience guilt. One longitudinal study examined socialization's impact on the development of various negative emotions, including guilt, in identical and dizygotic (fraternal) twins at 14, 20, and 24 months (Zahn-Waxler & Robinson, 1995). The study found that all the negative emotions showed considerable genetic influence (as evidenced by higher concordance rates for identical twins), but guilt was unique in being highly influenced by social environment. With age, the influence on guilt of a shared environment became stronger, whereas the evidence for genetic influences disappeared. These findings support the hypothesis that socialization is the predominant influence on moral emotions such as guilt. Perhaps surprisingly, parental warmth is associated with greater guilt in children, suggesting that feelings of guilt arise in healthy and happy relationships. As children become citizens in a social world, they develop the capacity to empathize, and they subsequently experience feelings of guilt when they transgress against others.

**EMBARRASSMENT AND BLUSHING** Embarrassment usually occurs following violations of cultural norms, loss of physical poise, teasing, and self-image threats (Miller, 1996). Some theories of embarrassment suggest that it rectifies interpersonal awkwardness and restores social bonds after a transgression. Embarrassment represents submission to and affiliation with the social group and a recognition of the unintentional social error. Research supports these propositions in showing that individuals who look embarrassed after a transgression elicit from onlookers more sympathy, more forgiveness, more amusement, and more laughter (Cupach & Metts, 1990). Like guilt, embarrassment may reaffirm close relationships after a transgression.

The American writer Mark Twain once said, “Man is the only animal that blushes. Or needs to.” Darwin, in his 1872 book, called blushing the “most peculiar and the most human of all expressions,” thereby separating it from emotional responses he deemed necessary for survival (FIGURE 9.23). Recent theory and research suggest that blushing occurs when people believe others view them negatively and that blushing communicates a realization of interpersonal errors. This nonverbal apology is an appeasement that elicits forgiveness in others, thereby repairing and maintaining relationships (Keltner & Anderson, 2000).



## SUMMING UP

### How Are Emotions Adaptive?

Emotions are adaptive because they bring about states of behavioural readiness. The evolutionary basis for emotions is supported by research on the cross-cultural recognition of emotional displays. Facial expressions communicate meaning

to others and enhance emotional states. Emotions aid in memory processes by garnering increased attention and deeper encoding of emotionally relevant events. Positive and negative emotions serve as guides for action. Emotions also repair and maintain close interpersonal relationships.

### MEASURING UP

1. A display rule is \_\_\_\_\_.
  - a. a term that refers to displays of aggression among animals in the wild
  - b. a rule that specifies when and how certain people can express an emotion
  - c. a way of measuring the extent of people's emotions
  - d. an interacting system of guidelines for interpreting various motivations
2. What is a likely explanation for blushing?
  - a. It is a nonverbal way of admitting a mistake.
  - b. It has no adaptive function, although in earlier times it probably signalled lower social status.
  - c. It shows a disregard for others and thus can maintain social status for the blushing person.
  - d. It signals weakness, which is important in human evolution.

## How Do People Experience Emotions?

Psychologists generally agree that emotions have three components: the *subjective experience*, or the feelings that accompany the emotions; the *physical changes*, such as increases in heart rate, in skin temperature, and/or in brain activation; and the *cognitive appraisal*, people's beliefs and understandings about why they feel the way they do.

### Emotions Have a Subjective Component

Emotions are *phenomenological*, meaning we experience them subjectively. We know we are experiencing emotions, in other words, because we *feel* them. The intensity of emotional reactions varies; some people report many distinct emotions every day, whereas others report only infrequent and minor emotional reactions. People who are overemotional or underemotional tend to have psychological problems. Among the former are people with *mood disorders* such as depression or panic attacks. People with mood disorders experience such strong emotions that they can become immobilized.

At the other extreme are those who suffer from *alexithymia*, a disorder in which people do not experience emotions' subjective component. Elliot, discussed at the beginning of this chapter, had alexithymia as a result of his brain surgery. One cause of the disorder is that the physiological messages associated with emotions do not reach the brain centres that interpret emotion. Damage to certain brain regions, especially the prefrontal cortex, is associated with a loss of mood's subjective component. Since a person with alexithymia does not experience (or express) many emotions, does it surprise you to learn that recent studies have found symptoms of alexithymia are more common in men than in women (Levant et al., 2006)? The question of whether women generally experience more emotions—or experience them more deeply—than men do has proved difficult to answer because the display rules are different for women and men. As discussed in Chapter 14,

### LEARNING OBJECTIVES

Differentiate between primary and secondary emotions.

Compare the three main theories of emotion—James-Lange, Cannon-Bard, and two-factor—and provide an example of each.

Describe the major physiological components of emotion.

women are more likely to be depressed than men are. On the other hand, men are more likely to report an absence of emotions. Do these findings reflect learned patterns of behaviours or biologically based sex differences? Because nature and nurture work together, it is difficult—often impossible—to distinguish their effects.

**primary emotions** Evolutionarily adaptive emotions that humans share across cultures; they are associated with specific biological and physical states.

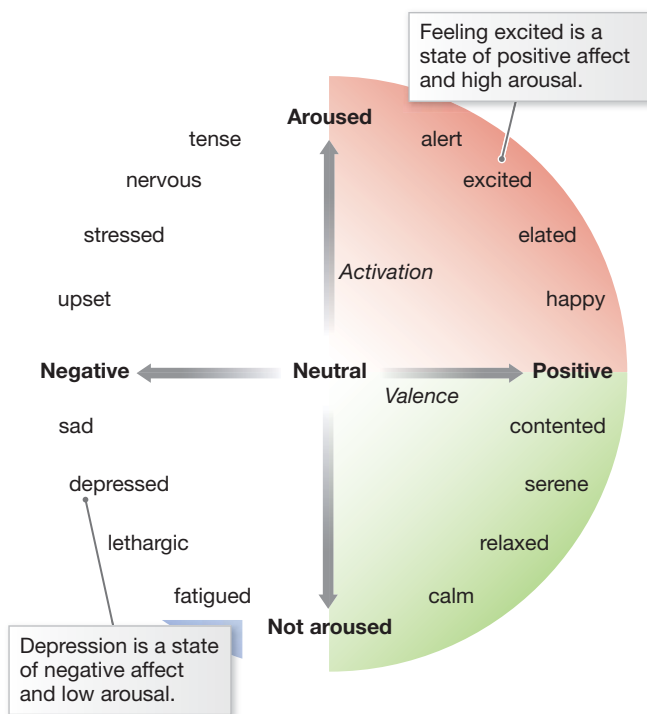
**secondary emotions** Blends of primary emotions, including states such as remorse, guilt, submission, and anticipation.

**DISTINGUISHING AMONG TYPES OF EMOTIONS** How many emotions does a person experience, and how are different emotions related to one another? Many emotion theorists distinguish between primary and secondary emotions, an approach conceptually similar to viewing colour as consisting of primary and secondary hues. Basic or **primary emotions** are evolutionarily adaptive, shared across cultures, and associated with specific biological and physical states. They include anger, fear, sadness, disgust, and happiness—and possibly surprise and contempt. **Secondary emotions** are blends of primary emotions; they include remorse, guilt, submission, and anticipation.

One approach to understanding the experience of emotion is the *circumplex model*, in which emotions are arranged in a circle around the intersections of two core dimensions of affect (Russell, 1980). The circumplex maps emotions according to their *valence*, indicating how negative or positive they are, and their *activation*, indicating how arousing they are (FIGURE 9.24). Psychologists have debated the names of dimensions and the whole idea of naming dimensions, but circumplex models have proved useful as a basic taxonomy, or classification system, of mood states (Barrett, Mesquita, Ochsner, & Gross, 2007).

As David Watson and his colleagues (1999) have pointed out, negative and positive affect are independent—people can even experience both kinds of emotions simultaneously. For example, consider the bittersweet feeling of being both happy and sad, as you might feel when remembering good times with someone who has died. In one study, research participants surveyed just after seeing the movie *Life Is Beautiful* (in which a good-natured father tries to protect his son in a Nazi prison camp), moving out of their dormitories, or graduating from university felt happy and sad at the same time (Larsen, McGraw, & Cacioppo, 2001). Neurochemical evidence supports the idea that positive and negative affect are independent, suggesting that positive activation states are associated with an increase in dopamine and negative activation states are associated with an increase in norepinephrine (on neurochemistry, see Chapter 3, “Biological Foundations”). Further, Watson and colleagues argue that positive and negative activations are adaptive. For instance, the motivation to seek out food, sex, and companionship is typically associated with pleasure, whereas the motivation to avoid dangerous animals is associated with pain (Watson, Wiese, Vaidya, & Tellegen, 1999).

**FIGURE 9.24** Circumplex Map of Emotion



### Emotions Have a Physiological Component

Emotions are associated with physical changes. Common sense suggests the emotions lead to the physical changes—we feel angry or sad or embarrassed, and our bodies respond. But in 1884, William James argued that it was just the opposite. In a proposal similar to one Descartes made in the 1600s concerning the split between mind and body (see Chapter 1, “Introduction”), James asserted that a person’s interpretation of the physical changes in a situation leads that person to feel an emotion. In James’s words, “we feel sorry because we cry, angry because we strike, afraid

because we tremble, [it is] not that we cry, strike, or tremble because we are sorry, angry, or fearful” (1884, p.190). James believed that physical changes occur in distinct patterns that translate directly into specific emotions. Around the same time, a similar theory was independently proposed by the Danish physician and psychologist Carl Lange, so the idea that felt emotion is the result of perceiving specific patterns of bodily responses is called the *James-Lange theory of emotion*.

One implication of the James-Lange theory is that if you mould your facial muscles to mimic an emotional state, you activate the associated emotion. According to the *facial feedback hypothesis*, first proposed by Silvan Tomkins in 1963, facial expressions trigger the experience of emotions, not the other way around. James Laird tested this idea in 1974 by having people hold a pencil between their teeth or with their mouths in a way that produced a smile or a frown (FIGURE 9.25). When participants rated cartoons, those in a posed smile found the cartoons funniest. Further support comes from the results of studies by Paul Ekman and colleagues (1983), who asked professional actors to portray anger, distress, fear, disgust, joy, and surprise. Physiological changes recorded during the actors’ portrayals differed for various emotions. Heart rate changed little with surprise, joy, and disgust, but it increased with distress, fear, and anger. Anger was also associated with higher skin temperature, whereas the other emotions resulted in little change in skin temperature. Thus these results give some support to James’s theory that specific patterns of physical changes are the basis for emotional states. However, subsequent evidence suggests that physical reactions are not specific enough to fully explain the subjective experience of emotions. We experience more emotions than there are distinct bodily reactions.

The counterintuitive James-Lange theory quickly attracted criticism. In 1927, Walter Cannon, who had developed the idea of homeostasis, noted that although the human mind is quick to experience emotions, the body is much slower, taking at least a second or two to respond. Cannon also noted that many emotions produced similar visceral responses, making it too difficult for people to determine quickly which emotion they were experiencing. For instance, anger, excitement, and sexual interest all produce similar changes in heart rate and blood pressure. Cannon, along with Philip Bard, proposed instead that the mind and body operate independently in experiencing emotions. According to the *Cannon-Bard theory of emotion*, the information from an emotion-producing stimulus is processed independently in cortical and in subcortical structures, causing the experience of two separate things at roughly the same time: an emotion (from cortex) and a physical reaction (from subcortex). When a grizzly bear threatens you, for example, you simultaneously feel afraid, begin to sweat, experience a pounding heart, and—if you can—run (FIGURE 9.26). Everything happens together.

**THE AMYGDALA** In 1937, James Papez proposed that many subcortical brain regions were involved in emotion. Fifteen years later, fellow American Paul MacLean expanded this list and called it the *limbic system*. (As discussed in Chapter 3, the limbic system consists of brain structures that border the cerebral cortex.) We now know that many brain structures outside the limbic system are involved in emotion and that many limbic structures are not central to emotion per se. For instance, the hippocampus is important mostly for memory and the hypothalamus mostly for motivation. Thus the term *limbic system* is used mainly in a rough, descriptive way rather than as a means of directly linking brain areas to specific emotional functions. For understanding emotion, the two most important brain regions are the amygdala and the prefrontal cortex (FIGURE 9.27).

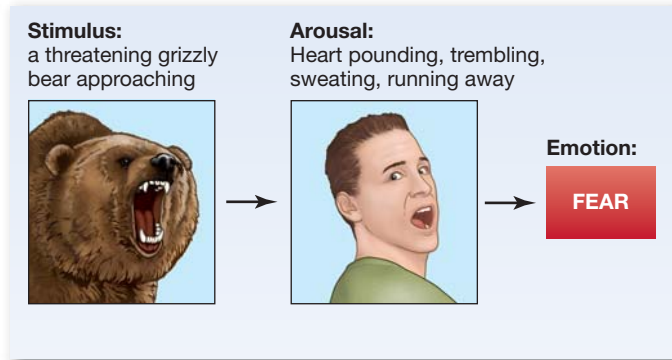
The amygdala processes the emotional significance of stimuli and generates immediate emotional and behavioural reactions (Phelps, 2006). According to Joseph LeDoux (2007), affective processing in the amygdala is a circuit that has developed



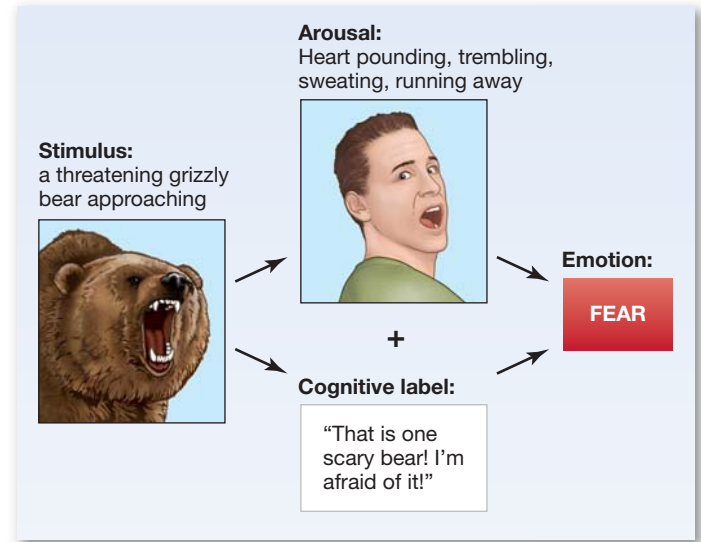
**FIGURE 9.25 Facial Feedback**

**Hypothesis** Even the forced alteration of a person’s facial expression can change that person’s experience of emotion. The woman on the left (“smiling” because of the pen in her mouth) will more likely report feeling happy than will the woman on the right (“frowning” because of the pencil on her lip). Try holding a pencil in these positions and reflecting on your feelings.

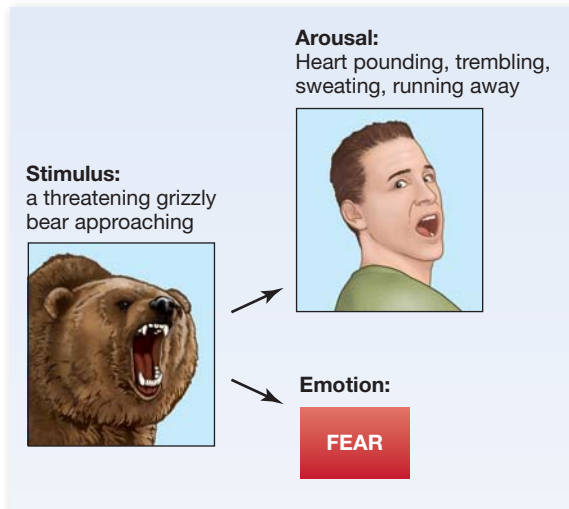
**James-Lange Theory**



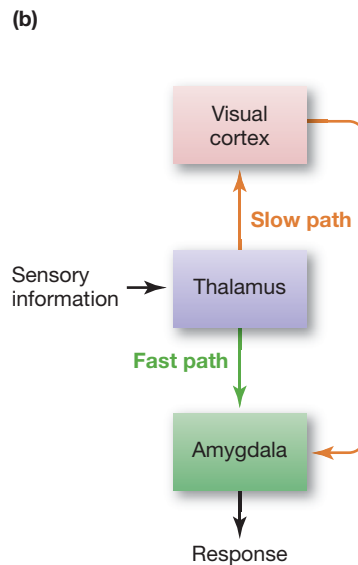
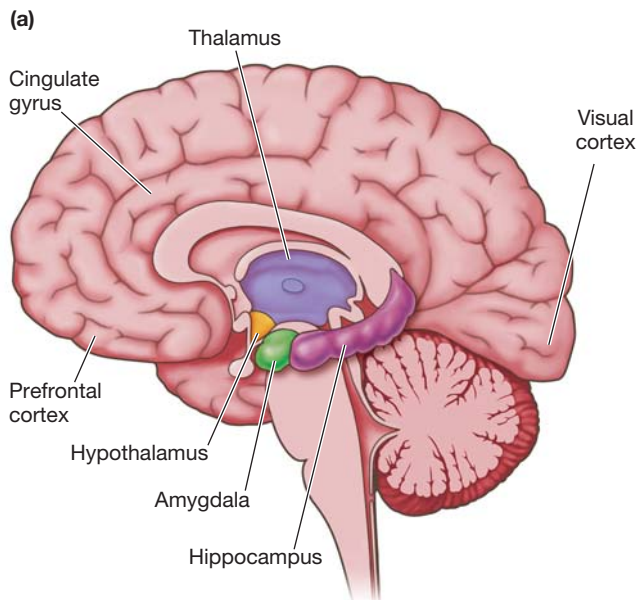
**Schachter Two-Factor Theory**



**Cannon-Bard Theory**



**FIGURE 9.26 Three Major Theories of Emotion** The theories differ not only in their relative emphases on physiology and on cognition but also in terms of when an emotional state is determined. (The two-factor theory is discussed below.)



**FIGURE 9.27 The Emotional Brain** (a) The two most important brain structures for processing emotion are the amygdala and prefrontal cortex. (b) There are two pathways for assessing and responding to emotion-producing stimuli.

over the course of evolution to protect animals from danger. LeDoux (1996; 2007) has established the amygdala as the brain structure most important for emotional learning, as in the development of classically conditioned fear responses (see Chapter 6, “Learning”). Humans with damage to the amygdala show fear when confronted with dangerous objects, but they do not develop conditioned fear responses to objects associated with dangerous objects. For instance, if people receive an electric shock each time they see a picture of a blue square, they normally will develop a conditioned response, evidenced by greater physiological arousal, when they see the blue square. But people with damage to the amygdala do not show classical conditioning of these fear associations. Consider patient S.P., who first showed signs of neurological impairment around age three and later was diagnosed with epilepsy (Anderson & Phelps, 2000). At age 48, her right amygdala was removed to reduce the seizures’ frequency. The surgery was reasonably successful, and S.P. retained most of her intellectual faculties. She has a normal IQ, has taken university courses, and performs well on standardized tasks of visual attention. However, she does not show fear conditioning. Strangely, S.P. can tell you that the blue square is associated with shock, but her body shows no physiological evidence of having acquired the fear response.

Information reaches the amygdala along two separate pathways. The first path is a “quick and dirty” system that processes sensory information nearly instantaneously. Sensory information travels quickly through the thalamus to the amygdala for priority processing. (As discussed in Chapter 5, “Sensation and Perception,” all sensory information except smell travels to the thalamus before going on to other brain structures and the related portion of the cortex.) The second pathway is somewhat slower, but it leads to more deliberate and thorough evaluations. Sensory material travels from the thalamus to the visual cortex, where the information is scrutinized in greater depth before it is passed along to the amygdala. Contemporary thinking is that the fast system prepares animals to respond should the slower pathway confirm the threat.

As noted in Chapter 7, emotional events are especially likely to be stored in memory. Indeed, brain imaging studies demonstrate that increased activity in the amygdala during an emotional event is associated with improved long-term memory for that event (Cahill et al., 2001; Hamann, Ely, Grafton, & Kilts, 1999). Researchers believe the amygdala modifies how the hippocampus consolidates memory, especially memory for fearful events (Phelps, 2004; 2006). That is, emotions such as fear strengthen memories.

Another role of the amygdala in processing emotions is its involvement in the perception of social stimuli, as in deciphering facial expressions’ affective meanings. For instance, fMRI studies demonstrate that the amygdala is especially sensitive to the intensity of fearful faces (Dolan, 2000). This effect occurs even if a face is flashed so quickly on a screen that participants are unaware they have seen it (Whalen et al., 1998). Perhaps surprisingly, the amygdala reacts more when a person observes a face displaying fear than when the person observes a face displaying anger. On the surface this difference makes little sense, because a person looking at you angrily is likely to be more dangerous. According to some researchers, the greater activity of the amygdala when a person looks at a frightened face is due to the ambiguity of the situation (Whalen et al., 2001)—that is, to the perceiver’s not being sure what the person fears. The amygdala also responds to other emotional expressions, even happiness, but generally the effect is greatest for fear. One study showed that the amygdala can be activated even by neutral facial expressions, but only in chronically anxious people (Somerville, Kim, Johnstone, Alexander, & Whalen, 2004).

Given that the amygdala is involved in processing the emotional content of facial expressions, it is not surprising that social impairments result when the amygdala is damaged. Those with damage to the amygdala often have difficulty evaluating the

## FIGURE 9.28 Try for Yourself: Evaluate Facial Expressions

Which of these people would you trust?



**Results:** Most people would say the person on the right looks more trustworthy.

**Conclusion:** The person on the left appears shifty-eyed and avoids our gaze, and therefore he looks less trustworthy. People with certain brain injuries cannot detect how trustworthy people are from facial expressions such as these.

intensity of fearful faces—but they do not show impairments in judging the intensity of other facial expressions, such as happiness. One study suggests that those with damage to the amygdala can tell a smile from a frown but that they fail to use information within facial expressions to make accurate interpersonal judgments (Adolphs, Tranel, & Damasio, 1998). For instance, they have difficulty using photographs to assess people's trustworthiness—a task most people can do easily (Adolphs, Sears, & Piven, 2001; **FIGURE 9.28**). They also tend to be unusually friendly with people they do not know, perhaps because they lack both the normal mechanisms for caution around strangers and the feeling that some people should be avoided.

**THE PREFRONTAL CORTEX** Antonio Damasio has found that patients such

as Elliot (discussed in the opening of this chapter), who have damage to the middle of the prefrontal region, often are insensitive to somatic markers (discussed above), the bodily responses that usually accompany emotions. When these regions are damaged, people still can recall information, but it has lost most of its affective meaning. They might be able to describe their current problems or talk about the death of a loved one, but they do so without experiencing any of the emotional pain that normally accompanies such thoughts.

Some evidence suggests that the left and right frontal lobes are affected by different emotions. The psychological scientist Richard Davidson has shown that unequal activation of the left and right hemispheres of the prefrontal cortex is associated with specific emotional states, a pattern known as *cerebral asymmetry*. In a series of studies, Davidson and his colleagues (2000) found that greater activation of the right prefrontal cortex is associated with negative affect, whereas greater activation of the left hemisphere is associated with positive affect. People also can be dominant in one hemisphere, and that hemisphere can bias emotion. Hemispherical dominance is assessed through a series of questions that ask participants how they might feel in an emotional situation (such as being anxious). Those who tend to move their eyes to the right are left-hemisphere dominant, and those who move theirs to the left are right-hemisphere dominant. A study of responses to film clips found that people who were left-hemisphere dominant showed the most positive response to pleasant scenes, whereas those who were right-hemisphere dominant showed the most negative response to unpleasant scenes. As you might expect from this pattern, people who tend to be depressed show greater right than left hemisphere activity, mainly because the left hemisphere does not seem to respond normally (Davidson et al., 2002).

### Emotions Have a Cognitive Component

According to Stanley Schachter's *two-factor theory of emotion*, a situation evokes a physiological response, such as arousal, and a cognitive interpretation, or *emotion label*. When people experience arousal, they initiate a search for its source. According to Schachter,



a person searches for an explanation when, for instance, his or her heart starts to race and his or her blood pressure rises. So the person might, for example, see a grizzly bear approaching and immediately label bodily responses such as racing heart and rising blood pressure as fear. Although the search for a cognitive explanation is often quick and straightforward, since we generally recognize the event that led to our emotional state, sometimes the situation is more ambiguous. What happens then? According to the two-factor theory, whatever the person believes caused the emotion will determine how the person labels the emotion.

Schachter and Jerome Singer (1962) devised an ingenious experiment to test the two-factor theory. First, participants were injected with either a stimulant or a placebo. The stimulant was adrenaline, which produced symptoms such as sweaty palms, increased heart rate, and shaking. Then participants either were told that the drug they took would make them feel aroused or were not told anything about the drug's effects. Finally, each participant was left to wait with a confederate of the experimenter, someone who was working with the experimenter and behaved according to the research plan. In the euphoric condition, each participant was exposed to a confederate who was in a great mood, played with a hula hoop, and made paper airplanes. In the angry condition, each participant was seated in a room with a confederate. Both the participant and the confederate were asked to fill out a long questionnaire that asked them very intimate, personal questions, such as "With how many men (other than your father) has your mother had extramarital relationships?" (To make the question even more insulting, the choices were four or fewer, five to nine, or ten or more.) The confederate became increasingly angry as he filled out the questionnaire. Finally, he ripped it up and stormed out of the room. Participants who received the adrenaline but were told how their bodies would respond to the drug had an easy explanation for their arousal and attributed it to the adrenaline, not to the situation. In contrast, the participants who received adrenaline but were not given information about its effects, who were just as aroused as the informed group but did not know why, looked to the environment to explain or label their body's response—sweating palms, increased heart rate, and shaking. Participants in the no-explanation group reported that they felt happy when they waited with the euphoric confederate and that they felt less happy when they waited with the angry confederate. They attributed their feelings to what was happening in the environment; participants in the informed group did not (FIGURE 9.29).

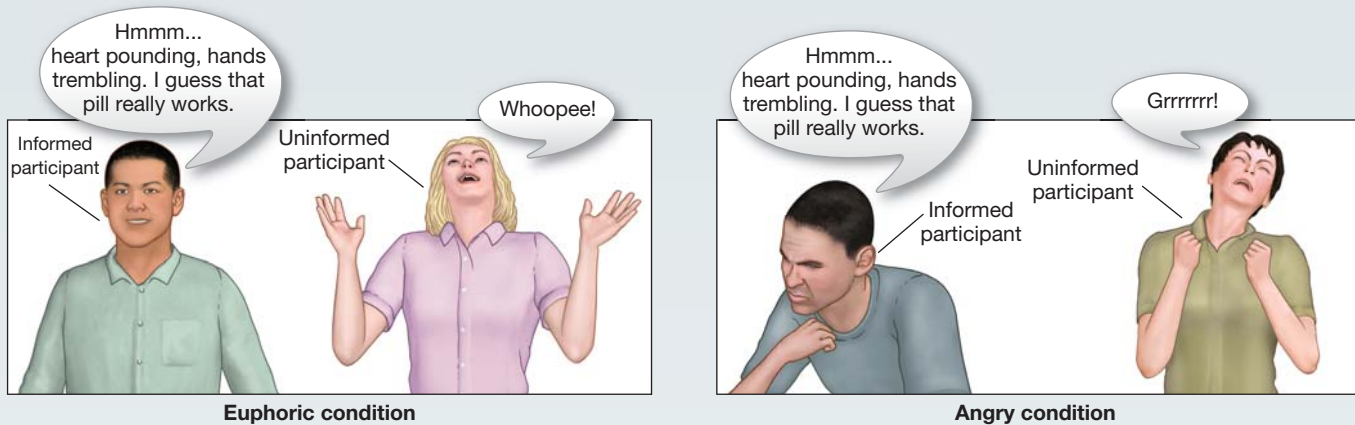
**PEOPLE CAN MISATTRIBUTE THE SOURCE OF EMOTIONAL STATES** One interesting implication of the Schachter theory is that physical states caused by a situation can be attributed to the wrong emotion. When people misidentify the source of their arousal, it is called *misattribution of arousal*. In one exploration of this phenomenon, researchers tried to see whether people could fall in love through misattribution (Dutton & Aron, 1974). Male participants were met by an interviewer on one of two bridges over the Capilano River in British Columbia. One was a narrow suspension bridge with a low rail that swayed 70 metres above raging, rocky rapids; the other was a sturdy modern bridge just above the river. An attractive female research assistant approached the men and interviewed them in the middle of the bridge. She gave them her phone number and offered to explain the results of the study to them at a later date if they were interested. According to the two-factor theory of emotion, the less stable bridge would produce arousal (sweaty palms, increased heart rate), which could be misattributed as attraction to the interviewer. Indeed, men interviewed on the less stable bridge were more likely to call the interviewer and ask her

## FIGURE 9.29 Scientific Method: Testing the Two-Factor Theory

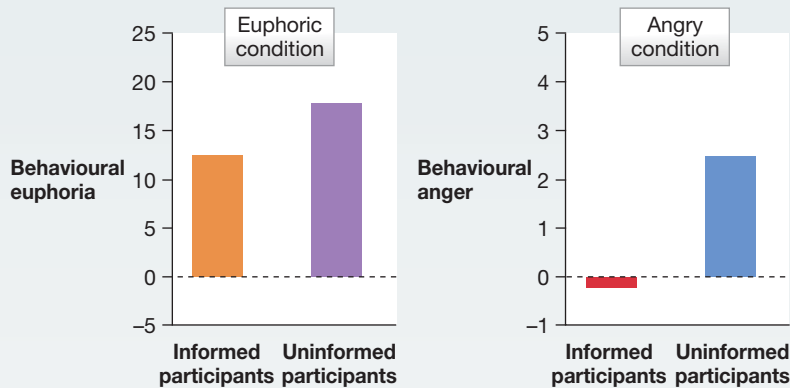
**Hypothesis:** Whatever a person believes caused an emotion will determine how the person experiences and labels the emotion.

**Research Method:**

- 1 Participants were injected with a stimulant (adrenaline) or a placebo.
- 2 Informed participants were told the drug they were given might make them feel shaky, cause their hearts to beat faster, and make their faces feel flushed, all of which are side effects of taking adrenaline. Uninformed participants were not told anything about the drug's effects.
- 3 In the euphoric condition, each participant was exposed to a confederate who was in a great mood, played with a hula hoop, and made paper airplanes. In the angry condition, each participant was seated with a confederate. Both the participant and the confederate were asked to fill out a questionnaire that asked very insulting questions, such as a question that implied their mothers had cheated on their fathers. The confederate became angry, tore up the questionnaire, and stormed out of the room.
- 4 The experimenters coded behavioural indicators of euphoria, such as joining in the fun, and of anger, such as agreeing with the angry confederate. Participants were also asked about their emotional states, such as whether they felt happy or angry.



**Results:** Participants who received the adrenaline but were told how their bodies would respond to the drug had an easy explanation for their arousal and attributed it to the adrenaline, not to the situation. In contrast, the participants who received adrenaline but were not given information about its effects looked to the environment to explain or label their bodies' responses.



Uninformed participants displayed behavioural indicators of euphoria (see graph at left) and reported that they felt happy when they waited with the euphoric confederates. They displayed behavioural indicators of anger and reported being irritated when they waited with the confederate who became angry at responding to insulting questions. These results happened because the uninformed participants attributed their feelings to what was happening in the environment. Informed participants did not react in the same ways or make the same attributions.

**Conclusion:** Feelings of arousal can be attributed to events in the environment, thereby shaping people's emotions.

for a date (FIGURE 9.30). A possible confound is that there could have been initial differences among the men who chose to cross the less stable bridge and those who chose the safer bridge—perhaps men who were more likely to take risks were more likely to take a scary bridge and to call for a date. However, the general idea that people can misattribute arousal for affection has been supported in other studies.

During a similar form of misattribution, *excitation transfer*, residual physiological arousal caused by one event is transferred to a new stimulus. In the period after exercise, for example, there is a slow return to baseline during which the body continues to have residual arousal symptoms, such as an elevated heart rate. However,

after a few minutes, most people will have caught their breath and may not realize their bodies are still aroused. During this interim period, they likely will transfer the residual excitement from the exercise to any event that occurs. This response has a practical application: You might want to take a date to a movie that produces arousal—a tear-jerker or an action film—in the hope that residual arousal will be misattributed to you.

## People Regulate Their Moods

As discussed extensively above, emotions are adaptive, helping us respond to environmental challenges in ways that have proved successful over the course of human evolution. At the same time, emotions can be disruptive and troublesome—as when people feel so anxious that they cannot study for exams, or when they are so angry at someone who raced ahead of them at an intersection that they want to run the other car off the road. In our daily lives, circumstances often require us to harness our emotional responses, but doing so is not easy. Consider how difficult it is to mask your expression of disgust when you are obligated by politeness to eat something you dislike—or when you have to be nice about losing a competition that really matters to you.

Successfully regulating our emotional states depends on several strategies. Some of these strategies help us prevent or prepare for bad events, and some of them help us deal with those events after they occur. James Gross (1999) outlined various strategies people use to regulate their emotions. For instance, they try to put themselves in certain situations and to avoid other situations. If you want to feel romantic when proposing to your girlfriend, you are better off doing so in a quiet, intimate bistro than in a fast-food joint; if you want to avoid feeling jealous of your sister's athletic skill, you could choose not to attend her soccer, basketball, and softball games; and so on. People also can help manage their emotional states by focusing their attention on certain aspects of situations. If you are afraid of flying, for example, you can distract yourself from your anxiety by helping the woman next to you entertain her restless toddler. People also can try to directly alter their emotional reactions to events by reappraising those events in more neutral terms. So, if you get scared while watching a movie, you can remind yourself that the whole spectacle has been staged and no one is actually being hurt. Recent studies have found that engaging in reappraisal changes the activity of brain regions involved in the experience of emotion (Ochsner, Bunge, Gross, & Gabrieli, 2002).

**HUMOUR** Humour is a simple, effective method of regulating negative emotions and has many mental and physical health benefits. Most obviously, humour increases positive affect. When we find something humorous, we smile, laugh, and enter a state of pleasurable, relaxed excitement. Research shows that laughter stimulates endocrine secretion, improves the immune system, and stimulates the release of hormones, dopamine, serotonin, and endorphins. When people laugh, they experience rises in circulation, blood pressure, skin temperature, and heart rate, along with a decrease in pain perception. All these responses are similar to those resulting from physical exercise, and they are considered beneficial to short-term and long-term health.

People sometimes laugh in situations that do not seem very funny, such as funerals or wakes. According to one theory, laughing in these situations helps people distance themselves from their negative emotions and strengthens their connections to other people. In one study on the topic, Dacher Keltner and George Bonanno (1997) interviewed 40 people who had recently lost a spouse. The researchers found that genuine laughter during the interview was associated with positive mental health and fewer negative feelings, such as grief. It was a way of coping with a difficult situation.



**FIGURE 9.30 Excitation Transfer** Men who walked across this narrow and scary bridge over the Capilano River displayed more attraction to a female experimenter on the bridge than did men who walked across a safer bridge.

## Real World PSYCHOLOGY

**SUPPRESSION AND RUMINATION** People make two common mistakes when trying to regulate mood. The first is *thought suppression*, in which they attempt not to feel or respond to the emotion at all. Research by the Calgary-born Daniel Wegner and his colleagues (1990) has demonstrated that trying to suppress negative thoughts is extremely difficult and often leads to a *rebound effect*, in which people think more about something after suppression than before. Thus, for example, people who are dieting and try to not think about tasty foods end up thinking about them more than if they had tried to engage in another activity as a way of not thinking about food. *Rumination*, the second mistake, involves thinking about, elaborating, and focusing on undesired thoughts or feelings. This response prolongs the mood and impedes successful mood regulation strategies, such as distracting oneself or focusing on solutions for the problem (Lyubomirsky & Nolen-Hoeksema, 1995).

Overall, distraction is the best way to avoid the problems that come with thought suppression or with rumination, since distraction absorbs attention and temporarily helps people stop thinking about their problems. But some distractions backfire, such as thinking about other problems or engaging in maladaptive behaviours. As noted in Chapter 4, for example, when people escape self-awareness, they sometimes overeat or binge drink. Moreover, watching a movie that captures your attention helps you escape your problems, but watching a movie that reminds you of your troubled situation may lead you to wallow in mental anguish.

## SUMMING UP

### How Do People Experience Emotions?

Emotions are often classified as primary emotions, which are similar across cultures and have an evolutionarily adaptive purpose, or secondary emotions, which are blends of primary emotions. Emotions have a valence (positive or negative) and a level of activation (level of arousal). The three main theories of emotion differ in their relative emphases on subjective experience, physiological changes, and cognitive interpretation. The James-Lange theory states that specific patterns of physical changes give rise to the perception of associated emotions. The Cannon-Bard theory proposes that two separate pathways, physical changes and subjective experience, occur at the same time. Schachter's two-factor theory emphasizes the combination of generalized physiological arousal and cognitive appraisals in determining specific emotions. We often misattribute the causes of our emotions, seeking environmental explanations for our feelings. People also use various strategies to alter their moods. The best methods for regulating negative affect include humour and distraction.

## MEASURING UP

For each of the three main theories of emotions—James-Lange, Cannon-Bard, and two-factor—select all the descriptive statements and examples that apply. Some answers may apply to more than one theory.

Descriptive statements:

1. Our emotions follow from our bodily responses.
2. Our cognitive responses to situations are important in determining our emotions.
3. Bodily responses are an important part of how we label emotions.
4. Excitation transfer is incompatible with this theory of emotion.

Examples:

- a. If you sing a happy song, you will feel happy.
- b. If you want someone to fall in love (not necessarily stay in love) with you, you should choose an exciting activity, such as snowboarding or rock climbing.
- c. Smiling during a painful procedure, such as a painful injection, will put you in a better mood.
- d. You feel angry and then notice your heart is beating fast.

## CONCLUSION

The study of motivation and emotion helps explain a wide array of thoughts and behaviours, from composing poetry to working late while finishing an important project to overcoming embarrassment about singing in front of friends. Motivation and emotion are linked in determining behaviour; we are motivated to engage in behaviours that improve our moods, and we avoid behaviours that cause us distress. Motivation is concerned not only with immediate survival but also with our efforts to achieve our loftiest goals. Many motivations arise to satisfy our bodies' basic biological needs, such as drinking to quench our thirst or eating when we are hungry. But other needs are also important in our lives, such as the need for other people and the need to feel competent.

An important principle in motivation is that over the course of human evolution, the activities that brought pleasure or positive emotions were often adaptive. Doing them increased survival and reproduction; sexual behaviour is perhaps the most obvious example. However, evolution merely leads to adaptive changes being passed along through generations; it does not guarantee that those changes will be advantageous indefinitely. Contemporary society, unlike the worlds of our hunter-gatherer ancestors, often requires us to override the urge to seek pleasure, as in restricting our consumption of tasty foods or not using drugs. Humans differ from other animals because we can set personal goals and try to achieve them. Studying motivation helps us understand why people desire to do certain things—and why sometimes they need to inhibit those desires.

At the same time, people react to environmental input with physiological reactions and cognitions, which together produce mental states perceived to be positive or negative, or shades in between. This response, emotion, is a primary force in motivating adaptive behaviours and discouraging maladaptive behaviours. For instance, when we look at the sun dipping below the horizon, we see not an astronomical event but a beautiful sunset that evokes all sorts of feelings. Emotions, even negative ones, are central to the human experience. Among their most important functions are supporting people's social bonds. Without emotions, would life be worth living?

## CHAPTER SUMMARY

### How Does Motivation Activate, Direct, and Sustain Behaviour?

- **Multiple Factors Motivate Behaviour:** Motives activate, direct, and sustain behaviours that will satisfy a need. Needs create arousal, and the response to being aroused is a drive to satisfy the need. Homeostasis refers to the body's attempts to maintain a state of equilibrium. The Yerkes-Dodson Law states that a person performs best when his or her level of arousal is neither too low nor too high.
- **Some Behaviours Are Motivated for Their Own Sake:** Behaviours such as playing games are unrelated to needs. People are intrinsically motivated by the joy of engaging in these behaviours.
- **People Set Goals to Achieve:** People with a high need to achieve set reasonably high goals and believe that with hard work, they can achieve their goals. These people are high in self-efficacy. They are able to delay gratification as they work toward difficult goals.
- **People Have a Need to Belong:** For most people, social motivation is very strong. Evolutionary theorists point out the survival advantage of having others to share dangerous tasks and care for one another. When people were made anxious in an experimental setting, they preferred to be with other people in a similar situation, most likely because they could interpret their own situation by comparing themselves to similar others.

### What Determines How We Eat?

- **Time and Taste Play Roles:** Customs and local norms strongly determine the foods we find appetizing and the times of day when we have our meals. Sensory-specific satiety is people's tendency to eat less when there is little variety in their food choices.
- **Culture Determines What We Eat:** Culture determines what a person considers edible. Neophobia is the reluctance to eat unfamiliar foods. Researchers have found that infants are more likely to try a new food when a family member offers it.
- **Multiple Neural Processes Control Eating:** The hypothalamus is the brain structure most closely identified with eating. Rats whose ventromedial hypothalami were damaged experienced hyperphagia—they consumed huge quantities of food. By contrast, rats whose lateral hypothalami were damaged exhibited aphagia—they stopped eating to the point of death. The limbic system, which is involved in reward, shows more activity when overweight people look at food than when people of normal weight do. Set-point sensors for body fat, blood glucose monitors, and hormones also play important roles in how much we eat.

### What Factors Motivate Sexual Behaviour?

- **Biological Factors Influence Sexual Behaviour:** The four stages of the human sexual response cycle are excitement, plateau, orgasm, and resolution. Men have a refractory period following orgasm, during which time they cannot become sexually aroused; women do not have a refractory period. Both men's and women's sexual responsiveness depends on their having a minimal amount of testosterone available.

Some data show that heterosexual women's preferences for masculine-looking men vary over the menstrual cycle.

- **Cultural Scripts and Cultural Rules Shape Sexual Interactions:** Our beliefs about how we should behave sexually are influenced by cultural scripts defining sexual behaviour for men and women. The double standard allows men greater sexual latitude than it allows women.
- **Mating Strategies Differ between the Sexes:** According to the evolutionary view, women tend to be more cautious about having sex and choosing partners because women's investments in pregnancy and child care are intensive. This view also helps explain why women prefer males who have status and resources, because of the benefits associated with providing for offspring. By contrast, men have a higher sex drive and are less choosy about short-term partners because men are not required to invest as much in potential offspring. Men also prioritize the attractiveness of their partners, because it is a cue of fertility.
- **People Differ in Sexual Orientation:** Evolutionary theorists have difficulty explaining homosexuality because same-sex relations do not result in offspring. A portion of the hypothalamus was found to be smaller in gay men than in heterosexual men, but as with any correlational data, the causal relation is unclear. Research suggests that prenatal hormones may be important in determining sexual orientation.

### How Are Emotions Adaptive?

- **Facial Expressions Communicate Emotion:** People from multiple cultures interpret a particular facial expression as representing the same emotion. Men appear to be less emotional than women, possibly because of societal display rules.
- **Emotions Serve Cognitive Functions:** We use our emotions as a guide when making decisions. One theory is that we use emotions as somatic markers informing our behaviours—meaning we interpret our body's responses and use that information to help make decisions.
- **Emotions Strengthen Interpersonal Relations:** Social bonds are strengthened when we can read other people's emotions accurately.

### How Do People Experience Emotions?

- **Emotions Have a Subjective Component:** Primary emotions are adaptive and common across cultures. They include anger, fear, sadness, disgust, happiness, surprise, and content. Secondary emotions are blends of the primary emotions.
- **Emotions Have a Physiological Component:** Emotions are associated with changes in bodily states. Research points to important roles of the amygdala and the prefrontal cortex in the production and experience of emotion.
- **Emotions Have a Cognitive Component:** According to the two-factor theory, emotions have an arousal component and a cognitive or interpretive component. The interpretation determines which emotion is felt.
- **People Regulate Their Moods:** When experiencing intense moods, we can use strategies such as distraction to manage them. Thought suppression and ruminating are not effective strategies.

## KEY TERMS

arousal, p. 392

display rules, p. 419

drive, p. 392

emotion, p. 416

extrinsic motivation, p. 395

homeostasis, p. 392

incentives, p. 393

intrinsic motivation, p. 395

motivation, p. 390

need, p. 391

need hierarchy, p. 391

need to belong theory, p. 398

primary emotions,

p. 426

secondary emotions, p. 426

self-actualization, p. 391

sexual response cycle,

p. 407

sexual strategies theory, p. 410

somatic markers, p. 422

Yerkes-Dodson law,

p. 393

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## ■ PRACTICE TEST

- Students enrolled in a difficult class are preparing to give end-of-term presentations, which will count 50 percent toward final grades. Which student below is likely to perform the best?
  - Ahn is not at all stressed about the presentation. He has done well all semester and is confident he will do just fine this time around, too. He puts together his slides a week before the due date and then reviews the talk a few hours before giving the presentation.
  - Sonya is somewhat anxious about this presentation. She knows her stuff but recognizes how much is riding on the quality of this presentation. This anxious energy motivates her to polish her slides and practice her talk.
  - Marcus is very stressed about this presentation. A bad evaluation on the presentation will ruin his grade for the class, which in turn will ruin his strong GPA. He decides to spend every waking moment preparing the talk, working late into the night and sometimes dreaming about the presentation.
- A classmate tells you he is having a hard time remembering which eating outcomes are associated with damage to different parts of the hypothalamus. Which of the following verbal mnemonics would be most helpful to your classmate? Select all that apply.
  - Organisms with damage to the **h**ypothalamus have **h**yperphagia.
  - Organisms with damage to the lateral area of the hypothalamus (**LH**) eat **l**ittle.
  - Organisms with damage to the preoptic area of the hypothalamus (**PH**) **p**ut on the **p**ounds.
  - Organisms with damage to the ventromedial region of the hypothalamus (**VMH**) eat **v**ery **m**uch.
- Which statement below is backed by empirical findings?
  - Parental treatment of a child gives rise to the child's sexual orientation.
  - High levels of androgens in women lead them to become lesbian, and high levels of estrogens in men lead them to become gay.
  - Prenatal exposure to hormones is associated with sexual orientation.
  - People are attracted to what is different: "the exotic becomes erotic."
- Which neurotransmitter is *not* implicated in the sexual response?
  - dopamine
  - GABA
  - nitric oxide
  - serotonin
- Which of these statements likely describe somatic markers? Select all that apply.
  - "My mind is wandering."
  - "I have butterflies in my stomach."
  - "My heart is pounding so hard it is going to jump out of my chest."
  - "My leg just fell asleep."
- People [can / cannot] experience positive and negative affect simultaneously.
- Positive affective states are associated with increased levels of [GABA / dopamine].
- Negative affective states are associated with increased levels of [dopamine / norepinephrine].
- Which of these statements are true regarding involvement of the amygdala in emotion?
  - Information reaches the amygdala along two separate pathways.
  - Increased activity in the amygdala during an emotional event is associated with improved long-term memory for that event.
  - The amygdala helps process the emotional content of facial expressions.
- Would you expect activity in the left or right prefrontal cortex in response to pictures of dead and decomposing livestock?
  - left
  - right

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## ■ PSYCHOLOGY AND SOCIETY

- Write down a goal you have for yourself. Provide a one-paragraph written analysis of whether this articulation of the goal has the qualities of a "good goal," meaning challenging (but not overly difficult) and specific. If your articulation of the goal falls short on any of these qualities, revise it to make it stronger. Finally, list the subgoals you will need to complete to reach this goal.
- A friend asks you for advice on how to get over a recent relationship breakup. Compose an email to your friend, drawing insight from the portion of this chapter that deals with regulation; describe effective strategies your friend should try as well as ineffective strategies your friend should avoid. Be sure to give specific and concrete advice.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.







# Health and Well-Being

BY ALL ACCOUNTS, GARY STOCKLAUFER is an ideal father. He is a happily married man, a state-certified foster parent, and the adoptive father of a great son. When his cousin was unable to raise Max, the cousin's baby son, Mr. Stocklaufer and his wife stepped in as the child's foster parents. After three months, they filed the paperwork to adopt their cherished foster son. A judge in Missouri, who also presided over Stocklaufer's earlier adoption, said no. The judge cited Stocklaufer's weight—at the time, between 225 and 275 kilograms (500 and 600 pounds)—as the reason for the denial. The Stocklaufers are healthy, but the judge reasoned that Mr. Stocklaufer would likely develop a serious disease and die at a young age because he was obese (FIGURE 10.1A). When asked about the case, the judge responded that he was required to consider the welfare and best interests of the child. The National Association to

## Can Psychosocial Factors Affect Health?

- The Biopsychosocial Model of Health Incorporates Multiple Perspectives for Understanding and Improving Health
- Behaviour Contributes to the Leading Causes of Death
- Critical Thinking Skill: Identifying Regression to the Mean
- Placebos Can Be Powerful Medicine
- Critical Thinking Skill: Recognizing Placebo Effects When Evaluating Treatment Claims

## How Do People Cope with Stress?

- Stress Has Physiological Components

- There Are Sex Differences in Responses to Stressors
- The General Adaptation Syndrome Is a Bodily Response to Stress
- Stress Affects Health
- Coping Is a Process

## What Behaviours Affect Mental and Physical Health?

- Obesity Results from a Genetic Predisposition and Overeating
- Smoking Is a Leading Cause of Death
- Exercise Has Physical, Emotional, and Cognitive Benefits

- There Are Ethnic Differences in Health Behaviours

## Can a Positive Attitude Keep Us Healthy?

- Being Positive Has Health Benefits
- Social Support and Social Integration Are Associated with Good Health
- Trust and Health Are Related across Cultures
- Spirituality Contributes to Well-Being

## Action Plan for Health and Well-Being

- Taking Care of Mind and Body



(a)



(b)

**FIGURE 10.1 Obesity in North America**  
(a) Gary Stocklaufer is shown here weighing over 225 kilograms (500 pounds). Shortly after this photograph was taken, he underwent surgery to lose weight. (b) The Canadian Transportation Agency's "one passenger, one fare" rule allows obese Canadians to request an extra seat with no additional charge if they cannot fit into one seat.

### LEARNING OBJECTIVES

Describe the biopsychosocial model of health.

Provide examples of the ways behaviour contributes to the leading causes of death.

Explain how placebos can affect health.

**health psychology** The field of psychological science concerned with the events that affect physical well-being.

Advance Fat Acceptance (NAAFA), asking whether “fat = poor parenting,” established a legal defence fund for Stocklaufer. Ultimately, the case was appealed, and the judge reversed his earlier ruling because Stocklaufer had lost over 90 kilograms (200 pounds) following gastric bypass surgery (“Judge Rules,” 2008).

Stocklaufer's case is only one of many similar stories in which fat people were denied the right to adopt. In Leeds, England, in 2009, Charlotte and Damien Hall were denied their application to adopt because Damien, at 156 kilograms (343 pounds), was considered obese and therefore at greater risk of illness or death. As of 2007, the official policy of the Chinese government is that obese foreigners are banned from adopting Chinese children. Is it reasonable to consider someone's weight when deciding something as important as a possible adoption? Since body weight has a substantial genetic component, should Mr. Stocklaufer be held accountable for his weight? Would it make a difference if we could show that his obesity is caused by factors beyond his control? Would a judge be acting in the children's best interests if he ruled that people who smoke cannot adopt children? What about people with diabetes or other conditions associated with reduced life spans?

The issue of obesity has raised many challenging questions in Canada. For instance, is obesity a medical disability requiring legal protection? The Supreme Court of Canada upheld the Canadian Transportation Agency's ruling that severely obese people are entitled to a free extra seat on airplanes under a “one passenger, one fare” rule (FIGURE 10.1B). Air Canada and WestJet require a doctor's note justifying the need for extra seating, but obesity advocates view this requirement as unnecessary, embarrassing to the obese passengers, and a burden on the health care system. Obesity has also been used in a legal defence. Peter Mathisen, of Brantford, Ontario, claimed that in 2001 he killed his wife accidentally. At the time, Mathisen weighed nearly 180 kilograms (400 pounds). During a physical altercation between the couple, he said, he lost his balance and fell on top of his wife. She suffered multiple injuries and suffocated. In 2005, a jury found him guilty of murder, but three years later a second jury deemed him guilty only of manslaughter, for which he received a three-year sentence. In considering issues of health and well-being, such as obesity, this chapter will examine individual differences and individuals' rights.

## Can Psychosocial Factors Affect Health?

People often think about health and wellness in biological and medical terms. They are therefore surprised to learn that their behaviours and attitudes affect their health. The traditional medical model emphasizes disease states and the treatments, including drugs, designed to rid us of disease. According to this model, people are passive recipients of disease and the medical treatments designed to return them to health after illness. The underlying idea in the traditional medical model is that health professionals know best and thus maintain control over what happens to the patient. Psychologists—and, increasingly, many medical professionals—take a more holistic and active approach to health and well-being. They believe our behaviours and attitudes are critical in keeping us healthy, helping us regain health following illness, and helping us achieve well-being. As you will learn in this chapter, a healthy lifestyle goes a long way toward promoting health and preventing disease.

**Health psychology**, one of psychology's many subdisciplines, is an area of study that integrates research on health and on psychology. This field was launched nearly three decades ago, when psychologists, physicians, and other health professionals came to appreciate the importance of lifestyle factors to physical health. Health psychologists apply their knowledge of psychological principles to promote health and

well-being, instead of thinking about health merely as the absence of disease. **Well-being** is a positive state in which we feel our best; it includes a striving for optimal health. To achieve optimal health, each of us needs to actively participate in maintaining wellness through health-enhancing behaviours. Health and well-being is a growing area of psychology, and there are now psychologists who provide health services and conduct research on the health outcomes of different behaviours and emotions. Some psychologists, recognizing the importance of behavioural and psychological variables in health, practice along with physicians in a wide range of contexts, such as diabetes management, cardiac specialties, and general medical settings.

Psychologists who study health and well-being rely on the experimental and statistical methods of psychology to understand the interrelationship among thoughts (health-related cognitions), actions, and physical and mental health. Researchers address issues such as ways to help people lead healthier lives. They study the ways in which our behaviour and social systems affect our health, and how ethnic and gender differences in healthy behaviours influence health outcomes. Health psychologists also study the inverse of these relationships: how health behaviours and health outcomes affect behaviour, cognition, and emotions. Health psychology is necessarily an interdisciplinary field that combines theories and research from the various areas of health studies and of psychology.

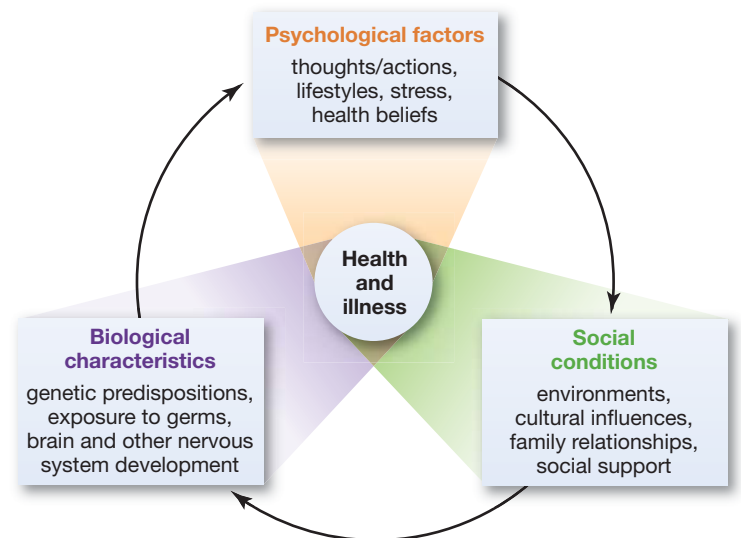
## The Biopsychosocial Model of Health Incorporates Multiple Perspectives for Understanding and Improving Health

How can someone’s personality or thoughts or behaviours affect his or her health? To answer this question, you need to understand the **biopsychosocial model**, which “views health and illness as the product of a combination of factors including biological characteristics (e.g., genetic predisposition), behavioural factors (e.g., lifestyle, stress, health beliefs), and social conditions (e.g., cultural influences, family relationships, social support)” (American Psychological Association, Health Psychology/Division 38, n.d). Research that integrates these levels of analysis helps scientists identify strategies that prevent disease by helping people lead healthier lives.

As shown in **FIGURE 10.2**, our thoughts and actions affect the environments we choose to interact with, and those environments, in turn, affect the biological underpinnings of our thoughts and actions. To understand how this continuous loop operates in real life, suppose you are genetically predisposed to be anxious, and you learn that one way to reduce your anxiety is to eat comfort foods such as mashed potatoes, oatmeal, and ice cream. If you consume these foods in excess, you may gain weight and eventually become overweight. Overweight people often find that exercise is not very pleasant. If their extra weight makes even moderate exercise difficult, they may decrease physical activity, that decrease would slow down their metabolism, and so on. Additional examples of the interplay between biological, social, and psychological factors are presented in several places throughout this chapter. The biopsychosocial model is central to understanding the difference between the traditional medical model, in which the individual is passive, and the approach taken by health psychologists, in which the individual’s thoughts, feelings, and behaviours are central to understanding and improving health.

**well-being** A positive state that includes striving for optimal health and life satisfaction.

**biopsychosocial model** A model of health that integrates the effects of biological, behavioural, and social factors on health and illness.



**FIGURE 10.2 The Biopsychosocial Model** This model illustrates how health and illness result from a combination of factors.

## Behaviour Contributes to the Leading Causes of Death

Are you an anxious flyer? Are you afraid of being killed in a shark attack? Does the thought of eating a hamburger terrorize you? Like many people, you may be at least somewhat anxious about flying. You may (surreptitiously) look around for nearby sharks whenever you wade into the ocean—or even a swimming pool, if you are very afraid of sharks. Most likely you do not find a hamburger terrifying; but given the actual leading causes of death, most people clearly fear the wrong things. A statistical expert in the field of aviation who is also a professor at MIT explained the risk of death from flying this way: “It’s once every 19,000 years—and that is only provided the person flew on an airplane once a day for 19,000 years!” (Barnett, quoted in “The six most feared,” 2005, ¶5). Other researchers have estimated that 1 in 13 million passengers die in airplane crashes. If you have read Chapter 8, you know that in the months following the September 11, 2001, terrorist attacks in the United States, many Canadians avoided flying—preferring instead what they believed to be the safety of driving. Yet, as described more fully in Chapter 8, the number of people who died in automobile accidents because they chose to drive instead of fly after the attacks far exceeded the number of people who were killed in the attacks.

According to many research studies, people are most likely to die from causes that stem from their own behaviours, which they can learn to modify. For example, the second leading cause of death in Canada in 2005 was heart disease. Obesity, lack of exercise, smoking, high fat diets, and, as you will learn later in this chapter, some personality traits contribute to this cause of death. Those who suffer from heart disease are not always to blame for their conditions, because heart disease also occurs in easygoing people who lead healthy lives. But all of us can change our behaviours in ways that reduce the likelihood of heart disease or postpone it until late in life.

Accidents are another leading cause of death. Most of us think about accidents as being beyond our control. But many accidents are avoidable, and for those that are not, we can reduce the probability of an accident (for example, by driving safely) and reduce the resulting injury (for example, by wearing seat belts). Additional causes of death—accidental or not—include risky sexual behaviour (AIDS is 100 percent preventable), the use of illegal drugs or the illegal use of legal drugs, and the use of firearms. It is easy to understand how our behaviours literally can kill us.

Even more sobering are the data regarding behaviours of both teenagers and young adults, age 15 to 24. In this age group, almost half of all deaths are due to accidents (44 percent). Suicide is the second leading cause of death (22 percent), followed by cancer (7 percent) and homicide (6 percent; Statistics Canada, 2009). It is a paradox of modern life that in the transition period between childhood and young adulthood, when most people are at their strongest and in their best health, they sometimes make bad decisions that can have disastrous outcomes. Lifestyle behaviours that begin in childhood and the teen years may decrease health or even lead to death. For example, although relatively few teens die from heart disease, poor eating habits (“You want fries with that burger?”) contribute to heart disease later in life. Violence, accidents, obesity, lack of exercise, risky sexual behaviours, the use and abuse of drugs—all these negative factors are associated strongly with young people.

In your great-grandparents’ generation, and even more so in their parents’ generation, the leading causes of death were childbirth, infectious diseases, and accidents. Thanks to medical and financial advances, the first two items on this list are rarely fatal in modern societies. And while hunger and malnutrition, like disease,

remain tragic realities in developing countries, most industrialized countries have made great progress in feeding their populations. The abundance of cheap, tasty food has brought new health problems to the developed world, however. As the circular biopsychosocial model makes clear, good and bad behaviours influence environments, and environments in turn influence the good and bad biological bases of behaviours.

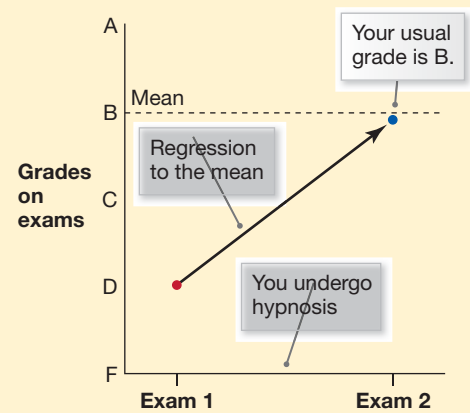
### CRITICAL THINKING SKILL

## Identifying Regression to the Mean

Think about a time when you had a cold or flu. Did you wait until you felt very bad before you started taking medicine or before you made an appointment to see a physician? If so, you are like most people, who seek medical help only when their symptoms are bad. Usually when you are sick, you will get better no matter what you do; that is, eventually you will return to your usual state of not feeling sick. If you wait until you are very sick to get medical help, then almost anything you do, including nothing at all, will be followed with feeling better. However, because you went to the doctor, you might credit him or her with making you feel better.

For any range of events, a more extreme event (in this case, feeling very sick) will tend to be followed by an event closer to the average or mean (in this case, feeling better). This principle is true for statistical reasons, and it operates in almost every situation. The phenomenon being described is called *regression to the mean*. It can be a difficult concept to understand and recognize because most of us usually have other explanations for why we returned to more normal states. As presented in the biopsychosocial model, our thoughts—in this case, the ways we explain both why we get sick and how we get well—are a critical determinant of how we take care of our health. Such thoughts often direct our behaviours, which in turn affect the biological underpinnings of health and well-being.

Remember: An extreme event will most likely be followed by a less extreme event. If you are aware of this principle, regression to the mean, you are less likely to believe an unrelated factor is responsible for the return to a more normal state (FIGURE 10.3).



**FIGURE 10.3 Think Critically: Identifying Regression to the Mean** Suppose you study as usual for an exam, but just by bad luck, the professor asks questions you cannot answer, so you get a very low grade. If you study as usual for the next exam, you are likely (but not guaranteed) to get a grade closer to your usual grades. If you study as usual but also go to a hypnotist to help calm your anxiety for the next exam, what will most likely happen? You probably will score closer to the way you usually do. Other than the hypnosis (on the realities of which, see Chapter 4, “The Mind and Consciousness”), what factors would explain the improvement?

## Placebos Can Be Powerful Medicine

Suppose you feel sick and go to a doctor, but the doctor does not take your complaint very seriously. To keep you happy, the doctor prescribes “sugar pills.” You, believing the pills will work because the doctor said they would, quickly feel better. Stories like this one usually end with a good laugh about how gullible and foolish the patient is. In this story, the pills act as placebos—they have no apparent physiological effect on the health condition for which they are prescribed. Often a drug or treatment will be studied by being compared with a placebo. As described in Chapter 2, research participants typically are assigned at random to either an experimental group or a control group—in this case, a drug/treatment group or the placebo group, respectively. Ideally, everything about the two groups is as similar

## Real World PSYCHOLOGY

**placebo effect** A drug or treatment, unrelated to the particular problem of the person who receives it, may make the recipient feel better because the person believes the drug or treatment is effective.

as possible. If the treatment consists of a large blue pill or weekly injections or dietary restrictions, the placebo group would take a large blue pill or receive weekly injections or follow different dietary restrictions; but for the placebo group, the pill might be made of sugar, the injections might deliver only water, and the diet might restrict foods believed to be unrelated to the treatment. Would you guess that some participants get well with only placebos? In fact, they do. This improvement in health, attributed to the inert drug or bogus treatment, is called the **placebo effect**. Its validity is complicated. After all, statistically speaking, most people's illnesses will improve even without treatment (see "Critical Thinking Skill: Identifying Regression to the Mean"). Even a few people with presumably terminal illnesses seem to beat the odds. Please do not take these points to mean that when you are ill you will always have statistics on your side. You cannot determine, for example, how long a minor illness might take to improve, or what complications it might produce if left untreated, or whether it is in fact the beginning of a major illness. When you are suffering, seek appropriate treatment. When you are well, take preventative measures.

For a placebo to improve health, the participant must believe it will. The person who receives the placebo must not know that, for example, the pills are chemically inert. Have you ever gone to a doctor's office feeling very sick—and noticed that as soon as the doctor said your problems were not serious, you immediately felt so relieved that you started feeling better? Some portion of the placebo effect is attributable to decreased anxiety, which can reduce pain and help recovery from an illness. But the placebo effect clearly is more than a reduction in anxiety. We cannot separate the effects of our minds from those of our bodies; they are seamlessly the same. The placebo effect is "all in the head," but the effect is real—all of our thoughts and feelings are in our heads. Thus the placebo effect is gaining new respect now that psychological scientists have a better understanding of its biological bases.

As discussed in Chapter 5, pain is more than just a sensory experience. How much pain people feel depends on many variables, including context (e.g., being on a battlefield versus being at home), expectations (i.e., feeling anxious or calm about a potentially painful experience), and thoughts about the pain (e.g., imagining it as less unpleasant). When people are calmer, their pain is less intense, so an important part of getting well lies in finding ways to reduce anxiety. Placebos can reduce pain perception when people believe they will (Wager, 2005). One placebo's ability to reduce pain was reduced when naloxone, a drug known to reduce the analgesic (pain-relieving) effects of several drugs, was administered after the placebo (Amanzio & Benedetti, 1999). In other words, a drug that makes pain relievers ineffective also made the placebo ineffective. Brain imaging shows that when patients have positive expectations about a placebo, the neural processes involved in responding to it are the same ones activated in response to a biologically active treatment (Benedetti, Mayberg, Wagner, Stohler, & Zubieta, 2005).

The study of placebo effects reveals a great deal about the power of the brain and body to produce healing effects. The placebo effect is a good example of the biopsychosocial model at work. The belief that a medication will work (psychological) affects the body in ways similar to those of medications, or treatments, with known biological effects (biological). These effects occur within a context that determines when, if, and how much the body will respond to the placebo (social). In the study of health and well-being, it sometimes can be difficult to separate these influences.

## Recognizing Placebo Effects When Evaluating Treatment Claims

Placebo effects can occur in many contexts, not just for health, so critical thinkers need to watch out for them in various settings. Suppose you are participating in a study and the researchers tell you your room is being infused with an odourless substance that will make you feel better. Each day, the researchers ask you to write in a journal how you feel that day and whether you feel better than you did the previous day. If you believe their claim about the odourless substance, you probably will feel a little better each day, and you might attribute this subjective judgment about how you feel to the odourless chemical you supposedly are breathing.

In fact, we fall for such false claims all the time. Consider this advertisement for copper bracelets, which is paraphrased only slightly:

For hundreds of years people have worn copper bracelets to relieve pain from arthritis. This folklore belief has persisted, and copper bracelets continue to be popular. These bracelets promote close contact between the copper and your wrist.

The advertisement does not say that copper bracelets relieve arthritis pain. They do not have this effect, and explicitly saying they do could lead to legal problems. But what do people remember after reading this advertisement? They remember reading that copper bracelets are good for arthritis. Many people wear copper bracelets and believe the bracelets provide some relief for their arthritis pain (FIGURE 10.4). You might ask if it matters as long as people feel less pain. Yes, it matters, because people who fall for phony treatments often avoid medical care, which can provide greater pain relief than they are getting from these placebo bracelets. They also are paying for treatments that do not really treat their health problem. A believer in copper bracelets might ask, If it really does not work, then why do I feel better? No one believes he or she will fall for a placebo, so it can be difficult to acknowledge that much of how we feel (but by no means all of it) is influenced by our beliefs.



**FIGURE 10.4 Think Critically:** **Recognizing Placebo Effects** Many people believe copper and zinc increase circulation. The idea appeals to those suffering from conditions such as arthritis, but any relief people feel from such “treatments” might be only a placebo effect.

### SUMMING UP

#### Can Psychosocial Factors Affect Health?

The biopsychosocial model of health and illness posits the interaction of biological variables (such as genetic predispositions), psychological variables (such as personality types and health behaviours), and social variables (such as social support and cultural beliefs about diseases). The leading causes of serious illness and death are, at least in part, behavioural. Behaviours such as overeating, lack of exercise, and smoking contribute in large measure to the development of coronary heart disease and other illnesses. For teens and young adults, accidents, suicide, cancer, and homicide are the leading causes of death; almost half of all deaths in this age range are due to accidents, many of them preventable. Placebos can powerfully affect health, so it not surprising that they activate the same areas of the brain and respond to other drugs in ways that are similar to validated treatments.

## ▶ MEASURING UP

1. Of the following possibilities, select one way that our behaviours contribute to reduced health.
  - a. We can make unhealthy choices such as eating a poor diet and smoking.
  - b. We can have genetic predispositions to obesity.
  - c. We can refuse to be in any research that has a placebo control group.
  - d. Our beliefs in a placebo can result in neural activity similar to the neural activity that results from validated treatments.
  - e. Our personalities cannot be controlled, so they cannot affect our health behaviours.
  - f. By being too passive, we allow other people to take advantage of us, often to the detriment of our health.
2. Which of the following statements exemplifies the biopsychosocial model?
  - a. The heart is a biological organ that we cannot control directly, so we rely on other people to affect the health of our hearts.
  - b. By engaging in healthy behaviours, we can strengthen our immune systems.
  - c. Reckless people exist in every society in the world, so behaviours related to accidents are not likely to be affected by culture.
  - d. That hostile people cannot change their personalities proves that biology influences health.

### ▶ LEARNING OBJECTIVES

Describe differences and similarities between female and male responses to stress.

Define and evaluate the general adaptation syndrome.

Describe and evaluate different ways of coping.

## How Do People Cope with Stress?

Stress is a basic component of our daily lives (FIGURE 10.5). Luckily, a small amount of it may be beneficial (Segerstrom & Miller, 2004). Stress does not exist objectively, out in the world, but rather results directly from the ways we think about events in our lives. Some students respond to final exams as extremely stressful events, for example, and often get sick at exam time, while others perceive the same



**FIGURE 10.5 Stress in Everyday Life**  
Stress is part of life. How do you cope with the stress in your life?



finals as mere inconveniences. **Stress** is a pattern of behavioural and physiological responses to events that match or exceed an organism's ability to respond in a healthy way. A **stressor** is an environmental event or stimulus that threatens an organism by seeming overwhelming; it elicits a **coping response**, which is any response an organism makes to avoid, escape from, or minimize an aversive stimulus. When too much is expected of us or when events are worrisome or scary, we perceive a discrepancy, real or not, between the demands of the situation and the resources of our biological, psychological, and social systems. In general, positive and negative life changes are stressful—going to university, getting a job, marrying, being fired, losing a parent, winning a major award, and so on. The greater the number of changes, the greater the stress, and the more likely the stress will affect our physiological state. Stress is often divided into two types: *eustress*, the stress of positive events (e.g., being admitted to the university you really want to attend or preparing for a party you are looking forward to) and *distress* (or duress), the stress of negative events (e.g., being trapped in traffic when you are late for an important meeting or dealing with an ongoing and serious illness of a loved one).

Psychologists typically think of stressors as falling into two categories: major life stressors and daily hassles. *Major life stressors* are changes or disruptions that strain central areas of people's lives. Positive events can be as stressful as, or even more stressful than, negative events. For instance, some parents report that having their first child is one of the most joyful—but also one of the most taxing—experiences of their lives. Major life stressors can be choices made by individuals, not just things that happen to them. Nonetheless, research has shown that unpredictable and uncontrollable catastrophic events (such as earthquakes) are especially stressful. In general, life changes are stressful. Consider, for example, starting college, changing jobs, getting married, being fired, losing a parent, or winning a major award. The greater the number of changes, the greater the stress, and the more likely stress is to have an impact on physiological state.

*Daily hassles* are small, day-to-day irritations and annoyances, such as driving in heavy traffic, dealing with difficult people, or waiting in line. Daily hassles are also stressful, and their combined effects can be comparable to the effects of major life changes. Because these low-level irritations are ubiquitous, they pose a threat to coping responses by slowly wearing down personal resources. Studies that ask people to keep diaries of their daily activities find consistently that the more intense and frequent the hassles, the poorer the physical and mental health of the participant. People may habituate to some hassles but not to others, such as interpersonal difficulties, which appear to have a cumulative effect on health. Living in poverty or in a crowded, noisy, or polluted place also can have detrimental effects on emotional well-being.

## Stress Has Physiological Components

Researchers have a good understanding of the biological mechanisms that underlie the stress response. A stressor activates a complex chain of events, in what is known as the **hypothalamic-pituitary-adrenal (HPA) axis**. As shown in **FIGURE 10.6**, stress begins in the brain with the perception of some stressful event. For our very distant ancestors, the event might have been the sight of a predator approaching

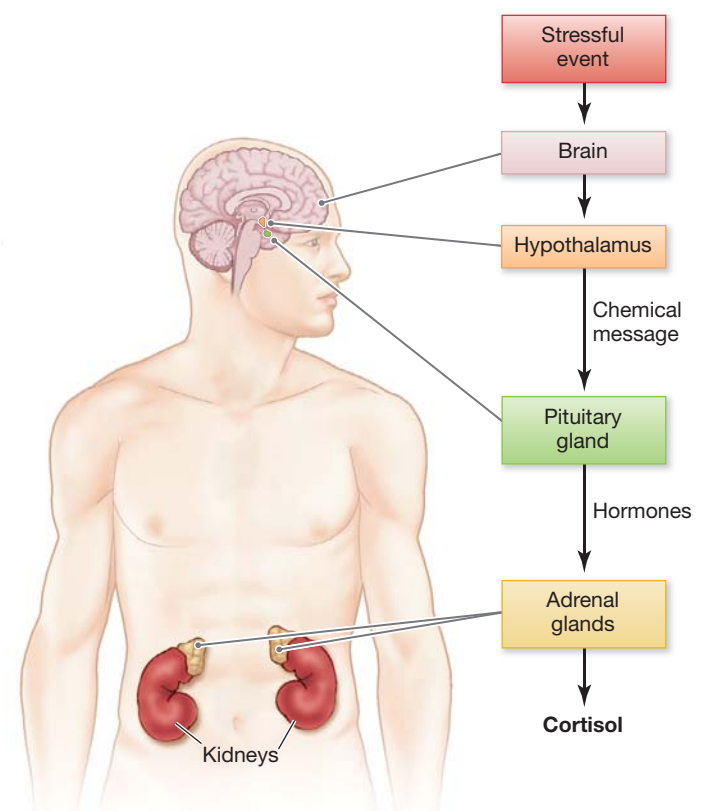
**stress** A pattern of behavioural, psychological, and physiological responses to events that match or exceed an organism's abilities to respond.

**stressor** An environmental event or stimulus that threatens an organism.

**coping response** Any response an organism makes to avoid, escape from, or minimize an aversive stimulus.

**hypothalamic-pituitary-adrenal (HPA) axis** The biological system responsible for the stress response.

**FIGURE 10.6 Hypothalamic-Pituitary-Adrenal (HPA) Axis** Stress sets off a complex chain of events in the body.



at a rapid clip; more likely for us, it is an approaching deadline, a stack of unpaid bills, a fight, an illness, and so on. In the HPA axis, the hypothalamus sends a chemical message to the pituitary gland (a major gland located just below the brain), which in turn secretes hormones that travel through the bloodstream until they reach the adrenal glands (located near the kidneys), which in turn secrete cortisol. Cortisol is responsible for many of the feelings we have when we are stressed.

The HPA axis was an efficient system for our ancestors because it results in increased energy, and energy is necessary for either outrunning a charging predator or standing your ground and fighting it. (Either response will cause you stress.) Because hormones have long-lasting effects, stress affects organs after the stressor has been removed. Scientific studies of stress (with human and nonhuman models) show that excessive stress disrupts working memory, especially when the demands on working memory are high (Oei, Everaerd, Elzinga, Van Well, & Bermond, 2006). Chronic stress has also been associated with memory impairments caused when cortisol damages neurons in brain areas including the hippocampus, which is a primary structure for memory (Sapolsky, 1994). Using brain imaging techniques, researchers can see the effect of stress on the brain. Neural-level effects of stress have been studied with strong experimental designs (experiments with random assignment to conditions) in rats and other nonhuman mammals, and this research provides clear evidence that stress interferes with the ability to recall previously learned information (Diamond, Fleshner, Ingersoll, & Rose, 1996).

### There Are Sex Differences in Responses to Stressors

From an evolutionary perspective, people's ability to deal effectively with stressors is important to survival and reproduction. The physiological and behavioural responses that accompany stress help mobilize resources to deal with danger. The American physiologist Walter Cannon coined the term **fight-or-flight response** to describe the physiological preparation of animals to deal with an attack. Within seconds or minutes, this response to a stressor allows the organism to direct all energy to dealing with the threat at hand. The physical reaction includes increased heart rate, redistribution of the blood supply from skin and viscera (digestive organs) to muscles and brain, deepening of respiration, dilation of the pupils, inhibition of gastric secretions, and an increase in glucose released from the liver. At the same time, less critical autonomic activities such as food digestion, which can occur after the stressor is removed, are postponed. (The autonomic system is described in more detail in Chapter 3, "Biological Foundations.")

The generalizability of the fight-or-flight response has been questioned by the psychologist Shelley Taylor, at UCLA, and her colleagues (2006; Taylor et al., 2002). They argue that because the vast majority of human and nonhuman animal research has been conducted using males (women represent fewer than 1 in 5 of the participants), it has distorted the scientific understanding of responses to stress. The exclusion of women from these early studies has many possible explanations. For example, researchers often use rats in studies of heart disease that cannot be conducted with humans because the research might increase participants' risk of heart disease, and most rat studies use male rats to avoid complications that may be caused by female hormonal cycles. Similarly, most researchers have avoided using women in their studies of responses to stress because female menstrual patterns might make women more difficult to study—their responses could be mediated by (influenced by) fluctuations in circulating hormones that vary over the menstrual cycle. The result is a sex inequality in laboratory stress studies, a research bias that can blind us to the fact that women and men often respond differently to social or biological stressors.

**fight-or-flight response** The physiological preparedness of animals to deal with danger.

Taylor and her colleagues argue that females respond to stress by protecting and caring for their offspring, as well as by forming alliances with social groups to reduce risks to individuals, including themselves. They coined the phrase **tend-and-befriend response** to describe this pattern. Tend-and-befriend responses make sense from an evolutionary perspective. Females typically bear a greater responsibility for the care of offspring, and responses that protect their offspring as well as themselves would be maximally adaptive. When a threat appears, quieting the offspring and hiding may be more effective means of avoiding harm than trying to flee while pregnant or with a clinging infant. Furthermore, females who selectively affiliate with others, especially other females, might acquire additional protection and support. The tend-and-befriend stress response is an excellent example of how thinking about psychological mechanisms in view of their evolutionary significance may lead us to question long-standing assumptions about how the mind works. Females who respond to stress by nurturing and protecting their young and by forming alliances with other females apparently have a selective advantage over those who fight or flee, and thus these behaviours would pass to future generations.

As is true for any theory of human behaviour, Taylor's theory about stress responses cannot be applied universally to all women and all men. There is almost always overlap between the behaviours of males and of females: Some males exhibit behaviours more typical of females, and some females exhibit behaviours more typical of males. Geary and Flinn (2002) note that males often engage in "tending behaviour," such as caring for their children; thus the concept of tend-and-befriend should apply to men as well as women. Taylor and her colleagues (2002) reply that men are often caring and nurturing fathers but that such behaviour is not a typical male response to the stress of a threat—and their theory specifically describes the typical response of each sex.

Consider once again the HPA axis model of stress and how it can be applied to tend-and-befriend responses to stress. **Oxytocin**, a hormone important for mothers in bonding to newborns, is produced in the hypothalamus and released into the bloodstream through the pituitary gland. Recent research with human and non-human models has shown that oxytocin levels tend to be high during socially stressful situations. Although oxytocin exists naturally in men and women, it seems especially important in women's stress response; thus it provides a possible biological basis for the tend-and-befriend response to stress exhibited (mainly) by women (Taylor, 2006). A great deal of research currently is being conducted on the role of oxytocin during stress responses and should lead to a better understanding of its role in maternal bonding. Recent research suggests that estrogen is important in understanding the differences in how women and men respond to stress (Kajantie, 2008). When estrogen levels are high for women (between menarche—the onset of menstruation—and menopause), they have reduced responses to stress, relative to men and to women in later life. Sex differences in response to stress may be one of the reasons women live an average of five to eight years longer than men.

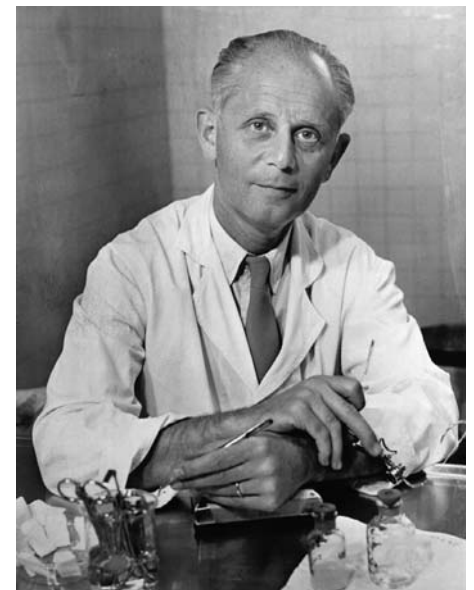
## The General Adaptation Syndrome Is a Bodily Response to Stress

In Montreal in the 1930s, Hans Selye (**FIGURE 10.7**) began studying the physiological effects of sex hormones by injecting rats with hormones from other animals. When he examined the rats, he found enlarged adrenal glands, decreased levels of **lymphocytes** (specialized white blood cells) in the blood, and stomach ulcers. Surmising that the foreign hormones must have caused these changes, Selye conducted further tests, using different types of chemicals and even physically

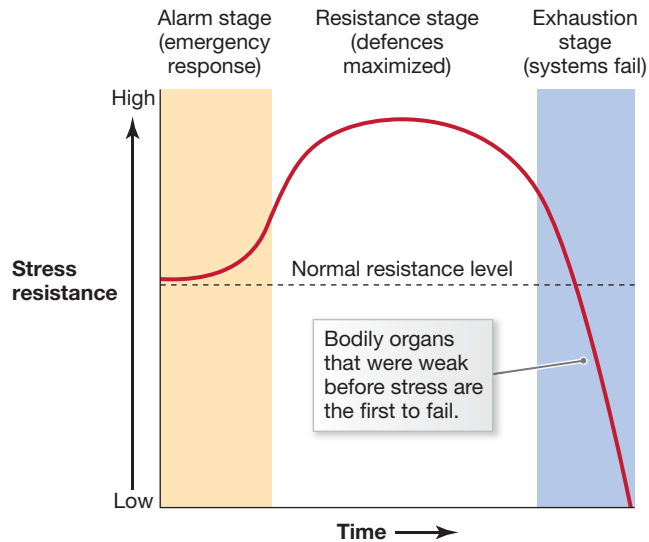
**tend-and-befriend response** Females' tendency to protect and care for their offspring and form social alliances rather than flee or fight in response to threat.

**oxytocin** A hormone that is important for mothers in bonding to newborns.

**lymphocytes** Specialized white blood cells known as B cells, T cells, and natural killer cells that make up the immune system.



**FIGURE 10.7 Hans Selye** Selye popularized the term *stress* and demonstrated that stress could affect physical health. He was born in Austria-Hungary, but spent most of his career in Montreal.



**FIGURE 10.8 The General Adaptation Syndrome** Selye described the three stages of physiological response to stress.

**immune system** The body's mechanism for dealing with invading micro-organisms, such as allergens, bacteria, and viruses.

**general adaptation syndrome** A consistent pattern of responses to stress that consists of three stages: alarm, resistance, and exhaustion.

restraining the animals to create stressful situations. He found slight variations in some physiological effects; but each manipulation produced a pattern of bloated adrenal glands, damaged lymphatic structures (part of the **immune system**), and stomach ulcers. He concluded that these three responses, which reduce the organism's potential ability to resist additional stressors, were the hallmarks of a *non-specific stress response*.

The consistent pattern of responses that Selye identified, the **general adaptation syndrome**, consists of three stages: alarm, resistance, and exhaustion (**FIGURE 10.8**). This syndrome occurs in addition to specific physiological responses to particular stressors. In the *alarm stage*, an emergency reaction that prepares the body to fight or flee, physiological responses are aimed at boosting physical abilities while reducing activities that make the organism vulnerable to infection after injury. In this stage, the body is most likely to be exposed to infection and disease, so the immune system kicks in and the body begins fighting back. During the *resistance stage*, the defences prepare for a longer, sustained attack against the stressor; immunity to infection and disease increases somewhat as the body maximizes its defences. When the body reaches the *exhaustion stage*, a variety of physiological and immune systems fail. Bodily organs that were already weak before the stress are the first to fail.

## Stress Affects Health

One of Selye's central points was that the prolonged action of stress hormones, such as cortisol, negatively affects health. Indeed, although stress hormones are essential to normal health, over the long term they are associated with problems such as increased blood pressure, cardiac disease, diabetes, declining sexual interest, and dwarfism (caused by the suppression of growth hormones). People who have very stressful jobs—such as air traffic controllers, combat soldiers, and firefighters—tend to have many health problems that presumably are due partly to the effects of chronic stress. Overwhelming evidence indicates that chronic stress, especially psychosocial stress, is associated with the initiation and progression of a wide variety of diseases, from cancer to AIDS to cardiac disease. Stress leads to specific physiological responses that affect health, and many people cope with stress by engaging in damaging behaviours. For instance, the number one reason problem drinkers give for abusing alcohol is to cope with negative stress in their lives. When people are stressed, they drink, smoke cigarettes, eat junk food, use drugs, and so on. As

discussed later in this chapter, most of the major health problems in industrialized societies are partly attributable to unhealthful behaviours, many of which occur when people feel stressed.

**THE IMMUNE SYSTEM** Stress alters the functions of the immune system. When foreign substances such as viruses, bacteria, or allergens enter the body, the immune system launches into action to destroy the invaders. Stress interferes with this natural process. The field of *psychoneuroimmunology* studies the response of the body's immune system to psychological variables. More than 300 studies have demonstrated that short-term stress boosts the immune system, whereas chronic stress weakens it, leaving the body less able to deal with infection (Segerstrom & Miller, 2004).

Researchers at the University of British Columbia found evidence that children raised in households of low socio-economic status had compromised immune systems as adults (Miller et al., 2009). This finding indicates that being raised in unfavourable circumstances has lifelong consequences. Evidence suggests that adverse childhood experiences may be responsible for the considerable health disparities that exist between Aboriginal and non-Aboriginal Canadians (Frohlich, Ross, & Richmond, 2006).

The detrimental effects of immediate and long-term stress on physical health are due partly to decreased lymphocyte production, which renders the body less capable of warding off foreign substances. In a particularly clear demonstration that stress affects health, the American researcher Sheldon Cohen and his colleagues (1991) paid healthy volunteers to have cold viruses swabbed into their noses. Those who reported the highest levels of stress before being exposed to the cold viruses developed worse cold symptoms and higher viral counts than those who reported being less stressed (**FIGURE 10.9**). (Surprisingly, behaviours such as smoking, maintaining a poor diet, and not exercising had very small effects on the incidence of colds.) Apparently, when the underlying physiological basis of the stress response is activated too often or too intensely, the function of the immune system is impaired, and the probability and severity of ill health increases (Herbert & Cohen, 1993; McEwen, 2007).

In a study that looked specifically at the effects of desirable and undesirable events on the immune system, participants kept daily diaries for up to 12 weeks (Stone, Neale, Cox, & Napoli, 1994). In the diaries, they recorded their moods and the events in their lives and rated the events as desirable or undesirable. Each day, the participants took an antigen, a substance their immune systems recognized as a threat and therefore formed antibodies to protect against it. Then they provided saliva samples so that researchers could examine their antibody responses. The more desirable events a participant reported, the greater the antibody production. Similarly, the more undesirable events reported, the weaker the antibody production. The effect of a desirable event on antibodies lasted for two days. These and subsequent findings provide substantial evidence that perceived stress influences the immune system. Chronic stress, especially when associated with changes in social roles or identity (such as becoming a refugee, losing a job, or getting divorced), has the greatest impact on the immune system.

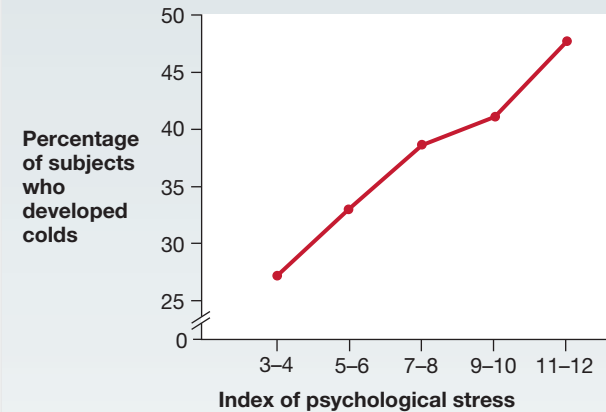
**HEART DISEASE** Coronary heart disease is the leading cause of death for adults in the industrialized world. According to a World Health Organization report in 2002,

**FIGURE 10.9 Scientific Method: Cohen's Study of Stress and the Immune System**

**Hypothesis:** Stress affects health.

**Research Method:** Researchers swabbed the noses of healthy volunteers with cold viruses.

**Results:** Participants who reported higher levels of stress before being exposed to the cold viruses developed worse cold symptoms.



**Conclusion:** The functioning of the immune system can be impaired when a stress response is activated.



**FIGURE 10.10 Heart Disease** To increase people's awareness of this growing problem, countries, cities, and local agencies employ public service campaigns like this one.

each year more than 30 million people around the globe have heart attacks, and more than 12 million people die from them (**FIGURE 10.10**). Conservative estimates indicate that 1.6 million Canadians are living with heart disease and that nine out of ten Canadians over age 20 have at least one risk factor for developing heart disease, such as being overweight, not exercising, and not eating well (Public Health Agency of Canada, 2009). Even though the rate of heart disease is lower in women than in men, heart disease is the number one killer of women. Genetics is among the many factors that determine heart disease, but two extremely important determinants are health behaviours and a small number of personality traits related to the way people respond to stress. Later, this chapter will discuss three major risk factors for heart disease: lack of exercise, obesity, and smoking. This section is concerned with the way personality traits can affect the heart.

The heart pumps nearly 7,500 litres of blood each day, on average beating more than 100,000 times. A vast network of blood vessels carries oxygen and nutrients throughout the body.

As people age, the arteries leading from the heart become narrow due to the buildup of fatty deposits, known as plaque. This narrowing makes it more difficult for the heart to pump blood and leads to coronary heart disease. When pieces of plaque break off from the wall of a blood vessel, blood clots form around the plaque and interrupt blood flow. If a clot blocks a blood vessel feeding the heart, it causes a heart attack; if it blocks a vessel that feeds the brain, it causes a stroke.

Stress and negative emotions increase the risk of coronary heart disease (Sirois & Burg, 2003). Being stressed or feeling negative emotions can cause heart problems in two ways. First, people often cope with these states through behaviours that are bad for health, such as overeating or smoking. Second, over time, stress causes wear and tear on the heart, making the heart more likely to fail. Chronic stress leads to overstimulation of the sympathetic nervous system, causing higher blood pressure, constriction of blood vessels, elevated levels of cortisol, increased release of fatty acids into the bloodstream, and greater buildup of plaque on arteries; each of these conditions contributes to heart disease. For these reasons, people who tend to be stressed out are more likely to have heart disease than are people who tend to be laid-back.

One of the earliest tests of the hypothesis that personality affects coronary heart disease was conducted in 1960, when the Western Collaborative Group, a group of physicians in San Francisco, began what was to be an eight-and-a-half-year study (Rosenman et al., 1964). Physicians recruited 3,500 men from northern California who were free of heart disease at the start of the study and screened them annually for symptoms such as high blood pressure, accelerated heart rate, and high cholesterol. Their overall health practices—and personal details such as education level, medical and family history, income, and personality traits—also were assessed.

The results indicated that, adjusting for the presence of established risk factors (such as high blood pressure, accelerated heart rate, or high cholesterol), a set of personality traits predicted heart disease. This set, the **Type A behaviour pattern**, describes competitive, achievement-oriented, aggressive, hostile, time-pressed (feeling hurried, restless, unable to relax), impatient, confrontational people. Men who exhibited these traits were much more likely to develop coronary heart disease than were those who exhibited the **Type B behaviour pattern**, which describes relaxed, noncompetitive, easygoing, accommodating people. In fact, this study found that a Type A personality was as strong a predictor of heart disease as was high blood pressure, high

**Type A behaviour pattern** A pattern of behaviour characterized by competitiveness, achievement orientation, aggressiveness, hostility, restlessness, inability to relax, and impatience with others.

**Type B behaviour pattern** A pattern of behaviour characterized by relaxed, noncompetitive, easygoing, and accommodating behaviour.

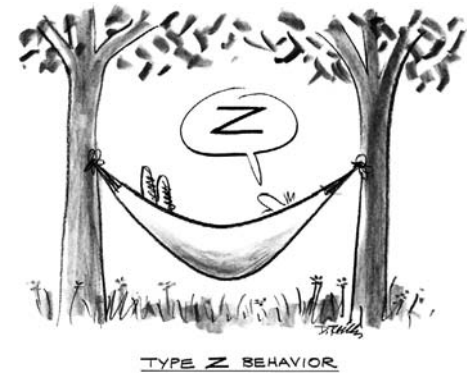
cholesterol, or smoking (Rosenman et al., 1975). Although the initial work was done only with men, more-recent research shows that these conclusions apply to women as well (Knox, Weidner, Adelman, Stoney, & Ellison, 2004; Krantz & McCeney, 2002).

Over the past 50 years, research has found that the original list of traits was too broad and that only certain components of the Type A behaviour pattern are related to heart disease. Researchers at Duke University found that the most toxic factor was hostility (Williams, 1987). Hot-tempered people who are frequently angry, cynical, and combative are much more likely to die at an early age from heart disease (Eaker, Sullivan, Kelly-Hayes, D'Agostino, & Benjamin, 2004). Indeed, having a high level of hostility while in university predicts greater risk for heart disease later in life (Siegler et al., 2003). Considerable evidence indicates that other negative emotional states, especially depression, also predict heart disease (Miller, Freedland, Carney, Stetler, & Banks, 2003). Of course, having a heart condition might make people hostile and depressed; but having a hostile personality and being depressed also predicted the worsening of heart disease, so causes and effects might be connected in a vicious cycle. In contrast, optimistic people tend to be at lower risk for heart disease (Maruta, Colligan, Malinchoc, & Offord, 2002). Learning to manage both stress and anger improves outcomes for those who have heart disease (Sirois & Burg, 2003). (Later in this chapter, you will find many suggestions for managing stress.)

How might negative personality traits combine to promote coronary heart disease? Being hostile, angry, or depressed can cause heart problems in two ways. First, as noted above, people often cope with their problems through behavioural strategies that are bad for health, and negative personality traits can increase people's problems—another vicious cycle. But negative personality traits also can produce direct physiological effects on the heart. Think back to a time when you were very angry at someone. How did it feel to be so angry? Your body responded by increasing your heart rate, shutting down digestion, moving more blood to your muscles—in short, acting as though you were preparing to fight or to run away. You may have seen someone turn red with anger or start to shake. People with hostile personalities frequently experience such physiological responses, which take a toll on the heart. Chronic hostility can lead to the same physical symptoms as chronic stress. Over time, then, being hostile or angry causes wear and tear on the heart, making it more likely to fail.

Numerous studies have identified the biological pathways that lead from being angry and hostile to developing heart disease. As you might expect, the repeated cascade of bodily responses in hostile and angry individuals affects more than just the health of their hearts. Other bodily organs suffer as well. Researchers investigated whether an association existed between hostility and chronic pulmonary disease or early indicators that pulmonary disease was developing (Jackson, Kubzansky, Cohen, Jacobs, & Wright, 2007). Chronic pulmonary disease, a progressive condition in which airflow to the lungs is reduced, is a serious health risk in itself and a contributor to coronary heart disease. Even among the young, healthy participants in this study, higher levels of hostility were related to several measures of reduced pulmonary functioning.

Stress researchers discuss their findings using the framework of the **allostatic load theory of illness**. Allostatic load is similar to *homeostasis*, the body's ability to maintain a steady state, or constancy. As discussed in Chapter 9, the body works like a room regulated by a thermostat, registering when it gets too warm or too cold. To cool itself, the body employs physiological mechanisms such as sweating; to warm itself, it shivers and constricts the blood vessels. Likewise, allostatic systems regulate the body's response to excessive stress. After responding to a stressful event, the



## Real World PSYCHOLOGY

**allostatic load theory of illness** When people are continually stressed, they are unable to return to bodily states that characterize normal stress levels.

body needs to return to a steady state. When people are continually stressed, the allostatic loads on their bodies are too great for the bodies to return to their normal resting states and recover from the effects of stress. Thus the bodies of people who have more-positive emotions should return to their normal resting states more quickly and more frequently.

The evidence across multiple studies with different indices of disease and markers for the early development of disease is clear: Hostile, angry people are at greater risk for serious diseases and earlier death than are those with more optimistic and happier personalities. This conclusion appears to be universal. For example, a cross-cultural comparative study conducted with Japanese and non-Japanese university students replicated the association of anger and impatience with a wide range of health symptoms for students from all ethnic and cultural groups (Nakano & Kitamura, 2001).

## Coping Is a Process

We all experience stressful events. To deal effectively with the stressors in our lives, we use cognitive appraisals that link feelings with thoughts, so we can think about and manage our feelings more objectively. Richard Lazarus (1993) conceptualized a two-part appraisal process: People use **primary appraisals** to decide whether stimuli are stressful, benign, or irrelevant. When they deem stimuli as stressful, people use **secondary appraisals** to evaluate response options and choose coping behaviours. Such cognitive appraisals also affect people's perceptions of and reactions to potential stressors in the future and help people prepare for stressful events. Coping that occurs before the onset of a future stressor is *anticipatory coping*—for example, when parents rehearse how they will tell their children they are planning to divorce.

**TYPES OF COPING** A taxonomy of coping strategies, developed by Susan Folkman and Richard Lazarus (1988), outlines two general categories of coping: In **emotion-focused coping**, a person tries to prevent an emotional response to the stressor, adopting strategies, often passive, to numb the pain. Such strategies include avoidance, minimizing the problem, trying to distance oneself from the outcomes of the problem, or engaging in behaviours such as eating or drinking. For example, if you are having difficulty at school, you might avoid the problem by skipping class, minimize the problem by telling yourself school is not all that important, distance yourself from the outcome by saying you can always get a job if university does not work out, or overeat and drink alcohol to dull the pain of the problem. These strategies do not solve the problem or prevent it from recurring in the future. By contrast, **problem-focused coping** involves taking direct steps to solve the problem: generating alternative solutions, weighing their costs and benefits, and choosing between them. In this case, if you are having academic trouble, you might think about ways to alleviate the problem, such as getting tutoring or asking for an extension for a paper. Given these alternatives, you could consider how likely a tutor is to be helpful, discuss the problem with your professors, and so on. People adopt problem-focused behaviours when they perceive stressors as controllable and are experiencing only moderate levels of stress. Conversely, emotion-focused behaviours may enable people to continue functioning in the face of uncontrollable stressors or high levels of stress.

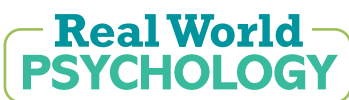
The best way to cope with stress depends on personal resources and on the situation. Most people report using problem- and emotion-focused coping. Usually, emotion-based strategies are effective only in the short run. For example, if your partner is in a bad mood and is giving you a hard time, just ignoring

**primary appraisal** Part of the coping process that involves making decisions about whether a stimulus is stressful, benign, or irrelevant.

**secondary appraisal** Part of the coping process during which people evaluate their options and choose coping behaviours.

**emotion-focused coping** A type of coping in which people try to prevent having an emotional response to a stressor.

**problem-focused coping** A type of coping in which people take direct steps to confront or minimize a stressor.





him or her can be the best option. In contrast, ignoring your partner's drinking problem will not make it go away, and eventually you will need a better coping strategy. However, problem-focused coping strategies work only if the person can do something about the situation. In one study that tested the best way to cope with an extremely threatening situation (Strentz & Auerbach, 1988), 57 airline workers were held hostage for four days by five "terrorists." Even though the participants volunteered to be hostages and knew their captors were actually FBI agents, the situation was very realistic and extremely stressful. Half the participants had been trained to use emotion-based coping, and half had been trained to use problem-based coping. Can you predict which strategy worked better? The emotion-based participants experienced less stress because they assumed any resistance they offered would just put them in greater danger. In other words, their best coping strategy was to remain calm. In contrast, on September 11, 2001, the passengers on the hijacked United Airlines Flight 93 knew that three other planes had been crashed by terrorists that morning (see the opening of Chapter 8, "Thinking and Intelligence"). Assuming their hijackers also planned to crash Flight 93, these passengers knew they had an equal or better chance of surviving if they resisted. Some of them decided they had nothing to lose, chose a problem-based coping strategy, and fought back against the hijackers (FIGURE 10.11).

Susan Folkman and Judith Moskowitz (2000) have demonstrated that two strategies in addition to problem-focused coping can help people use positive thoughts to deal with stress. Both strategies involve *positive reappraisal*, a cognitive process in which a person focuses on possible good things in his or her current situation, looking for the proverbial silver lining. One strategy is to make *downward comparisons*, comparing oneself to those who are worse off; doing so has been shown to help people cope with serious illnesses. *Creation of positive events* is a strategy of infusing ordinary events with positive meaning. If you were diagnosed with diabetes, for example, you could focus on how having diabetes will force you to eat a healthy diet and exercise regularly (positive reappraisal), recognize that it is not as serious as having heart disease (downward comparisons), and take joy in everyday activities such as riding a bike. Positive events might include such things as enjoying a beautiful sunset, finding humour in a situation, savouring a recent compliment—all of which might help you focus on the positive aspects of your life and deal with your negative stress.

**INDIVIDUAL DIFFERENCES IN COPING** People differ widely in their perceptions of how stressful life events are. Some people could be termed *stress-resistant* for their ability to adapt to life changes by viewing events constructively. This personality trait has been characterized as *hardiness* by Suzanne Kobasa (1979), who lists three components: *commitment*, *challenge*, and *control*. People high in hardiness are committed to their daily activities, view threats as challenges or as opportunities for growth, and see themselves as being in control of their lives. People low in hardiness typically are alienated, fear or resist change, and view events as being under external control. Numerous studies have found that people high in hardiness report fewer negative responses to stressful events. In a laboratory experiment in which participants were given difficult cognitive tasks, people high in hardiness exhibited higher blood pressure during the tasks—a physiological indicator of active coping. Moreover, a questionnaire completed immediately after the tasks revealed that participants high in hardiness increased the number of positive thoughts they had about themselves in response to the stressor.

**FAMILY-FOCUSED INTERVENTIONS** One of the most stressful events in life is dealing with a chronic illness—such as cancer, asthma, heart disease, AIDS—or



**FIGURE 10.11 Flight 93** This film still is from *United 93* (2006), a dramatic re-creation of events on the fourth hijacked plane on 9/11. Here, passengers discuss their options after learning about the crashes of the three other planes.

chronic pain, whether the illness or pain is our own or that of a loved one. Many, perhaps all, readers of this chapter likely have provided care for an ill person or will need to do so in the future. Although including family members in the treatment plan for a chronically ill person might seem important, a review of the research literature shows that including family members in a treatment plan is often not effective (Martire & Schulz, 2007). A major problem in enlisting family members is that the patient may feel as though family members are controlling his or her life rather than providing assistance. A common theme in the psychological literature is that being in control of essential decisions in one's life reduces stress and promotes well-being (Karasek & Theorell, 1990); it is also a central component of hardiness.

Family interventions can be beneficial, however, when family members promote the patient's autonomy. Some behaviours that seem to help when a family member has a chronic illness include (1) motivating the patient to make his or her own health and life choices and to carry out the activities of everyday living, (2) modelling healthy behaviours, (3) providing rewards, and (4) pointing out the positive consequences of caring for one's illness (Martire & Schulz, 2007). For example, family members might prepare food for the patient or help the patient practice relaxation techniques. By providing motivation, encouragement, and emotional support, families can also assist the patient in adjusting to life with the illness.

## **SUMMING UP**

### **How Do People Cope with Stress?**

Stress occurs when people feel overwhelmed by the challenges they face, as when major change happens in their lives. Hans Selye's general adaptation syndrome conceptualizes the stages of physiological coping. Stresses include major life changes as well as daily hassles. Females' responses to stress include the tendency to affiliate with a group in which members care for each other, whereas males tend to have a fight-or-flight response in which their bodies prepare them for combat or fast escape. Cognitive appraisals, such as determining the relevance of the stressor and adopting a problem-focused versus emotion-focused approach, can alleviate stress or minimize its harmful effects. Hardy people handle stress well because they believe they can control events in their lives, are committed to and actively engaged in what they do, and see obstacles as challenges to be overcome. A positive appraisal of events is also a good way to regulate emotions. When providing care for an ill person, it is important to allow the patient to maintain control over his or her life. Maintaining such control is a trait of hardy people.

## **MEASURING UP**

1. Match each stage in the general adaptation syndrome—alarm, resistance, and exhaustion—with one of the following examples.
  - a. After years of responding to tight deadlines at work, the executive developed several medical problems that required hospitalization.
  - b. When Myrtle returned home and found a stranger in her living room, her heart began pounding rapidly.
  - c. As the hurricane lashed the shore, nearby residents struggled to keep themselves safe.

2. How does long-term stress affect health?
  - a. The extended physiological response damages organs such as the heart.
  - b. Long-term stress sharpens a person's awareness of potentially harmful events and increases the person's attention span.
  - c. Repeated stress tunes the immune system so that the body is better able to fight disease.
  - d. Long-term stress provides an evolutionary advantage in modern societies.

## What Behaviours Affect Mental and Physical Health?

The previous sections looked at how stress affects the body, and how people cope with stress. This section looks at the effects of stress on people's behaviour. Before the twentieth century, most people died from infections and from diseases transmitted person to person. But the last century saw a dramatic shift in the leading causes of mortality. People now are most likely to die from heart disease, cancer, accidents, diabetes, liver disease, and so on—all of which are at least partially outcomes of lifestyle. Our daily habits—such as smoking, poor eating, alcohol use, and lack of exercise—contribute to nearly every major cause of death in developed nations (Smith, Orleans, & Jenkins, 2004). And stress plays an important role in motivating each of these health-threatening behaviours. A study of more than 12,000 people from Minnesota found that high stress was associated with greater intake of fat, less-frequent exercise, and heavier smoking (Ng & Jeffrey, 2003).

### Obesity Results from a Genetic Predisposition and Overeating

Obesity is a major health problem with physical and psychological consequences. One factor that contributes to obesity is overeating, which some people are especially likely to do when stressed (Heatherton & Baumeister, 1991). Why some people can control how much they eat and others cannot remains unclear. Some people believe that those who overeat are lazy or unmotivated. In fact, obese people typically try multiple diets and other “cures” for fat—and even when they lose weight, they likely will gain it all back.

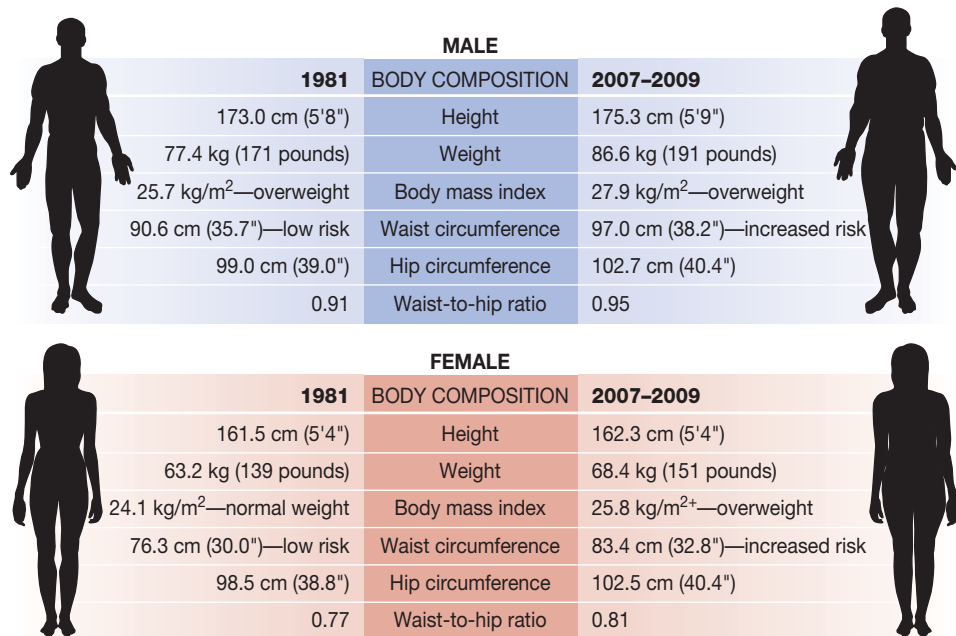
Society's negative attitudes toward overweight people provide plenty of motivation for those who suffer from prejudice against the obese. Bettye Travis (cited in Stewart, 2007), the former president of the National Association to Advance Fat Acceptance (NAAFA), described societal reactions to obesity this way: Fat people are “one of the last marginal groups that are still targeted. . . . [I]t is still OK to make fun of fat people” (p. B7). After a lifetime of both shame and failed attempts to lose weight, she learned to say “the f word”: *fat*. NAAFA exists to help fat people fight “size discrimination,” as in being denied the right to be an adoptive parent (see the opening of this chapter). NAAFA members do not oppose attempts to lose weight, nor do they dispute the research indicating serious health risks for people who are obese. But after experiencing repeated disappointments with diets, they realize they will likely always be fat and that they must learn to accept themselves and to educate society about obesity. Given the rise in obesity in industrialized countries around the world, including Canada (FIGURE 10.12), the



#### LEARNING OBJECTIVES

Summarize the causes of obesity and reasons for smoking, and use this information to suggest methods for reducing obesity and smoking.

List the physical, emotional, and cognitive benefits of exercise.



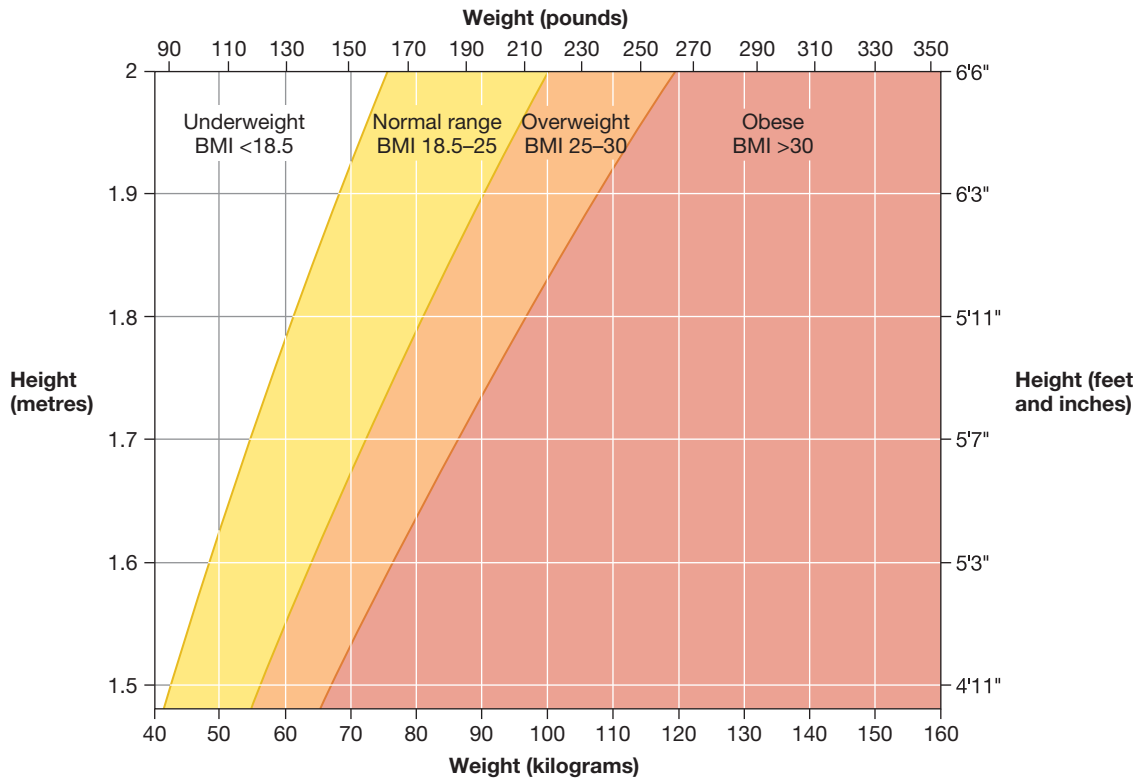
**FIGURE 10.12 Weight of Canadians Increasing** Today, typical Canadian adults weigh more and are less physically active than the previous generation was.

organization may see its membership grow. However, even many obese people stigmatize obese people and may not want to join a group that advocates “fat acceptance.”

There is no precise definition of obesity, but people are considered obese if they are more than 20 percent over ideal body weight, as indicated by various mortality studies. One measure of obesity widely used in research is **body mass index (BMI)**, a ratio of body weight to height. (FIGURE 10.13 shows how to calculate BMI and how to interpret the value obtained.) According to standard BMI cut-offs, more than one-fifth of Canadians currently are medically obese. Over the last 60 years, researchers have learned a great deal about the causes of obesity—a multi-faceted problem influenced, like so many physical and psychological phenomena discussed in this book, by genes and environment. Thus understanding obesity requires a multi-level approach that examines behaviour, underlying biology, cognition (how we think about food and obesity), and the societal context that makes cheap and tasty food readily available. Obesity is an ideal example of the biopsychosocial model of health presented earlier in the chapter. As you read about obesity, keep in mind the linkages among genetic predispositions, thoughts, feelings, and behaviours as well as the continuous loop through which these variables cycle.

**GENETIC INFLUENCE** A trip to the local mall or anyplace families gather reveals one obvious fact about body weight: Obesity tends to run in families. Indeed, various family and adoption studies indicate that approximately half the variability in body weight can be considered the result of genetics (Klump & Culbert, 2007). One of the best and largest studies, carried out in Denmark during the 1980s, found that the BMI of adopted children was strongly related to the BMI of their biological parents and not at all to the BMI of their adoptive parents (Sorensen, Holst, Stunkard, & Skovgaard, 1992). Studies of identical and fraternal twins provide even stronger evidence of genetic control of body weight, finding heritability estimates ranging from 60 percent to 80 percent. (As discussed in Chapter 3, heritability refers to the proportion of variability, in a population, attributed to genetic transmission of

**body mass index (BMI)** A ratio of body weight to height, used to measure obesity.



**FIGURE 10.13 Determining Body Mass Index** You can find your own BMI by finding the point at which your weight and height meet on the graph. Beyond or below the optimal normal range, you are at greater risk for health problems.

a trait from parents to their offspring.) Moreover, the similarity between the body weights of identical twins does not differ for twins raised together versus twins raised apart, a finding that suggests environment has far less effect on body weight than genetics has.

If genes primarily determine body weight, why has the percentage of Canadians who are obese doubled over the past few decades? Albert Stunkard, a leading American researcher on human obesity, points out that genetics determines whether a person *can* become obese, but environment determines whether that person *will* become obese (Stunkard, 1996). In an important study conducted at Laval University by the geneticist Claude Bouchard, identical twins were overfed by approximately 1,000 calories each day for 100 days. Most of the twins gained some weight, but there was great variability among pairs in how much they gained (ranging from 4.3 kg to 13.3 kg, or 9.5 lbs to 29.3 lbs; C. Bouchard et al., 1990). Further, within the twin pairs there was a striking degree of similarity in how much weight they gained and in which parts of the body they stored the fat. Some of the twin pairs were especially likely to put on weight. Thus genetics determines sensitivity to environmental influences. Genes predispose some people to obesity in environments that promote overfeeding, such as contemporary industrialized societies (FIGURE 10.14). Many genes are involved in obesity, as might be expected for such a complex condition: More than 300 genetic markers or genes have been identified as playing some role (Snyder et al., 2004).

**THE STIGMA OF OBESITY** Obesity is associated with a significant number of medical problems, including heart disease, high blood pressure, and gastric ailments. It also can give rise to various psychological problems, primarily because



**FIGURE 10.14 Inuit of the Canadian Arctic** Is obesity inherited or environmental? Studies have shown that among indigenous peoples of Canada, obesity is due to a traditionally high caloric intake combined with large amounts of fats, sugars, and carbohydrates, all of which previously were scarce. Additionally, the rate of Type II diabetes among Canadian Inuit is the highest in the world.



**FIGURE 10.15 Variations in Body Image**  
In some places, larger shapes are more desirable, as embodied by these welcoming women on the island of Fatu Hiva, in French Polynesia.

of the extreme stigma associated with being overweight. In most Western cultures, obese individuals are viewed as less attractive, less socially adept, less intelligent, and less productive than their normal-weight peers (Dejong & Kleck, 1986). Moreover, perceiving oneself as overweight is linked to depression, anxiety, and low self-esteem. (As noted in Chapter 2, we cannot randomly assign people to different weight conditions or different levels of self-esteem, so most of the obesity research with humans is correlational.)

It might be tempting to infer that being overweight causes these problems, but a recent study suggests that low self-esteem might cause weight gain (Lemeshow et al., 2008). Almost 6,000 girls aged 12 to 18 rated their social status at school, using a scale of 1 to 10, with 10 being the most admired and popular. The girls who rated themselves as 4 or less on this scale were much more likely—after a control for other relevant variables (e.g., age, television viewing, height growth, household income)—to show a gain of 2 BMI points two years after rating their self-esteem than were girls who rated themselves higher. Many possible explanations exist for this correlation, however, so we cannot claim any causal relationships between low self-esteem and weight gain.

Not all cultures stigmatize obesity (Hebl & Heatherton, 1998). In some developing countries, such as many African nations, being obese is a sign of being upper class. Obesity may be desirable in developing countries because it helps prevent some infectious diseases, reduces the likelihood of starvation, and is associated with having more successful births. It may also serve as a status symbol in developing countries, an indication that one can afford to eat luxuriously. In Pacific Island countries such as Tonga and Fiji, being obese is a source of personal pride, and dieting is uncommon (**FIGURE 10.15**).

In most industrialized cultures, where food is generally abundant, being overweight is associated with lower socio-economic status, especially for women. The upper classes in Western cultures have a clear preference for very thin body types, as exemplified in fashion magazines. The typical woman depicted by the fashion industry is 180 centimetres (5 feet 11 inches) tall and weighs approximately 50 kilograms (110 pounds)—18 centimetres (7 inches) taller and 14 kilograms (30 pounds) lighter than the average woman in Canada. Such an extreme standard of thinness represents a body weight ideal that is difficult, if not impossible, for most people to achieve. Indeed, women report holding body weight ideals that are not only lower than average weight but also lower than what men find attractive (Fallon & Rozin, 1985).

**RESTRICTIVE DIETING DOES NOT WORK** Dieting is a notoriously ineffective means of achieving permanent weight loss. Most individuals who lose weight through dieting eventually regain the weight; often, they gain back more than they lost. Most diets fail primarily because of the body's natural defence against weight loss (Kaplan, 2007). Body weight is regulated around a set-point determined primarily by genetic influence. Consider two examples. In 1966, several inmates at a Vermont prison were challenged to increase their body weight by 25 percent (Sims et al., 1968). For six months, these inmates consumed more than 7,000 calories per day, nearly double their usual intake. If each inmate was eating about 3,500 extra calories a day (the equivalent of seven large cheeseburgers), simple math suggests that each should have gained approximately 80 kilograms (175 pounds) over the six months. In reality, few inmates gained more than 20 kilograms (44 pounds), and most lost the weight when they went back to normal eating. Those who did not lose the weight had family histories of obesity, a finding that supports the view that genetics predisposes some people to obesity.

At the other end of the spectrum, more than 100 men volunteered to take part in a scientific study as an alternative to military service during World War II (Keys,

Brozek, Henschel, Mickelsen, & Taylor, 1950). The researchers were investigating the short- and long-term effects of semistarvation, and over six months the participants lost an average of 25 percent of their body weight. Most found this weight reduction very hard to accomplish, and some had great difficulty losing more than 5 kilograms (11 pounds). The men underwent dramatic changes in emotions, motivation, and attitudes toward food. They became anxious, depressed, and listless; they lost interest in sex and other activities; and they became obsessed with eating. Many of these outcomes are similar to those experienced by people with eating disorders.

Although it is possible to alter body weight, the body responds to weight loss by slowing down the metabolism and using less energy. Therefore, after the body has been deprived of food, it needs less food to maintain a given body weight. Likewise, weight gain occurs much faster in previously starved animals than would be expected by caloric intake alone. In addition, repeated alterations between caloric deprivation and overfeeding have been shown to have cumulative metabolic effects, so that weight loss and metabolic functioning are slowed more each time the animal is placed on caloric deprivation, and weight gain occurs more rapidly with each resumption of feeding. Such patterns might explain why “yo-yo dieters” tend to become heavier over time.

Recent research has yielded the surprising finding that body weight is also socially contagious (Christakis & Fowler, 2007). One study found that close friends of the same sex tend to be similar in body weight. Even when close friends live far apart from each other, if one friend is obese, the other one is likely to be obese as well. Studies of the social transmission of obesity suggest that it is not eating the same meals or cooking together that is critical; rather, it is the implicit agreement on what body weight is acceptable or normal. If many of your close friends are obese, implicitly you learn that obesity is normal. Thus subtle communications can affect how we think and act when we eat. Such findings highlight a main theme of this book: We are not aware of many of the psychological influences on our thoughts, behaviours, and attitudes.

**RESTRAINED EATING** Diets may also fail because people engage in occasional, or not so occasional, bouts of overeating. The psychologists Janet Polivy and Peter Herman (1985), at the University of Toronto, have demonstrated that chronic dieters, whom they call *restrained eaters*, are prone to excessive eating in certain situations. For instance, if restrained eaters believe they have eaten high-calorie foods, they abandon their diets. Their mindset becomes “I’ve blown my diet, so I might as well just keep eating.” Many restrained eaters diet all week and then lose control on the weekend, when they are faced with increased food temptations and at the same time are in less structured environments. Being under stress also leads restrained eaters to break their diets (Heatherton, Herman, & Polivy, 1991).

Binge eating by restrained eaters depends on their *perceptions* of whether they have broken their diets. Dieters can eat 1,000-calorie Caesar salads and believe their diets are fine; but if they eat 200-calorie chocolate bars, they feel their diets are ruined and become disinhibited (first they inhibit their eating, and then they lose the inhibition—that is, they become *disinhibited*). The problem for restrained eaters is that they rely on cognitive control of food intake: Rather than eating according to internal states of hunger and satiety, restrained eaters eat according to rules, such as time of day, number of calories, and type of food. Such patterns will likely break down when dieters eat high-calorie foods or feel distressed. Getting restrained eaters back in touch with internal motivational states is one goal of sensible approaches to dieting.

**DISORDERED EATING** When dieters fail to lose weight, they often blame their lack of willpower, vowing to redouble their efforts on the next diet. Repeated

dietary failures may have harmful and permanent physiological and psychological consequences. In physiological terms, weight-loss and weight-gain cycles alter the dieter's metabolism and may make future weight loss more difficult. Psychologically, repeated failures diminish satisfaction with body image and damage self-esteem. Over time, chronic dieters tend to feel helpless and depressed. Some eventually engage in more extreme behaviours to lose weight, such as taking drugs, fasting, exercising excessively, or purging. For a vulnerable individual, chronic dieting may promote the development of a clinical eating disorder.

**anorexia nervosa** An eating disorder characterized by an excessive fear of becoming fat and thus a refusal to eat.

The two most common eating disorders are *anorexia nervosa* and *bulimia nervosa* (Wiseman, Harris, & Halmi, 1998). Individuals with **anorexia nervosa** have an excessive fear of becoming fat; as a result, they refuse to eat. Anorexia most often begins in early adolescence and mainly affects upper-middle- and upper-class Caucasian girls. Although many adolescent girls strive to be thin, fewer than 1 in 100 meet the clinical criteria of anorexia nervosa (TABLE 10.1). These criteria include both objective measures of thinness and psychological characteristics that indicate an abnormal obsession with food and body weight. Those who have anorexia view themselves as fat despite being at least 15 percent to 25 percent underweight. Issues of food and weight pervade their lives, controlling how they view themselves and how they view the world. Initially, the results of self-imposed starvation may draw favourable comments from others. But as the anorexic approaches her emaciated ideal, family and friends usually become concerned. In many cases, medical attention is required to prevent death from starvation. Anorexia is difficult to treat, since patients maintain the belief that they are overweight or not as thin as they would like to be, even when they are severely emaciated. This dangerous disorder causes a number of serious health problems, in particular a loss of bone density, and about 15 percent to 20 percent of those with anorexia eventually die from the disorder—they literally starve themselves to death (American Psychiatric Association, 2000b).

**bulimia nervosa** An eating disorder characterized by dieting, binge eating, and purging.

Individuals with **bulimia nervosa** alternate between dieting and binge eating. Bulimia often develops during late adolescence. Like anorexia, bulimia is most

**Table 10.1 Diagnostic Criteria for Anorexia Nervosa and Bulimia Nervosa**

CRITERIA FOR ANOREXIA NERVOSA	CRITERIA FOR BULIMIA NERVOSA
A. Refusal to maintain body weight at or above a minimum normal for age and height (e.g., weight loss leading to maintenance of body weight less than 85 percent of that expected; or failure to make expected weight gain during period of growth, leading to body weight less than 85 percent of that expected).	A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following: <ol style="list-style-type: none"> <li>(1) Eating, in a discrete period (e.g., within any 2-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances.</li> <li>(2) A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).</li> </ol>
B. Intense fear of gaining weight or becoming fat, even though underweight.	B. Recurrent inappropriate compensatory behaviour in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, enemas, or other medications; fasting; or excessive exercise.
C. Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight.	C. The binge eating and inappropriate compensatory behaviours both occur, on average, at least twice a week for 3 months.
D. In postmenarcheal females, amenorrhea (the absence of at least three consecutive menstrual cycles).	D. Self-evaluation is unduly influenced by body shape and weight.

SOURCE: American Psychiatric Association, 1994.



If a fairly close relative or friend needed a kidney transplant because of renal failure and you were a perfect or very good match, would you donate one of your kidneys to that person? What if the person's renal failure was due to her obesity, a condition that increases the risk of kidney failure sevenfold? Imagine further that maintaining a healthy weight has been difficult for you; you jog six kilometres a day and are vigilant about what you eat, while your relative or friend has not been so careful. Would you still feel a moral obligation to donate your kidney?

The increasing incidence of obesity is no secret, and concern is growing rapidly in Canada, Britain, Australia, the United States, and various European countries. Health Canada reports that about one-fifth of Canadian adults are obese and more are overweight. Obesity is a well-recognized cause of chronic health problems such as diabetes, hypertension, and heart disease—some of the leading causes of health care spending, disability, and death. The economist Roland Sturm (2002), of the RAND Corporation, has found that obesity helps increase the number of chronic conditions at a rate similar to that of twenty years' aging and significantly greater than current or past smoking or problem drinking. But unlike smokers and drunk drivers, fat people do not compromise the well-being of others. Or do they? What about the costs of treating obesity-related disease? A study of obesity costs around the world found that obese individuals have medical costs approximately 30 percent higher than their peers of normal weight (Withrow & Alter, 2010).

Explanations for the rise in obesity are numerous: increasingly sedentary lifestyles because of television, video games, computers, and car travel; a decrease in physical activity programs in schools; increased portion sizes; more fast food and fewer healthy, home-cooked meals (Vanchieri, 1998); even high fructose corn syrup. The geneticist Jeffrey M. Friedman (2003), of Rockefeller University, argues that we cannot discuss obesity meaningfully until we resist the impulse to assign blame. Nor, he argues, can we hold to the simple belief that through willpower alone, people consciously can resist food's allure and precisely control their weight. Friedman emphasizes that there is more to the equation and that the answers seem to reside in our genes and their interactions with environmental factors.

Epidemiological, experimental, and twin studies have found major differences in individuals' sensitivity and resistance to obesity. In fact, in the United States, morbid obesity is increasing more rapidly than moderate obesity (Sturm, 2003), and the BMI of adults in the lowest percentiles has not changed nearly as much as has the BMI of those in the highest percentiles. Some people appear susceptible to obesity in what is essentially a toxic environment of high-fat diets and decreased physical activity, and others are relatively resistant. To most of us, these facts are no surprise. We all know people who eat like horses and never gain weight and people who eat very little and are always fighting to keep their weight down.

Some anti-obesity researchers suggest that because no good medical treatment exists for obesity and most dieters fail at their attempts to maintain weight loss, the best hope for dealing with the "obesity epidemic" might be political. Suggestions have been made to restrict the marketing of junk foods, especially to children in schools and on television, and to impose taxes (known as "the fat tax") and put calorie labels on junk food and fast food. In 2008, British Columbia banned junk food vending machines in schools. As of September 2011, children in Ontario will no longer be able to buy junk food at school: no pop, candy, fries, or energy drinks on school grounds. The children will also be required to perform 20 minutes of physical activity each school day.

Some public interest groups, such as NAAFA, argue that fatness is a form of body diversity, is not a disease, and should be tolerated and respected. Is obesity a public health issue that needs to be addressed or is it a form of body diversity that should be accepted as a variation of normal? Is it ethical for the government to interfere in our personal lives regarding food choice, or do people have a right to live their lives the way they choose? Are the added costs to the health care system of an unhealthy diet and lack of exercise different from the strain put on it by people who make other unhealthy lifestyle choices, such as smoking and not using condoms or wearing seatbelts? Does government have a responsibility to protect people, especially children, from toxic environments that include the slick marketing of junk food?

common among upper-middle- and upper-class Caucasian women, but it is more common among minorities and men than anorexia is. Approximately 1 percent to 2 percent of women in high school and university meet the definitional criteria for bulimia nervosa. These women tend to be of average weight or slightly overweight. They regularly binge eat, feel their eating is out of control, worry

excessively about body weight issues, and engage in one or more compensatory behaviours, such as self-induced vomiting, excessive exercise, or the abuse of laxatives. Whereas anorexics cannot easily hide their self-starvation, binge-eating behaviour tends to occur secretly. When ordering large quantities of food, bulimics pretend they are ordering for a group, and they often hide the massive quantities of food they buy for binges. They try to vomit quietly or seek out little-used bathrooms to avoid being heard while they vomit. Although bulimia is associated with serious health problems, such as dental and cardiac disorders, it is seldom fatal (Keel & Mitchell, 1997). A variant of bulimia is *binge-eating disorder*, wherein individuals engage in binge eating but do not purge. Many people with binge-eating disorder are obese.

Eating disorders tend to run in families and, like obesity, are due partly to genetics. The incidence of eating disorders in the United States increased into the 1980s (Keel, Baxter, Heatherton, & Joiner, 2007), so a genetic predisposition for them appears to be manifested in societies with an abundance of food. Bulimia seems to be more culture bound, meaning there are large cultural variations in its incidence, whereas anorexia is prevalent in all societies that have abundant food.

## Smoking Is a Leading Cause of Death

Despite overwhelming evidence that smoking cigarettes leads to premature death, millions around the globe continue to light up (Carmody, 1993). According to a recent report from the World Health Organization, increasing numbers of people are smoking in low-income countries, and 5.4 million deaths are caused by tobacco every year. Thirty percent of all smokers worldwide are in China; 10 percent are in India; and an additional 25 percent come from Indonesia, Russia, the United States, Japan, Brazil, Bangladesh, Germany, and Turkey combined (World Health Organization, 2008; **FIGURE 10.16**). It is estimated that more than one billion people will die from smoking in this century. According to the Canadian Tobacco Use Monitoring Survey (Health Canada, 2009), approximately 18 percent of adults age 15 and older were current smokers, which is down from 25 percent in 1999. Still, many thousands of Canadians die each year from smoking-related illnesses. The recent decline in smoking in Canada is likely attributable to restrictions on where people can smoke (Shields, 2007) as well as graphic warning labels placed on cigarette packages (Hammond, Fong, MacDonald, Brown, & Cameron, 2004).

Most smokers begin in childhood or early adolescence, and every day thousands of children around the world have their first cigarette (Gilpin, Choi, Berry, & Pierce, 1999). About half of these young smokers will likely continue smoking into adulthood, and one-third of those will die from smoking (United States Department of Health and Human Services, 2001).

Among the numerous health problems smoking causes are heart disease, respiratory ailments, and various cancers. Cigarette smoke also causes health problems for nonsmoking bystanders—a finding that has led to bans on smoking in many public and private places. Smokers also endure scoldings from physicians, and loved ones, concerned for their health and welfare. Besides spending money on cigarettes, smokers pay significantly more for life insurance and health insurance. Why do they continue to smoke? Why does anyone start?

**STARTING SMOKING** It is hard to imagine any good reason to start smoking. First attempts at smoking often involve a great deal of coughing, watering eyes, a terrible taste in the mouth, and feelings of nausea. So why do kids persist? Most researchers point to powerful social influences as the leading cause of adolescent



(a)



(b)

**FIGURE 10.16 Smoking Is a Global Phenomenon** (a) These men are smoking in Tiananmen Square, in Beijing, China. (b) These smokers belong to the Mentawai people, a seminomadic hunter-gatherer tribe in the coastal and rain forest regions of Indonesia.

smoking (Chassin, Presson, & Sherman, 1990; **FIGURE 10.17**). Research has demonstrated that adolescents will more likely smoke if their parents or friends smoke (Hansen et al., 1987). They often smoke their first cigarettes in the company of other smokers, or at least with the encouragement of their peers. Moreover, many adolescent smokers appear to show a false-consensus effect—they overestimate the number of adolescent and adult smokers (Sherman, Presson, Chassin, Corty, & Olshavsky, 1983). Adolescents who incorrectly believe that smoking is common may take it up to fit in with the crowd.

Other studies have pointed to the potential meaning of “being a smoker” as having a powerful influence. For instance, research has shown that smokers are viewed as having positive qualities such as being tough, sociable, and good with members of the opposite sex. Children take up smoking partially to look “tough, cool, and independent of authority” (Leventhal & Cleary, 1980, p. 384). As discussed in Chapter 6, adolescents imitate models through observational learning. Smokers in movies are often portrayed in glamorous ways that appeal to adolescents. Researchers in Germany found that the more German children age 10 to 16 watched popular North American movies that depicted smoking, the more likely they were to try smoking (Hanewinkel & Sargent, 2008). Thus smoking may be one way for adolescents to enhance their self-images as well as their public images (Chassin et al., 1990). By grade 12, 70 percent of adolescents have had some experience with tobacco products (Mowery, Brick, & Farrelly, 2000). Of course, it is hard to look tough while gasping and retching; so while most adolescents try one or two cigarettes, most do not become regular smokers. Even so, approximately 15 percent of Canadian grade 12 students are occasional or daily smokers (Health Canada, 2009).

Over time, casual smokers become addicted. It is now widely acknowledged that the drug nicotine, in tobacco, is of primary importance in motivating and maintaining smoking behaviour (Fagerström & Schneider, 1989). Once the smoker becomes “hooked” on nicotine, going without cigarettes will lead to unpleasant withdrawal symptoms, including distress and heightened anxiety (Russell, 1990). Some people appear especially susceptible to nicotine addiction, perhaps because of genetics (Sabol et al., 1999). Nicotine may lead to increased activation of dopamine neurons, which can have a rewarding effect. (On the role of dopamine neurons, see Chapter 3, “Biological Foundations.”)

**MAINTAINING A HEALTHY WEIGHT OR QUITTING SMOKING** For weight loss programs to be successful, individuals need to make permanent lifestyle changes that include altering eating habits, increasing exercise, eliminating food cues, enlisting family members to help, and, for some, taking prescription drugs and undergoing surgery. Although it is far from easy, some people manage to lose excess weight and maintain healthy weights.

Gary Stocklaufer, discussed at the opening of this chapter, is one of the many obese people who have had surgery to reduce their stomachs and prevent them from overeating because they could not lose weight with diet and exercise. Many other obese people have turned to drugs to help them lose weight, but there are no get-thin-quick medications, and all the available medications require exercise and healthy eating to bring about weight loss. People who are not obese but want to shed extra pounds can join support groups to help them exercise more and eat better. In fact, many people have lost weight and kept it off by adopting healthy lifelong habits.



**FIGURE 10.17 Social Influence and Smoking** Children are more likely to start smoking if their friends or family members are smokers.

Cigarette smokers similarly need orchestrated efforts for their best chances at stopping smoking. These efforts often include nicotine patches to assist with the withdrawal symptoms, avoiding places where other people smoke, and substituting behaviours that are healthier than smoking. However, like other addicts, smokers may need to “hit rock bottom” before realizing they have to do something about their behaviour. The psychologist David Premack provides an example of a man who quit smoking because of something that happened as he was picking up his children at the city library:

A thunderstorm greeted him as he arrived there; and at the same time a search of his pockets disclosed a familiar problem: he was out of cigarettes. Glancing back at the library, he caught a glimpse of his children stepping out in the rain, but he continued around the corner, certain that he could find a parking space, rush in, buy the cigarettes and be back before the children got seriously wet. (Premack, 1970)

For the smoker, it was a shocking vision of himself “as a father who would actually leave the kids in the rain while he ran after cigarettes.” The man quit smoking on the spot.

### Exercise Has Physical, Emotional, and Cognitive Benefits

Research clearly shows the benefits of physical exercise on almost every aspect of our lives, including reduced depression, enhanced memory, and enhanced cognition (Harburger, Nzerem, & Frick, 2007). Aerobic exercise (the kind that temporarily increases breathing and heart rates) promotes neurogenesis, the growth of new neurons and neural connections (Carmichael, 2007). The additional neurons created through exercise result in a larger brain—affecting especially the hippocampus, an area of the brain important in memory and cognition (see Chapter 3, “Biological Foundations”).

Unlike societies throughout most of human history, modern society allows people to exert little physical energy. People drive to work, take elevators, spend hours watching remote-controlled television, use various labour-saving devices, and complain about not having time to exercise. Once people are out of shape, it is difficult for them to start exercising regularly.

Fortunately, it is never too late to start exercising and getting its positive benefits. In one study, sedentary adults between the ages of 60 and 79 were randomly assigned to either six months of aerobic training (such as running or fast dancing) or a nonaerobic control group (Emery, Kiecolt-Glaser, Glaser, Malarkey, & Frid, 2005). Participants in aerobic training significantly increased their brain volume, including both white (myelinated) and grey matter. The nonaerobic control group experienced no comparable changes. In another study, older adults were assigned randomly to either three months of aerobic exercise or a nonaerobic control group. All the participants agreed to have small cuts made on their bodies so the researchers could study whether aerobic exercise hastened the time it took for the wounds to heal. The wounds of the aerobic group took an average of 29.2 days to heal, while those of the nonaerobic group took an average of 38.9 days to heal. Besides faster healing time, the aerobic group had better cardiorespiratory (heart and lung) fitness. Another recent study randomly assigned older adults with memory problems to an exercise group (three hours a week for two weeks) or to a control group (Lautenschlager et al., 2008). The participants in the exercise group improved in their overall cognition, including memory; the control group showed no changes. The researchers concluded that exercise reduces cognitive decline in older adults with moderate memory problems.

In general, the more people exercise, the better their physical and mental health. Aerobic exercise is especially good for cardiovascular health; it lowers blood pressure and strengthens the heart and lungs (Lesniak & Dubbert, 2001). Other recent evidence indicates that exercise might help prevent certain cancers and improve the immune system. Because exercise helps control appetite and metabolism, in addition to burning calories, it is an essential element of any weight control program.

Exercise is also good for mental health because it can reduce stress and improve mood. Indeed, as little as 10 minutes of exercise can improve feelings of vigor and enhance mood, although at least 30 minutes of daily exercise is associated with the most positive mental state (Hansen, Stevens, & Coast, 2001). The evidence is compelling that exercise can contribute to positive outcomes for the clinical treatment of depression (Craft & Perna, 2004) as well as addiction and alcoholism (Read & Brown, 2003). How exercise exerts these positive effects is not known. It may simply make people feel good because they know the exercise is good for them, or it may build self-confidence and help people cope with stress. It may affect neurotransmitter systems involved in reward, motivation, and emotion. It may also enhance neurogenesis, the production of neurons, and synaptogenesis, the production of synaptic connections in the brain.

### There Are Ethnic Differences in Health Behaviours

Worldwide, racial and ethnic groups exhibit large disparities in health. For example, in Canada, life expectancy is 78.4 years for white males and 83.0 years for white females (Statistics Canada, 2010). But the life expectancy in Inuit-inhabited areas lags by approximately 12 years (Wilkins et. al, 2008), and Aboriginal Canadians in general have a lower life expectancy, particularly if they live on reservations (Frohlich et al., 2006). The reasons that racial and ethnic groups experience differences in their health include genetics, access to health care, and cultural factors. For example, First Nations Canadians are more likely to smoke, are more obese, have more accidents, and have double the rate of suicide (Frohlich et al., 2006). *Acculturation*—the extent to which individuals assimilate the customs, values, beliefs, and behaviours of the mainstream culture—is an important variable in understanding why different groups have disparate health behaviours and health outcomes.

In a study of health behaviours and ethnicity in the United States, a sample of university students who were similar in their educational backgrounds but came from a range of ethnic backgrounds filled out both a survey of their health behaviours (for example, how often they got medical checkups, went to the dentist, exercised, and ate fruit) and an acculturation scale that assessed the extent to which they listened to mainstream music, watched mainstream television shows, followed mainstream fashion, and so on (Despues & Friedman, 2007). African Americans and Hispanic Americans were less likely to smoke or drink alcohol than European Americans and Asian Americans. However, African Americans, Hispanic Americans, and Asian Americans were all less likely to exercise, eat fruit, or go to a dentist than were members of the mainstream culture—European Americans. Additionally, in each group, those who were more acculturated tended to be more like the European Americans in their health behaviours.

Such important differences in health behaviours among ethnic groups will have long-term consequences for people's health and expected lifespans (FIGURE 10.18). Thus, by assuming a biopsychosocial perspective, researchers can see how cultural-level variables influence behaviours and how behaviours alter underlying biology. Each level of analysis provides a piece of the intricate puzzle that determines health and well-being. Not all healthy behaviours are associated with acculturation to the



**FIGURE 10.18 The Longest-Living People** The Japanese tend to live very long lives. Pictured here are 99-year-old Matsu and 91-year-old Taido, both of Ogimi Village.

mainstream society, however, so people might want to keep the healthy behaviours associated with their own ethnic groups while adopting the healthy behaviours of other groups.

## SUMMING UP

### What Behaviours Affect Mental and Physical Health?

How people behave in their daily lives profoundly affects their physical and mental health. People engage in many unhealthy behaviours when they are stressed, such as eating fatty foods and smoking. Other behaviours that directly affect health include suicides, homicides, and accidents. People who eat too much may become obese, especially if they have a genetic predisposition to put on weight, and obesity poses some serious health risks. Smoking is especially bad for health and is a leading cause of death. Unfortunately, smoking typically starts in adolescence, when people give little thought to long-term consequences. Exercise is one of the best things people can do for their health. Regular physical activity enhances emotional experiences, improves memory and cognition, and builds a strong, healthy body. Racial and ethnic groups exhibit health disparities, some of which can be attributed to differences in their health behaviours. Interventions may work best if they are grounded in an understanding of the health behaviours of different races and different ethnicities.

## MEASURING UP

1. How does exercise affect the brain?
  - a. Exercise improves muscles and lungs, but does not affect the brain.
  - b. As revealed in MRI brain scans, excessive exercise can cause an aversion to physical activity.
  - c. People already in good physical shape show no brain effects, and those in poor physical shape show an enlargement in the areas corresponding to motor control.
  - d. Exercise causes the growth of new neurons and new neural connections, especially in brain areas associated with memory and cognition.
2. Why do restrictive diets rarely work in reducing obesity?
  - a. Obese people usually cheat when they are on restrictive diets.
  - b. The body learns to conserve calories, so restrictive dieting may lead ultimately to greater weight gain.
  - c. We do not know enough about foods' caloric contents to determine good diets.
  - d. The obese tend to lose less weight with restrictive diets than other people do.

### LEARNING OBJECTIVE

Discuss research showing that optimism, social support, trust, and spirituality are good for our health.

## Can a Positive Attitude Keep Us Healthy?

It seems more like a trite remark than objective science to say that people feel better when they “put on a happy face,” but there just might be something to the advice to “keep your sunny side up.” Did the lyricists of old musicals know more about human nature and health than have most psychologists and physicians in the last 50 years? Regardless of the inspiration for these happy songs, the message is a good one—you can collect handsome health dividends if you “smile, smile, smile” (FIGURE 10.19).

## Being Positive Has Health Benefits

Psychologists from the humanist school of thought focused on what is positive in the human experience. Abraham Maslow, Carl Rogers, and Erik Erikson were among the early pioneers in the field of positive psychology, although it was not known by that title then. These early humanist psychologists enjoyed the greatest success in the decades from 1950 to 1970. Other schools of thought, especially cognitive perspectives, then took the leading roles in psychology. Since the 1990s, positive psychology has enjoyed a tremendous comeback. The new *positive psychology* emphasizes the strengths and virtues that help people thrive. Its primary aim is an understanding of psychological well-being. If you have read Chapter 2, then you might be wondering how the term *happy* is operationalized, or identified and measured. According to positive psychologists, it has three components: (1) positive emotion and pleasure, (2) engagement in life, and (3) a meaningful life (Seligman, Steen, Park, & Peterson, 2005). For example, a happy university professor might experience pleasure when interacting with students and colleagues (component 1), might be actively engaged in teaching and research (component 2), and might find meaning in contributing to the success of students and of colleagues (component 3). Such variables affect each other: When any one increases, the others increase as well; although, as with most of the data on health variables, we can conclude that they are correlated and can only speculate about causal linkages.

**ARE HAPPIER PEOPLE HEALTHIER?** Earlier in this chapter, you read about the negative health consequences of negative emotions, especially hostility and stress. You may have wondered about the flip side of this relationship: Are positive emotions associated with health and well-being (**FIGURE 10.20**)? This question was addressed in a study in which more than 1,000 patients in a large medical practice returned questionnaires about their emotional traits (Richman et al., 2005). The questionnaires included scales measuring the positive emotions hope and curiosity and the negative emotions anxiety and anger. Two years after receiving the questionnaires, the patients' medical files were used to determine if relationships



**FIGURE 10.19 Positivity** Laughing clubs, such as this one in India, believe in laughter as therapy and a way to keep in shape.

### FIGURE 10.20 Try for Yourself: How to Be Happier

Research shows that with relatively short interventions, people can become happier, at least in the short run; the long-term effects are unknown.

Here are some suggestions based on research findings about happiness. You can try these activities for yourself to test their effects.

1. In the next week, write a letter of gratitude and deliver it in person to someone who has been kind to you but whom you have never thanked.
2. Once a week, write down three things that went well that day and explain why they went well.
3. Tell a friend about a time when you did your very best, and then think about the strengths you displayed. Review this story every night for the next week.
4. Imagine yourself 10 years in the future as your best possible self, as having achieved all your most important goals. Describe in writing what your life is like and how you got there.
5. Keep a journal in which you write about the positive aspects of your life. Reflect on your health, freedom, friends, and so on.
6. Act like a happy person. Sometimes just going through the motions of being happy will create happiness.

**Result:** Data suggest that each of these activities can enhance a person's happiness (Lyubomirsky, King, & Diener, 2005). Activities such as these are called "shotgun interventions" because they are fast acting, cover a broad range of behaviours, have relatively large effects for such a small investment, and pose little risk.

existed among these emotions and three broad types of diseases: hypertension, diabetes, and respiratory tract infections. Higher levels of hope were associated with reduced risk of these medical diseases, and higher levels of curiosity were associated with reduced risk of hypertension and diabetes. Therefore, the answer is, in general, yes: Positive emotions can predict better health.

A great deal of research literature focuses on the health effects of positive emotions. Having a positive affect, or being generally positive, has been shown to have multiple beneficial effects on the immune system (Marsland, Pressman, & Cohen, 2007). People with a positive affect show enhanced immune system functioning and greater longevity than their less positive peers. They have fewer illnesses after exposure to cold germs and flu viruses (Cohen, Alper, Doyle, Treanor, & Turner, 2006). Thus, across multiple studies and types of measures, optimistic people are found to be healthier.

## Social Support and Social Integration Are Associated with Good Health

There is a Broadway song about people who need people being the luckiest people in the world. Perhaps the songwriters again got it right. Happy people tend to have strong social networks and are more socially integrated than are less happy people (Smith, Langa, Kabeto, & Ubel, 2005).

Social interaction is beneficial for physical and mental health. The psychologist Susan Holtzman, of the University of British Columbia, and colleagues (2004) found that social support helped people cope with the pain of chronic arthritis. People with larger social networks (more people they interact with regularly) will less likely get colds (Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997). Apparently, people who have more friends also live longer than those who have fewer friends. A study that used a random sample of almost 7,000 adults found that people with smaller social networks were more likely to die during the 9-year period between assessments than were those with more friends. Men with fewer friends were 2.3 times more likely to die than comparable men with more friends; women with fewer friends were 2.8 times more likely to die than comparable women with more friends (Berkman & Syme, 1979). These risk factors for social support were independent of other common risks such as stated health at the time of the first contact, obesity, smoking, socio-economic status, and physical activity. In addition, ill people who are socially isolated will likely die sooner than those who are well connected to others (House, Landis, & Umberson, 1988), in part because isolation is associated with many health problems.

The positive benefits of social interaction depend on more than just the size of a person's social network, however. **Social integration** refers to the quality of the social relationships a person has. Having social support is an essential component of positive mental and physical health. A review of more than 80 studies found strong evidence linking social support to fewer health problems (Uchino, Cacioppo, & Kiecolt-Glaser, 1996).

Social support helps people cope and maintain good health in two basic ways. First, people with social support experience less stress overall. Consider single parents who have to juggle job and family demands. The lack of a partner places more demands on them, thus increasing their likelihood of feeling stressed. Therefore, social support can take tangible forms, such as providing material help or assisting with daily chores. To be most effective, however, social support needs to imply that people care about the recipient of the support. Knowing that other people care can lessen the negative effects of stress. The **buffering hypothesis** (Cohen & Wills, 1985) proposes that when others provide emotional support, such as expressions

**social integration** The quality of a person's social relationships.

**buffering hypothesis** The idea that other people can provide direct support in helping individuals cope with stressful events.



of caring and willingness to listen to another person's problems, the recipient is better able to cope with stressful events.

**EMOTIONAL DISCLOSURE HAS POSITIVE HEALTH EFFECTS** Can expressing your emotions improve your health? A large body of evidence supports the conclusion that writing about or talking about emotional events can yield substantial health benefits. The American psychologist James Pennebaker and his colleagues conducted a series of studies in which the emotional events disclosed ranged from childhood incest and the horrors of the Holocaust to less traumatic events, such as not being included in a social event. Repeatedly, they found positive health effects for people who wrote about or talked about these emotional events (Pennebaker, Barger, & Tiebout, 1989; Pennebaker, Mayne, & Francis, 1997; **FIGURE 10.21**). The linkage between writing about the emotional events in one's life and health was seen in several measures. In one study, university students randomly assigned to write about an emotional event visited the university health centre fewer times than students assigned to write about other topics, even though there were no group differences in how often the students visited the health centre before participating in the writing study (Pennebaker & Beall, 1986).

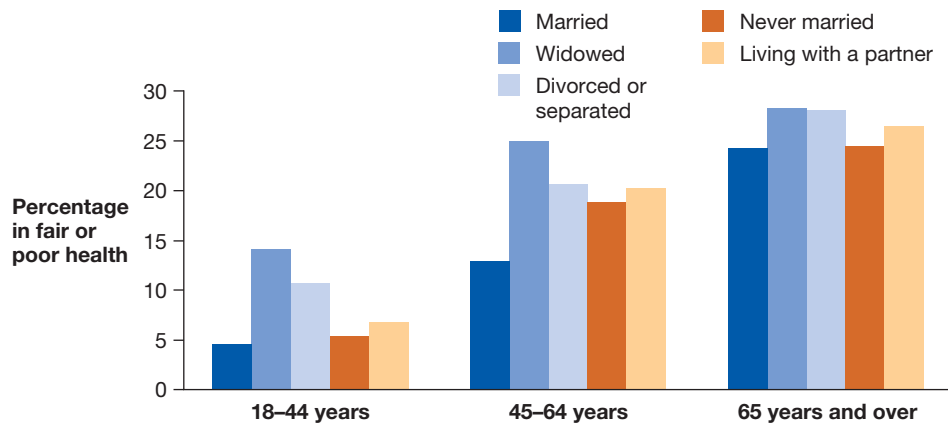
In their review of the literature, Anderson and Anderson (2003) show multiple benefits of disclosure and explain how it works best. Writing about emotional events can help the writers understand the causes of those events. As people write in this way, they construct meaningful stories out of experiences so they can better understand the experiences and can move on from them. (Talking into a recording device may work similarly for people who have difficulty writing.) Anderson and Anderson suggest that when trying this technique people should anticipate some negative feelings, at least in the short run, but that over time these feelings will dissipate. They suggest starting with something that needs a resolution—a topic that might be difficult to disclose to other people. Write about it or talk about it for at least 15 minutes without stopping, they advise, both describing the troubling situation and expressing feelings about it. (If you are suffering from a traumatic event that needs resolution, consider seeing a professionally trained psychotherapist—a topic discussed in Chapter 15, “Treatment of Psychological Disorders.”)

**MARRIAGE CAN BE GOOD FOR YOUR HEALTH** The research on social support shows clearly that positive relationships are good for health. Marriage is generally people's most intimate and long-lasting supportive relationship, but being married has health benefits only if the marriage is a good one, and the positive effects of marriage are stronger for husbands than for wives (Kiecolt-Glaser & Newton, 2001). Single women have 50 percent greater mortality than married women; single men have 250 percent greater mortality than married men. (Recent data on the relationship between marital status and health are shown in **FIGURE 10.22**.) Comparable data are not available for homosexuals who are married or in long-term, marriagelike relationships, but it is reasonable to expect that they would receive the same beneficial effects as heterosexuals. A recent study compared heterosexual and gay and lesbian couples, all of whom were in long-term, committed relationships, and found them indistinguishable on measures including self and partner reports of the quality of the relationship as well as a variety of physiological measures that are indicators of health. The one exception was that the lesbian couples worked more co-operatively on laboratory tasks than did the heterosexual or gay couples (Roisman, Clausell, Holland, Fortuna, & Elieff, 2008).

Marriage is not a panacea for ill health, however. Troubled marriages are associated with increased stress, and unmarried people are happier than those in bad marriages. In a study categorizing newlyweds based on observed interactions,



**FIGURE 10.21 Emotional Disclosure** Holocaust survivors may find comfort in talking with others about their experiences. The survivors above, siblings Hilda Shlick and Simon Glasberg, are holding a picture of their parents.



**FIGURE 10.22 Relationship between Marriage and Health** These data come from the National Health Interview Surveys in the United States from 1999 to 2002. The greatest benefit from marriage can be seen in the age range 45–64 years.

couples who fought more and showed more hostility toward each other exhibited decreased immune system activity in the 24 hours after conflict (Kiecolt-Glaser, Malarkey, Chee, & Newton, 1993). Janice Kiecolt-Glaser and Ronald Glaser (1988) found that people with troubled marriages and people going through a divorce or bereavement all had compromised immune systems.

Marital conflict has more negative health outcomes for wives than for husbands. In a review of 64 studies of the relationship between marriage and health, Kiecolt-Glaser and Newton (2001) drew linkages among marital discord, sex-related differences in response to stress, and effects on health. They found that women, who generally are more attuned to the emotional quality of their marriages than men are, are also more responsive physiologically. Given that women initiate fully two-thirds to three-quarters of divorces, Kiecolt-Glaser and Newton (2001) argue that women’s greater responsiveness to conflict and the higher premium they place on emotional closeness makes them more likely than men to seek divorce when there is high conflict.

### Trust and Health Are Related across Cultures

How would you respond in the following research situation? Suppose you are in a laboratory to play a “trust game” over the computer network with another participant whom you do not know and will never meet in person. At the start of the game, each of you receives \$10 with which to play. At random, one of you is selected to go first. The first player transfers some amount of his or her \$10 to the other player; the player who receives the money gets four times the amount sent and then transfers some amount of money back to the first player. The game proceeds for several rounds, after which each player takes home the money he or she has. If you go first, you have to decide how much to transfer to the other player. If you transfer all \$10, you will have \$0 left and the other person will have \$50 (original \$10 plus four times the amount you transferred). The best strategy is to co-operate and transfer the maximum amount of money at each round. But what if you send the other player \$10 and you get back \$1 or even \$0, so you end up with little or nothing and the other player has a much bigger win than you do? How would you behave in this situation?

As you might expect, when people receive a generous proportion of the money available from the other player, they send more money to that player on the next round, and the reverse is true when little money is received. Can you see why this game is based on “trust”? How you behave and how much money you end up with depends on whether you and the other player trust each other. Earlier in this chapter, we talked about hostility as a personality trait bad for your health. Although trust is not exactly the opposite of hostility, it is at least close. Is trust good for your health?

**OXYTOCIN IS INVOLVED IN TRUST RELATIONSHIPS** The hormone oxytocin is released when people trust each other. Recall from earlier in this chapter that oxytocin has been implicated as critical to the tend-and-befriend response more

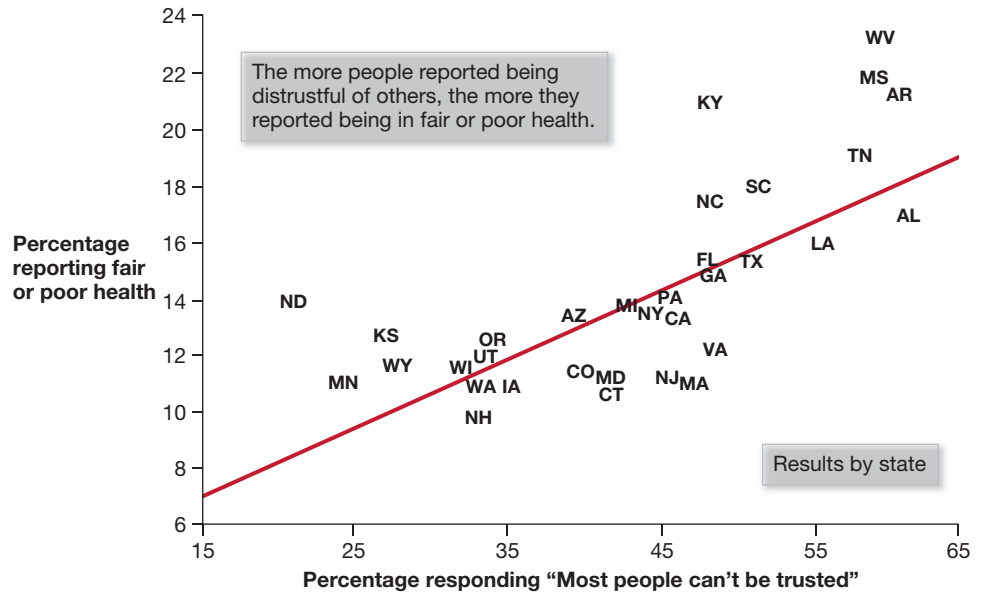
typical of women's responses to stressful situations than of men's responses. As discussed in Chapter 11, oxytocin is sometimes called the attachment hormone because a mother releases oxytocin when she breastfeeds her baby; the hormone, in conjunction with the act of feeding the baby, creates an attachment to the baby. Oxytocin is also released when people feel empathy toward others, and it is involved in feelings of love (Panksepp, 1992). Oxytocin is released when participants are engaged in trust relationships while playing the trust game (Zak, Kurzban, & Matzner, 2005). But does oxytocin cause feelings of trust, or is it secreted when people feel trust?

In an experimental study, oxytocin was sprayed into the players' noses while they were playing the trust game. (Receptors for oxytocin exist throughout the brain but especially along the olfactory passages.) Players who had oxytocin sprayed in their noses gave the other players more money—in other words, they behaved as though they trusted the other players more than did players who had placebos sprayed in their noses. These results suggest that having more oxytocin caused people to be more trusting. The Swedish physiologist Kerstin Uvnäs-Moberg (1998, p. 155) commented that “a causal relationship may exist between oxytocin and personality.” According to this theory, people who secrete more oxytocin have more trusting personalities and form attachments more readily than do those who secrete less oxytocin.

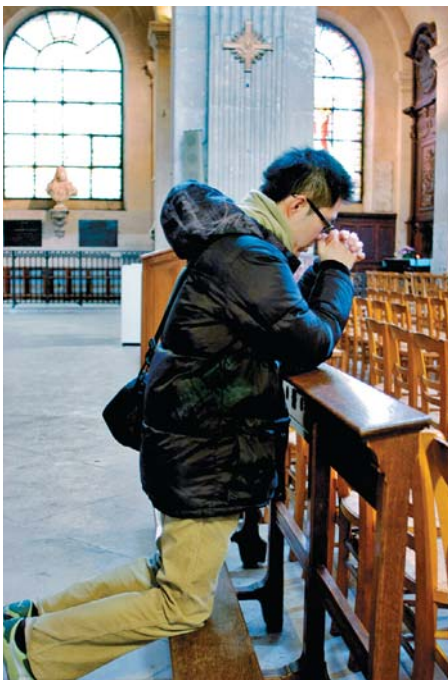
Now, consider how people respond when they distrust someone. Suppose that while playing the trust game you send \$9 to the other player, who responds by sending you \$1. You are unlikely to send a large amount of money on the next trial, because you probably will not trust the other player to reciprocate. The American neuroeconomist Paul Zak and his colleagues have conducted a series of studies on the connection between distrust and the secretion of testosterone, the male hormone implicated in physically aggressive behaviours such as fighting predators or rivals. Males secrete testosterone in response to environmental events, whereas females generally have low levels of testosterone. The researchers therefore hypothesized that men would secrete more testosterone when they distrusted someone, but that women would not show changes in their levels of testosterone or any of the sex hormones. As predicted, men showed large increases in testosterone levels within a few minutes after responding to a player they did not trust, but women showed no change in their testosterone levels. Other hormones, monitored as controls, showed no response to levels of trust (Zak, Kurzban, & Matzner, 2005). Thus women and men respond differently when they distrust someone, although there seems to be more similarity between the sexes in other measures. For example, women and men secrete increased amounts of oxytocin when they are in trusting relationships.

Like hostility, trust is an important factor for health because it determines how many people we affiliate with and how closely attached we are to other people. Given that social relationships are critical for health, it should be clear that trust is essential for psychological and physical health. In fact, various sources of data suggest that trust is associated with better health and a longer life. This relationship was supported in a study of more than 160,000 people from every state in the United States, who responded to the question *Most people can't be trusted. Do you agree or disagree with this statement?* In each state, as the percentage of respondents who believed most people cannot be trusted increased, so did the percentage who reported that their health was fair to poor (Kawachi, Kennedy, & Glass, 1999; **FIGURE 10.23**).

Taken alone, this correlational study can only support hypotheses that have been tested with more rigorous research designs (see Chapter 2, “Research Methodology”). The study cannot prove that being distrustful causes poorer health, because a third factor could be causing an association between distrust and poorer health. But when we consider this study in conjunction with strong experiments such as the one in



**FIGURE 10.23** Relationship between Trust and Health



**FIGURE 10.24 Spirituality and Well-Being** A sense of spirituality can have positive effects on health and on well-being, but that sense does not have to be connected with a particular religion.

which oxytocin or a placebo was sprayed into participants’ noses, we can be more confident that the relationship is causal.

### Spirituality Contributes to Well-Being

In many studies, people who are religious report greater feelings of well-being than do those who are not religious. The positive effects are associated not with any single religion but with a sense of spirituality that occurs across religions (Myers, 2000; **FIGURE 10.24**). The American psychologist David Myers and his colleagues found that religious people are better at coping with crises in their lives. Their religious beliefs serve as a buffer against hard knocks, such as having a child with a serious disability, getting divorced, experiencing the death of a loved one, and having a serious illness. From their faith, people also derive meaning and purpose in their lives. The theme of needing to find meaning in life appears repeatedly in the writing and reflections of Holocaust survivors (Frankl, 1959). Myers (2000) describes the effect of spirituality by quoting Rabbi Harold Kushner, who writes that people need to feel they are “something more than just a momentary blip in the universe” (p. 64). On a daily basis, religious beliefs can help people achieve and maintain well-being through the social and physical support provided by faith communities. Many religions support healthy behaviours, such as avoiding alcohol and tobacco; and some religions place eating restrictions on less healthful foods such as pork, fatty meats, or caffeine.

### SUMMING UP

#### Can a Positive Attitude Keep Us Healthy?

A variety of evidence shows that optimistic people are healthier and live longer than their more negative counterparts. These findings show the flip side of the negative health consequences associated with hostile personalities. Social support and being socially integrated in a group are also protective health factors, because

concerned others provide material and psychological support. Marriages low in conflict have a positive association with health, though these effects are greater for men than for women. Women are more likely than men to feel the stress of conflictual marriages and initiate divorce when marriages are troubled. Similarly, trust is associated with attachment, love, and better health. Spirituality is also associated with better health due to the sense of meaning that can be derived from religious beliefs and the support people receive from communities of faith.

## MEASURING UP

1. Which of the following statements explains how researchers concluded that oxytocin causes people to be more trusting?
  - a. Infants secrete oxytocin when they are being nursed, causing them to bond with their mothers.
  - b. Oxytocin levels were found to be highest among people living in countries where people generally distrust each other.
  - c. Across the United States, there was a linear relationship between oxytocin levels and reports of good health.
  - d. When researchers sprayed oxytocin in the noses of people playing the trust game, the players acted in a more trusting way than did the placebo control group.
2. What aspects of social support are most important in creating a positive effect on health?
  - a. The support needs to come from family members because of the genetic basis of this effect.
  - b. It is more important to know many people than it is to interact with them regularly.
  - c. It is most important that people around you genuinely care about your well-being.
  - d. It is most important that the people providing social support be religious because they can share in your spirituality.

## Action Plan for Health and Well-Being

### Taking Care of Mind and Body

Over the last 25 years, psychological science has learned much about the complex relations among stress, behaviour, and health. Fifty years ago, people did not know that smoking is so unhealthy, that saturated fats and other dietary factors contribute to cardiovascular disease, or that being under prolonged stress can damage the body. We now know that to live healthy lives people need to cope with stress, regulate their emotions, and control their daily habits. The following strategies will enhance your health and well-being. Are you willing to adopt them and take control of your life?

- **Eat natural foods** Food fads come and go, but the basic rules never change: Eat a varied diet that emphasizes natural foods (e.g., whole grains, fruits, and vegetables) and avoid processed and fast foods. Various animal products can also be part of a natural, healthy diet. Avoid foods containing trans-fatty acids and other artificial types of fat that prolong store shelf life. Some studies have found that natural oils, such as olive oil, can benefit the heart.

**Real World**  
**PSYCHOLOGY**

- **Watch portion size** Eat a varied diet in moderation—and eat only when you are hungry. Many prepared foods are sold in large portions, which encourage overeating. Over time, the extra calories from large portions may contribute to obesity. Eating small snacks between meals can prevent people from becoming too hungry and overeating at their next meal.
- **Drink alcohol in moderation, if at all** Some research indicates that one glass of wine per day, or similar quantities of other alcohol-containing drinks, may have cardiovascular benefits. But excessive alcohol consumption can cause serious health problems, including alcoholism, liver problems, some cancers, heart disease, immune system deficiencies, and so on.
- **Keep active** Engage in moderate physical activity at least four times a week for at least 30 minutes. Ignore the saying *no pain, no gain*—research shows it is inaccurate, because pain deters people from exercising over the long run. Start with moderate exercise that will not leave you breathless, and gradually increase your exercise intensity. Look for other ways to be active, such as taking the stairs or walking to work or school.
- **Do not smoke** This recommendation may seem obvious, yet many university students and other adults begin smoking each year. Smoking eventually produces undesirable physical effects for all smokers, such as a hacking cough, unpleasant odour, bad breath, some cancers, and death at a younger age.
- **Practice safe sex** Sexually transmitted diseases (STDs) affect millions of people worldwide—including university students. Many new HIV cases are occurring among those under age 25, who are infected through heterosexual or homosexual activity. Despite the devastating consequences of some STDs, many young adults engage in risky sexual practices, such as not using condoms, and they are especially likely to do so when using alcohol or other drugs. Ways to avoid STDs include condom use or abstinence.
- **Learn to relax** Daily hassles and stress can cause many health problems, including conditions, such as insomnia, that can interfere with your ability to function. Relaxation exercises can help soothe the body and mind. Seek help from trained counsellors who can teach you these methods, such as using biofeedback to measure your physiological activity so you can learn to control it. You might also try a relaxing activity, such as yoga.
- **Learn to cope** Negative events are a part of life. Learn strategies for assessing them realistically and seeing what might be positive about them as well as accepting the difficulties they pose. You can learn strategies for dealing with stressors—seeking advice or assistance, attempting new solutions, distracting yourself with more pleasant thoughts or activities, reinterpreting situations humorously, and so on. Find out which strategies work best for you. The important thing is not to allow stress to consume your life. Exercise helps reduce stress and is an excellent daily strategy for keeping it in check.
- **Build a strong support network** Friends and family can help you deal with much of life's stress, from daily frustrations to serious catastrophes. Avoid people who encourage you to act in unhealthy ways or are threatened by your efforts to be healthy. Instead, find people who share your values, who understand what you want from life, who can listen and provide advice, assistance, or simply encouragement. Trusting others

is a necessary part of social support, and it is associated with positive health outcomes.

- **Write about troubling events in your life** Write about difficult memories or challenges, or talk about them into a recorder if you prefer. There is good evidence that writing about difficult events can reduce depression and improve overall health.
- **Consider your spiritual life** If you have spiritual beliefs, try incorporating them into your daily living. Benefits can accrue from living a meaningful life and from experiencing the support provided by faith communities.
- **Try some of the happiness exercises** The exercises suggested in Figure 10.20 to enhance happiness include low-risk activities such as expressing gratitude and imagining your “best possible self.” By focusing on positive events—and more positive explanations of troubling ones—you may become a happier person.

## CONCLUSION

What country in the world has the longest life expectancy? The answer may surprise you. The tiny country of Andorra, in the Pyrenees Mountains between France and Spain, has an average life expectancy of 83.5 years, followed by Japan (80.7 years), San Marino (81.1 years), and Singapore (80.1 years). A baby born in Canada will live an average of 80.8 years. The shortest life expectancies are in African countries ravished by AIDS, famine, and civil strife: Swaziland has the shortest life expectancy at 34.1 years, followed by Zambia (37.2 years), Zimbabwe (37.8 years), and Angola (38.3 years). The reasons for variations in life expectancy are seemingly simple, but making changes so that everyone can live a long and healthy life has proved to be immensely difficult.

A major reason for some of the disparity among countries with more resources is different health care systems and varying access to high-quality, preventive health care. In addition, increasing numbers of people in Canada and other industrialized countries are obese and fail to get enough exercise—both factors that reduce life expectancies. We know how to live healthier lives, yet too many of us eat foods high in fats, fail to exercise, smoke cigarettes, engage in risky behaviours, and so on. How can people be motivated to change their habits?

Convincing people to live healthier lives will require a large-scale effort on multiple levels. Families need to make a commitment to eating well and engaging in physical activities at all age levels. Schools need to provide better health education and healthy school lunches. Neighbourhoods should be safe so people can walk around and play in parks and playgrounds. We need to promote families and other social relationships and provide communities that care. We need to create a caring society committed to tackling problems such as loneliness and social isolation. Everyone needs access to high-quality health care. With a system-wide response, we can all live healthier lives.

Health psychologists apply the research methods and theories of psychology to health, with the goal of enhancing well-being. Researchers in this field recognize that our behaviours contribute to the leading causes of death, an understanding that means we can be active participants in creating and maintaining better health. The biopsychosocial model integrates findings from the biological sciences, psychology, and sociology to explain the simultaneous influences from these three perspectives on health. In thinking about ways to promote health and well-being, we need to adopt a multidisciplinary perspective and attack the problems of ill health at the individual, societal, and biological levels.

## CHAPTER SUMMARY

### Can Psychosocial Factors Affect Health?

- **The Biopsychosocial Model of Health Incorporates Multiple Perspectives for Understanding and Improving Health:** The biopsychosocial model describes the reciprocal and multiple influences of biological predispositions, individual thoughts and actions, and societal variables on health. According to this model, people are active participants in shaping health outcomes.
- **Behaviour Contributes to the Leading Causes of Death:** The leading causes of death are all behavioural, especially among teenagers and young adults, who are most likely to die from accidents and suicide. Many lifestyle variables, such as eating unhealthy foods, being obese, and leading a sedentary life, contribute to heart disease, cancer, respiratory disease, and other disease states that reduce the quality and length of life. People with certain personality types, such as those with hostile personalities, are at an increased risk for heart disease and earlier death.
- **Placebos Can Be Powerful Medicine:** Placebos can have powerful effects on health and well-being, but a placebo works only if the person taking it believes in its ability to reduce pain or disease. The same brain processes involved in responses to chemically active (nonplacebo) drugs are involved when patients respond to placebos.

### How Do People Cope with Stress?

- **Stress Has Physiological Components:** Stressful events cause a cascade of physiological events, most importantly the release of hormones from the hypothalamus, the pituitary gland, and the adrenal glands. Stress-related hormones circulate through the blood stream, affecting organs throughout the body.
- **There Are Sex Differences in Responses to Stressors:** Women and men respond somewhat differently to stress. Women will more likely tend to befriend, whereas men will more likely have a fight-or-flight response. Consistent with an evolutionary perspective on psychology, these different styles may be related to sex-differentiated roles in hunter-gatherer societies and to higher estrogen concentrations in women during childbearing years.
- **The General Adaptation Syndrome Is a Bodily Response to Stress:** Selye outlined the general adaptation syndrome, the steps by which the body responds to stress. The initial response, alarm, is followed by resistance; if the stressor continues, the final response is exhaustion.
- **Stress Affects Health:** A small amount of stress may be healthy, but excessive stress negatively affects health by placing a heavy allostatic load on the physical system, impairing memory and cognition. When we are constantly stressed, our bodies do not have enough time to return to homeostasis, the resting state, to recover from stress reactions.

- **Coping Is a Process:** Coping means adjusting to stress. We have emotion-focused and problem-focused coping strategies. The latter are usually more constructive in the long run because they allow us to find ways to change a stressful situation.

### What Behaviours Affect Mental and Physical Health?

- **Obesity Results from a Genetic Predisposition and Overeating:** In industrialized countries around the world, an increasing number of people are obese. Obesity results from a combination of a genetic predisposition and overeating. Restrictive diets rarely help obese people lose weight.
- **Smoking Is a Leading Cause of Death:** Smoking contributes to all the major diseases that kill people, including heart disease and many cancers. People usually start smoking as children or adolescents and continue because of the attractive traits sometimes associated with people who smoke, such as defying authority.
- **Exercise Has Physical, Emotional, and Cognitive Benefits:** Exercise has been shown to reduce depression, improve memory, and speed healing, in addition to its positive effects on muscles and the respiratory system. Exercise can reduce cognitive decline in older adults. Despite these positive effects, many people fail to exercise.
- **There Are Ethnic Differences in Health Behaviours:** Ethnic and racial differences in health behaviours can explain some of the disparities in health outcomes. As groups become more acculturated to the mainstream culture, they tend to adopt the health behaviours of that culture, positive and negative. Health interventions intended to bring about changes need to consider the behaviours of different groups.

### Can a Positive Attitude Keep Us Healthy?

- **Being Positive Has Health Benefits:** A range of evidence shows that there are health benefits to having a positive, optimistic outlook.
- **Social Support and Social Integration Are Associated with Good Health:** Social support is critical to good health because when others care about us, they provide material and psychological support. They can help us reinterpret events more positively. Socially integrated individuals have meaningful relations with others.
- **Trust and Health Are Related across Cultures:** Oxytocin, sometimes called the trust hormone, is secreted during trusting encounters; it is involved in infant/parent attachment and love relationships.
- **Spirituality Contributes to Well-Being:** Being spiritual can give meaning to people's lives; members of religious communities also provide physical assistance to one another and support healthy behaviours.

## KEY TERMS

allostatic load theory of illness, p. 453	bulimia nervosa, p. 462	hypothalamic-pituitary-adrenal (HPA) axis, p. 447	problem-focused coping, p. 454	Type A behaviour pattern, p. 452
anorexia nervosa, p. 462	emotion-focused coping, p. 454	immune system, p. 450	secondary appraisal, p. 454	Type B behaviour pattern, p. 452
biopsychosocial model, p. 441	fight-or-flight response, p. 448	lymphocytes, p. 449	social integration, p. 470	well-being, p. 441
body mass index (BMI), p. 458	general adaptation syndrome, p. 450	oxytocin, p. 449	stress, p. 447	
buffering hypothesis, p. 470	health psychology, p. 440	placebo effect, p. 444	stressor, p. 447	
		primary appraisal, p. 454	tend-and-befriend response, p. 449	



## PRACTICE TEST

- Which of the following comments most accurately represents health psychologists' current understanding of illness?
  - "Illness is totally under our own control. We can stay healthy simply by making healthy decisions."
  - "Illness is a matter of luck. If our bodies are destined to become ill, we're out of luck."
  - "I feel sorry for people with family histories of illnesses such as heart disease, breast cancer, and diabetes. Their genetic predispositions guarantee they'll develop these same illnesses."
  - "Genetic predispositions to some illnesses exist. But living healthily can help reduce the chances we'll develop an illness."
- The correct answer to the previous question is consistent with the \_\_\_\_\_ of health and illness.
  - biomedical model
  - biopsychosocial model
  - moral model
  - self-efficacy model
- Lisa is normally an engaged and satisfied employee. For a few months, she becomes very dissatisfied, grumpy, and uninterested in her job. Shortly after participating in a weekend-long seminar about the secrets of success, Lisa begins enjoying her work again. Which of the following attributions for her improved satisfaction at work best reflects the concept of regression to the mean?
  - "Well, I figured I couldn't stay in that funk forever. Things eventually had to start looking up again."
  - "That seminar was amazing! Things are really starting to go my way now that I know the secret to success."
  - "I'm so glad my boss moved to another department. Now that she's gone, things are looking up."
  - "Everything started going better once I changed my negative attitude."
- Which of the following individuals is most at risk for developing heart disease, assuming equal levels of physiological risk factors such as blood pressure and cholesterol level?
  - People describe Sonja as driven. She desires to be the top in her field and packs her calendar with important meetings and educational opportunities to help her meet this goal.
  - People describe Patti as a complainer. She always finds something to gripe about, whether it is poor service at a restaurant, a driver's failure to use turn signals, or a loud talker on a cellphone.
  - People describe Kenji as laid back. He always has time for a cup of coffee with friends or to surf the Web.
  - People describe Oksana as scattered. She is regularly late for class and forgets to turn in assignments. Although apologetic for her tardiness, she does not seem distressed by her behaviour.
- Individuals who are hardy \_\_\_\_\_. Choose all that apply.
  - are committed to daily activities
  - are optimistic
  - have access to financial resources
  - have many close friends
  - see challenges as opportunities for growth
  - see themselves as able to control their own lives
- Which of the following statements are true?
  - Our bodies have natural defenses against weight loss that limit dieting's effectiveness.
  - Body weight seems to be determined largely by a set-point.
  - Dieters who lose and regain weight repeatedly tend to become heavier over time.
  - Exercise is an essential element of any weight control program.
- Label each of the following statements as applying to anorexia nervosa (AN) and/or bulimia nervosa (BN).
  - This disorder can result in death if not treated.
  - A person with this disorder exhibits eating that is out of control and excessive.
  - The person will be at least 15 percent to 25 percent underweight.
  - The person refuses to eat.
  - The person will tend to be average weight or slightly overweight.
  - This disorder results in a loss of bone density.
  - This disorder typically develops in early adolescence.
  - This disorder typically develops in late adolescence.
  - Typically other people do not realize the person is suffering from this disorder.
  - The person worries excessively about body weight issues.
- Imagine your grandparent is preparing to move to a retirement community. Which of the following might you say if you wanted to help her or him promote physical and mental health? Choose all that apply.
  - "Keep in mind there are a lot of shady characters out there looking to take advantage of people. Be suspicious of new people until you have a reason to trust them."
  - "Know that I care about you and am here for you if there's anything I can do to help with the transition to your new home."
  - "Make a point of meeting a lot of other residents."
  - "Make sure to stay in touch with your close friends."
  - "Your cable service offers over 100 channels; you won't run out of interesting programs to watch!"
- Which of the following statements are true regarding oxytocin?
  - Oxytocin is critical in the fight-or-flight response to stress.
  - Oxytocin is released when people feel empathy.
  - Oxytocin is secreted when males engage in aggressive behaviours.
  - Participants dosed with oxytocin behave more trustingly than control participants do.
  - Women release oxytocin when they breast-feed infants.

## PSYCHOLOGY AND SOCIETY

- Think about a stressor you likely will face in the near future (e.g., starting a new job, moving to a new city, becoming geographically separated from friends or family). Write a journal entry describing concrete strategies you can engage in to cope with the stressor. Be specific, and discuss the extent to which each coping strategy is considered adaptive or maladaptive. If you have a tendency to engage in maladaptive coping strategies (e.g., overeating, procrastination), remind yourself to be careful about these behaviours.
- You notice a troubling trend in a magazine to which you subscribe: Each month, the magazine touts a new diet "guaranteed" to help people lose weight. Compose a letter to the magazine's editor expressing concern about the editorial team's decision to promote these diets. Use scientific evidence to back up any claims you make about the likely effectiveness of these diets and the physical and psychological effects people attempting to follow these diets might experience.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.





# Human Development

IN 1970, A MOTHER AND HER YOUNG DAUGHTER walked into a welfare office in Los Angeles, California. The mother was seeking help after escaping an abusive and mentally ill husband, and the girl, later known as “Genie,” appeared to be suffering from autism (FIGURE 11.1). When a social worker saw Genie, who was 1.4 metres and 27 kilograms (4 feet 6 inches and 59 pounds), she alerted her supervisor. Although Genie looked much younger, she turned out to be 13 years old. Having suffered severe neglect and abuse, she could not hop, skip, climb, or do anything requiring the full extension of her limbs (Curtiss, 1977; Rymer, 1993). After being admitted to a hospital, she was taken from her parents and placed in foster care.

Genie’s early life had been a nightmare. For more than 10 years, her father had locked her in a tiny, dark bedroom. Tied to a chair during the day and caged in a crib at night, she had been poorly fed and beaten for making any noise. She had no one to talk to and nothing to listen to or even look at in her barren room. She was raised with essentially no

## What Shapes a Child?

- Development Starts in the Womb
- Brain Development Promotes Learning
- Attachment Promotes Survival
- Critical Thinking Skill: Understanding That “Some” Does Not Mean “All”

## How Do Children Learn about Their Worlds?

- Perception Introduces the World
- Memory Improves over Childhood
- Piaget Emphasized Stages of Development

- Infants Have Early Knowledge about the World
- Humans Learn from Interacting with Others
- Language Develops in an Orderly Fashion

## How Do Children and Adolescents Develop Their Identities?

- Social Systems Influence Development
- Friends Influence Identity and Behaviour
- Parental Style Can Affect Children’s Well-Being
- Divorce Is Difficult for Children

- Critical Thinking Skill: Recognizing and Avoiding Either/Or Thinking
- Gender Identity Is Determined by Biology and Cultural Norms
- People Define Themselves in Terms of Race and Ethnicity

## What Brings Meaning to Adulthood?

- Adults Are Affected by Life Transitions
- Aging Can Be Successful
- Cognition Changes during Aging



**FIGURE 11.1 Genie** This photo shows Genie in 1971.

**developmental psychology** The study of changes in physiology, cognition, and social behaviour over the lifespan.

#### LEARNING OBJECTIVES

Describe how the prenatal environment can affect development.

List and describe the types of attachment infants have to their caregivers.



normal human contact and no stimulation from the external world. When she was rescued, Genie had a strange gait, almost like a rabbit's, and held her hands out in front of her like a dog sitting up and begging. She understood just a few words and could form only brief phrases, such as *Stop it* and *No more*. Genie also showed few signs of emotion or interest in connecting with those around her.

For the next four years, scientists from Childrens Hospital Los Angeles cared for Genie as they studied the consequences of her social isolation. For decades, psychological scientists had struggled to understand the extent to which development was affected by nature and by nurture. How much of who we are as humans is hard-wired in our genes, and how much is the result of early experience? What is human nature when it is stripped of society and culture? No experiment could be conducted ethically to answer these questions, but would Genie provide insight into what makes us human? Would she be able to learn? Would she develop normal social skills that could allow her to become a full member of society? Would a warm, nurturing environment help her recover from her tragic past? If the ability to acquire language is inborn, would she quickly learn to speak and be able to describe what had happened to her?

In the first few years that Genie was cared for by the scientists, she made some progress in forming social relationships and acquiring minimal language. But she was able to develop only the most rudimentary language skills. She learned many words, but she could not put them together properly in sentences. Sadly, when Genie turned 18, her mother regained custody of her and immediately cut off all contact with the scientific community. Genie lived with her mother for only a short time before she was removed and sent to various foster homes. In at least one home, she was again abused. She now lives in a small group home for adults who cannot look after themselves. The role her social and physical abuse played in her enduring difficulties in interacting with others and acquiring language will never be known. Yet her case provides some tantalizing demonstrations of experience's role in shaping both brain development and psychological capacities.

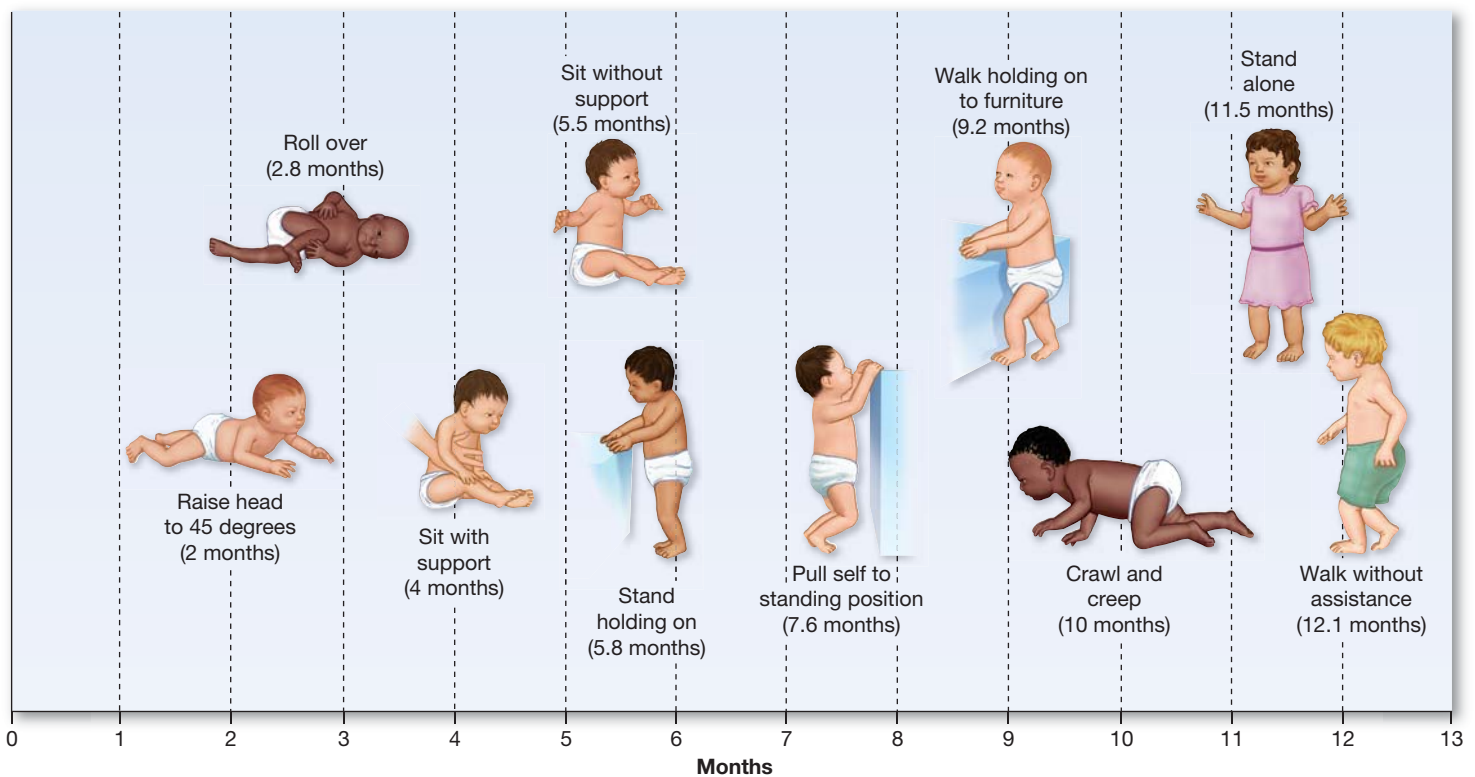
This chapter examines the ways biological and social forces combine to shape the path of human development. **Developmental psychology** is concerned with changes, over the lifespan, in physiology, in cognition, and in social behaviour. For instance, to study how humans develop cognitive skills, scientists have focused on age-related changes in psychological capacities such as perception, language, and thinking. The mind develops adaptively, as new, useful skills appear at appropriate times, even in the absence of specific training. Infants also develop socially—innately forming bonds with others—an adaptive trait that provides protection and facilitates survival. As children grow, they learn how to communicate with others, how to behave appropriately in various situations, and how to establish and maintain relationships. Socialization also affects human characteristics such as morality, gender, and identity. In exploring these aspects of development, the chapter also examines some of the most fundamental questions about humanity: How do we become members of society? How do we develop into who we are and come to value what we value? How do genes interact with early experiences to produce unique individuals? How do we grow and adapt within our own cultures? How do we change across the lifespan? These processes shape us into who we become.

## What Shapes a Child?

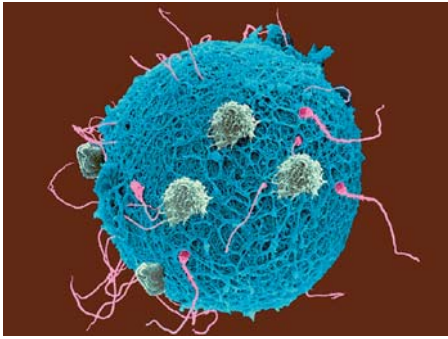
For the most part, human development follows a predictable progression. Physically, at about the same periods in the lifespan, each human grows and matures. During the prenatal period, the body develops in a fixed sequence. Depending on its genetic instructions, the developing body turns into a male or female infant. No newborn

talks immediately, nor does any baby walk before it can sit up. Virtually all humans make eye contact quickly after they are born; display a first social smile at around six weeks; and learn to roll over, to sit up, to crawl, to stand, to walk, and to talk, in that order (occasionally a step may be skipped or reversed), within a predictable range of ages (FIGURE 11.2). This pattern's consistency suggests that our genes set the pace and order of development.

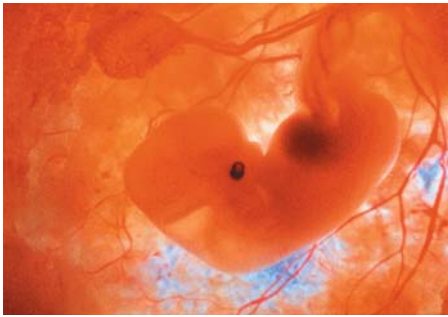
Environment also influences what happens throughout development. For example, children often achieve developmental milestones at different paces, depending on the cultures in which they are raised. For instance, healthy children in Uganda tend to walk by 10 months, whereas children in France often do not walk before 15 months (Berger, 2004). These differences are due in part to different patterns of infant care across cultures, such as whether infants are carried around during the day, whether infants sleep with their parents, or even whether infants sleep on their backs or their stomachs. In recent years, parents in North America have been advised that placing their infants on their backs to sleep minimizes the risk of suffocation. Because it is relatively difficult for infants to turn over, those who sleep on their backs crawl much later than those who sleep on their stomachs. In some other countries, infants are seldom left on the floor to crawl because of hygiene issues. These infants learn to crawl at later ages than infants who are regularly placed on the floor. Parental practices such as these influence how motor skills develop. As discussed in Chapter 3, environment determines which of a person's genes are expressed and how they are expressed: We are the products of both nature and nurture, because genes and experience work together to make us who we are.



**FIGURE 11.2 The Progression of Human Physical Development** A baby learns to walk without formal teaching. Learning to walk progresses along a fixed, time-ordered sequence characteristic of all humans.



(a)



(b)



(c)

**FIGURE 11.3 The Progression of Development in the Womb** (a) The union of egg and sperm forms a zygote. (b) The zygote develops into an embryo. (c) The embryo becomes a fetus.

**teratogens** Environmental agents that harm the embryo or fetus.

## Real World PSYCHOLOGY

## Development Starts in the Womb

From conception through birth approximately nine months later, remarkable developments occur (**FIGURE 11.3**). The process begins at the moment of conception, when the sperm from the male unites with the egg from the female to create the *zygote*, the first cell of a new life. From about two weeks to two months, the developing human is known as an *embryo*. During this stage, the internal organs, such as the heart, lungs, liver, kidneys, sex organs, and nervous system, begin to form. After two months, the growing human is called a *fetus* and at this time undergoes a great deal of physical growth as the whole body takes its infant form. The final trimester, or three-month period, puts the finishing touches on the fetus; at this point, a healthy fetus is capable of surviving outside the womb.

**PHYSICAL DEVELOPMENT** Genes in combination with the environment in the womb govern much of the human nervous system's prenatal development. Most of the brain's nerve cells develop in a specific sequence in the first seven months of gestation (Rakic, 2000). The basic brain areas begin to form by week 4. The cells that will form the cortex are visible by week 7; those of the thalamus and hypothalamus, by week 10; and those of the left and right hemispheres, by week 12. By the seventh month, the fetus has a working nervous system. By birth, the brain is complex: It has cortical layers, connections among its neurons, and myelination. Yet brain development does not stop at birth—the brain continues to develop throughout childhood and adulthood and into old age.

Hormones that circulate in the womb influence the developing fetus. For instance, if the mother's thyroid does not produce sufficient amounts of hormones, the fetus is at risk for lower IQ and diminished intellectual development. The mother's emotional state can also affect the developing fetus. Pregnancy is often trying, but the fetuses of mothers who are unusually anxious or unusually upset may be exposed to high levels of stress hormones, which may interfere with normal development, producing low birth weight and negative cognitive and physical outcomes that can persist throughout life (Wadhwa, Sandman, & Garite, 2001).

**TERATOGENS** Some environmental influences adversely affect the developing fetus. **Teratogens**, agents that can impair physical and cognitive development in the womb, include drugs, alcohol, bacteria, viruses, and chemicals. The physical effects of exposure to certain teratogens may be obvious at birth, but disorders involving either language or reasoning may not become apparent until the child is older. The extent to which a teratogen causes damage depends on when the fetus is exposed to it, as well as the length and amount of exposure. For instance, exposure to a teratogen at about four weeks of age can interfere with the proper development of basic brain structures. A tragic example of birth defects caused by teratogens occurred during the 1950s, when women were prescribed the drug thalidomide to ease pregnancy symptoms. Thalidomide caused various birth defects, especially limb deformities, the precise nature of which depended on when the mother took the drug.

Excessive consumption of alcohol during pregnancy can lead to *fetal alcohol syndrome (FAS)*, the symptoms of which consist of low birth weight, face and head abnormalities, slight mental retardation, and behavioural and cognitive problems. The Government of Canada reports that there are about 300,000 people with FAS in Canada (Public Health Agency of Canada, 2010). Although FAS is much more likely among infants of women who drink heavily during pregnancy, especially if they binge drink, some evidence suggests that smaller amounts of alcohol can be problematic for the developing fetus. In fact, no minimal amount of alcohol has been determined to be safe for pregnant women and their developing babies. For this reason, many

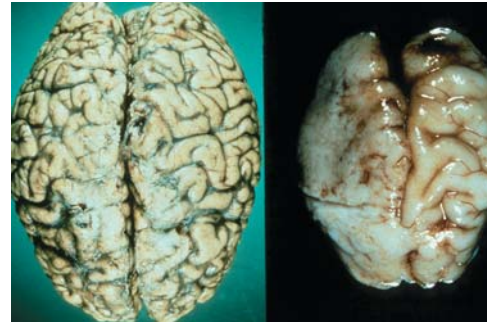
One cause of mental retardation in the Western world is prenatal alcohol exposure, which can result in FAS (Centers for Disease Control and Prevention, 2004). Alcohol interferes with normal brain development and can cause permanent brain damage, especially to the neocortex, hippocampus, and cerebellum (FIGURE 11.4). The resulting impairments can negatively affect learning, attention, the inhibition and regulation of behaviour, memory, causal reasoning, and motor performance (Guerra, 2002). In Canada, the rate of FAS is estimated at one to three per 1,000 births, with the number much higher in some Aboriginal communities (Health Canada, 2005).

The use of recreational drugs, such as opiates, cocaine, or cannabis, during pregnancy can also affect a child's development. Premature birth and other complications have been associated with the use of all these drugs during pregnancy (Gilligley et al., 1990; Sherwood et al., 1999). Infants of women taking opiates, particularly methadone, have two to three times greater risk for unexplained sudden death in infancy (Davidson Ward et al., 1990), and cocaine use has also been linked to sudden infant death (Hulse, Milne, English, & Holman, 1998; Kandall & Gaines, 1991). Among infants exposed to opiates in utero, 55 percent to 94 percent show symptoms of newborn withdrawal (American Academy of Pediatrics, 1998), including irritability, high-pitched crying, tremors, vomiting, diarrhea, and rapid breathing. However, some heavy drug users have normal infants, while some moderate users have infants with serious effects, so we cannot say that a baby born to a drug user will necessarily be impaired.

For any case in which prenatal drug or alcohol use puts an infant at high risk of injury, death, or lifelong disability, Norman Fost (1989), a medical ethics professor, poses three questions:

- Does a woman have a duty to abstain from using drugs that are likely to harm the fetus?
- Does the state have an obligation to protect the fetus/newborn from harm?
- Should there be legal measures to reduce the incidence of such harm or to prevent it from occurring?

The central conflict is between, on the one hand, the personal rights and autonomy of the woman and, on the other, the effects of her behaviour on both the infant and society. According to the bioethics professor Ruth Macklin (1990), most people would agree that it is better for a baby to be healthy than not healthy and therefore pregnant women are morally obligated to do all



**FIGURE 11.4 Fetal Alcohol Syndrome** To see the effects of interrupted brain development, compare (left) the brain of a normal six-week-old baby with (right) the brain of a baby of the same age with FAS.

they can to produce healthy infants. However, many pregnant women are not willing and able to comply.

Whereas all Canadian governmental agencies and medical associations recommend that physicians be alert to the possibility that pregnant women may use or abuse drugs or alcohol, they differ in the extent to which they feel that a woman should be forced to receive treatment. The Public Health Agency of Canada has called for routine, nonjudgmental, and respectful screening for alcohol use among pregnant women. Health care workers should recommend brief interventions that focus on motivations to avoid harming the fetus. The guiding principle is that less-intensive intervention is best and only if it fails should more-intensive treatment be considered.

Many psychologists, physicians, and ethicists worry that legally coercive measures will drive pregnant women away from the health care system when they need it most and will result in more harm to both the woman and the fetus. Fost (1989) argues that although this consideration is important, it is difficult to weigh the effects of women's not seeking prenatal health care against the known risks of drug and alcohol use during pregnancy. He makes an analogy to child abuse laws, which may similarly deter some parents from seeking medical care for their children; however, few people would advocate the abolition of child abuse laws because of these potentially harmful effects.

What do you think? Does an unborn infant's right to a healthy life outweigh a pregnant woman's right to personal autonomy? Should pregnant drug users be placed in facilities where they cannot take drugs until their babies are born, and if so, should taxpayers pay for these women's care? What might be some alternative options?

health workers recommend that women abstain from drinking alcohol when they are pregnant or trying to become pregnant.

## Brain Development Promotes Learning

Newborns normally come into the world able to see, smell, hear, taste, and respond to touch. Although these skills are not fully developed at birth, the newborn is able to process a considerable range of sensory stimuli. For instance, two-hour-old infants prefer sweet tastes to all other tastes (Rosenstein & Oster, 1988). Young infants also have a reasonably acute sense of smell, at least for smells associated with feeding. In a number of studies, infants turned their heads toward a pad containing their own mother's milk but not toward pads containing milk from other breastfeeding mothers (e.g., Winberg & Porter, 1998). The sense of hearing is also quite good at birth: Infants are startled by loud sounds and often will turn their bodies toward the source of the sounds. Newborns' sense of hearing is much better than their sense of vision, however; their range of visual acuity is 20–30 centimetres, about the distance, during breastfeeding, between an infant's face and its mother's face. This limited visual range may be adaptive, since it encourages the infant to focus on what is most important, the mother's breast and face, and promotes the beginnings of the child's social interaction. As discussed further in the next section, newborns' perceptual skills increase tremendously over the first few months of life.

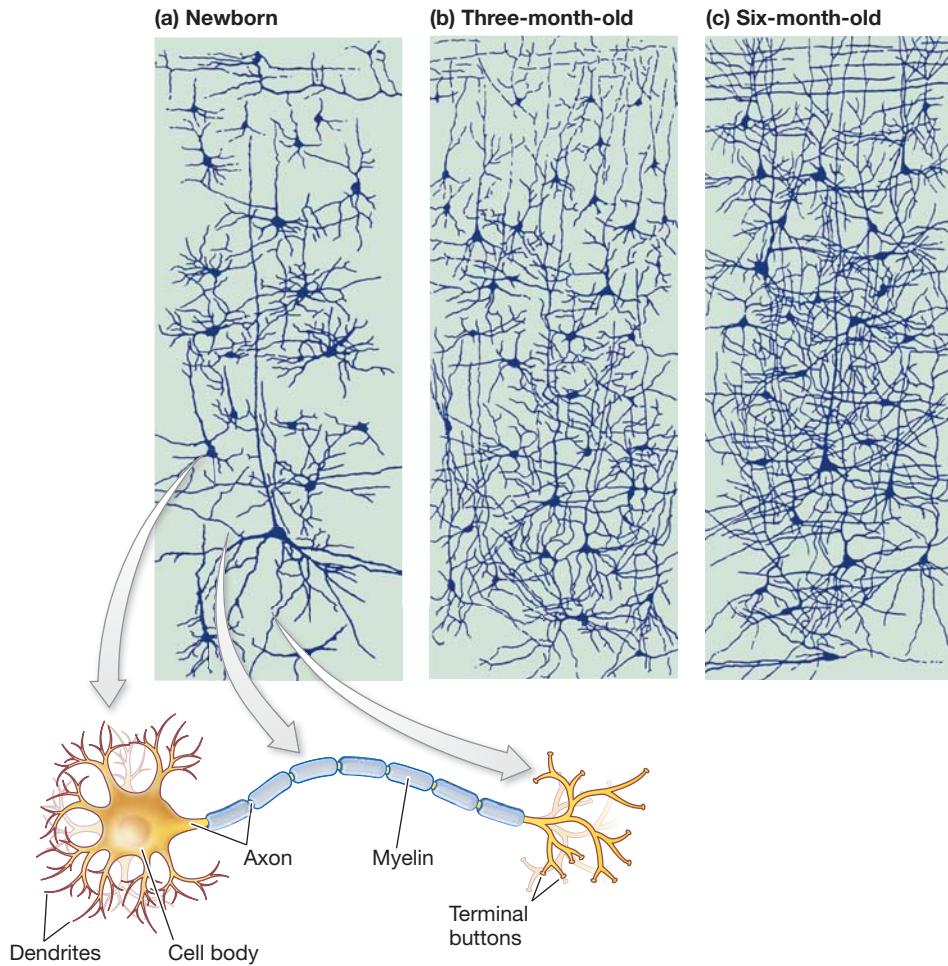
Although newborn infants cannot survive on their own, they are not completely helpless. Newborns have various basic reflexes that aid survival. Perhaps you have observed the *grasping reflex* when a baby held your finger. Some believe this reflex is a survival mechanism that has persisted from our primate ancestors; after all, young apes grasp their mothers, an adaptive reflex because the offspring need to be carried from place to place. Also innate is the *rooting reflex*, the turning and sucking that infants automatically engage in when a nipple or similar object touches an area near their mouths. These reflexes pave the way for learning more-complicated behaviour patterns such as feeding oneself or walking. Thus at birth the brain is sufficiently developed to support basic reflexes, but further brain development appears necessary for cognitive development to occur.

**MYELINATION AND NEURONAL CONNECTIONS** Early brain growth has two important aspects: Specific areas within the brain mature and become functional, and regions of the brain learn to communicate with one another through synaptic connections. One important way that brain circuits mature is through myelination, which begins on the spinal cord during the first trimester of pregnancy and on the brain's neurons during the second trimester. As discussed in Chapter 3, myelination is the brain's way of insulating its "wires": Nerve fibres are wrapped with a fatty sheath, much like the plastic coating around electrical wire, to increase the speed with which they are able to transmit signals. Myelination occurs in different brain regions at different stages of development (**FIGURE 11.5**).

The myelinated axons form synapses with other neurons. Far more of these connections develop than the infant brain will ever use. Then something remarkable happens: The brain adopts a very strict "use it or lose it" policy. The frequently used connections are preserved; the unused ones decay and disappear. This process, **synaptic pruning**, occurs in different areas of the brain at different times. As shown in **FIGURE 11.6**, synaptic density is highest in the auditory cortex around age three; in the visual cortex around ages one and two; and in the prefrontal cortex, which is critical for reasoning, around age six. After adolescence, the density of synapses remains approximately constant in these three brain areas (Thomas & Johnson, 2008). Once connections are established, the brain sets about making them more

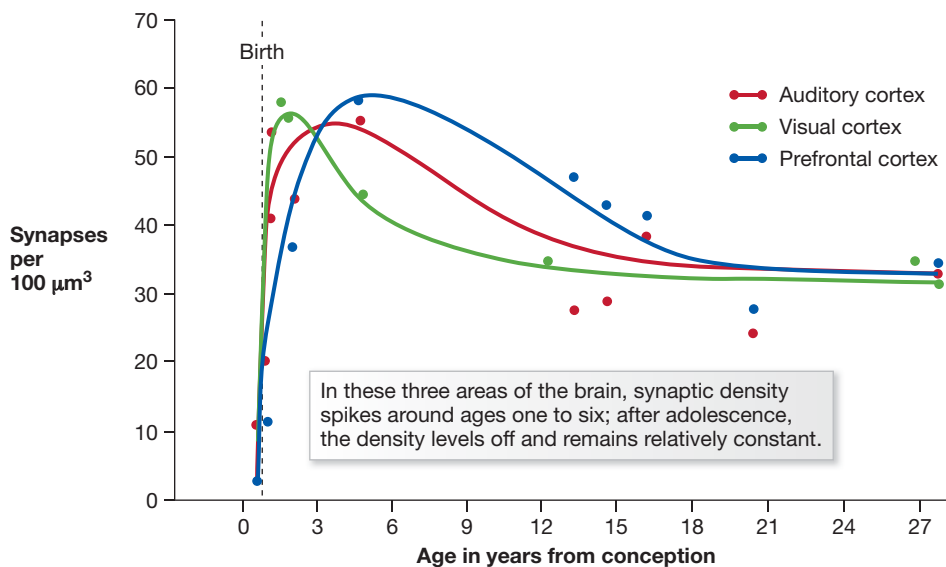
**synaptic pruning** A process whereby the synaptic connections in the brain that are frequently used are preserved, and those that are not are lost.





**FIGURE 11.5 Myelination** Neurons in the visual cortex develop more and more myelination as the infant's brain ages.

permanent—for example, by increasing myelination. Some developmental psychologists believe infants do not develop specific cognitive skills until certain brain connections are made. This idea, that the progression of learning is tied closely to brain development, presents a new and exciting approach for research energized by the biological revolution in psychological science.



**FIGURE 11.6 Synaptic Density through Early Adulthood** The highest levels of density can be thought of as the times when the brain is most plastic—most able to change.

The brain grows as determined by genetic instruction, but the organ is also highly “plastic,” meaning hard-wired to adapt to different environments. Though most neurons are already formed at birth, the brain’s physical development continues through the growth of neurons and the new connections they make. By age four, the human brain grows from about 350 grams to about 1,250 grams (about 80 percent of the adult size). This size increase is due to myelination and to new synaptic connections among neurons. The developing brain’s plasticity has led researchers to some remarkable findings about early environment’s influence on the brain’s physical structure. For example, as noted in Chapter 3, rats raised in enriched environments show evidence of greater brain development. Early childhood nutrition also affects myelination and other aspects of brain development. Malnourished children not only have less myelination but might also lack the energy to interact with objects and people in their environments, and this lack of stimulation further undermines brain development. As recent research has confirmed, poverty is bad for the development of human brains, and its deleterious effects begin at a young age—probably before birth—and continue through life (Farah et al., 2008; Farah et al., 2006). Thus, although genes provide instructions for the maturing brain, how the brain changes during infancy and early childhood is also very much affected by environment.

**critical periods** Biologically determined time periods for the development of specific skills.

**sensitive periods** Biologically determined time periods when specific skills develop most easily.

**SENSITIVE LEARNING PERIODS** Psychological scientists believe that the key to learning is the creation of connections among certain neurons and that certain connections are made most easily during particular times in development, assuming the right stimuli are provided. The native German linguist Eric Lenneberg (1967) theorized that during biologically determined time periods, which he called **critical periods**, young animals, including young humans, are able to acquire specific skills and specific kinds of knowledge. Lenneberg believed that if these skills and these kinds of knowledge were not acquired during their critical periods, they could not be acquired. However, the case of Genie, discussed at this chapter’s opening, shows that the critical period for language (generally estimated to be before age 12) is not so rigid as Lenneberg thought. Genie was unable to acquire full language skills, perhaps because she was not exposed to language early in life, but she learned some aspects of language at a later age. The specific points in development at which some skills or kinds of knowledge are learned most easily are now called **sensitive periods**.

## Attachment Promotes Survival

Children are shaped not only by biological development but also by their early interactions with other people—especially their caregivers. Social development begins in infancy. Caregivers shape much of an infant’s early experience, from what the child eats to where it sleeps to what social connections it makes. Like all young primates, human infants need nurturance and care from adults to survive. Unlike horses and deer, which can walk and find food within hours after birth, humans are born profoundly immature, unable even to hold up their own heads or roll over. But they are far from passive. Just minutes after birth, infants’ cries cause psychological, physiological, and behavioural reactions in caregivers that compel the offering of food and comfort to the newborns. Even young infants have highly interactive social relationships; for example, within 10 weeks after birth, infants are profoundly affected by their caregivers’ facial expressions and may become very upset when their primary caregivers fail to display emotional reactions.

Between four and six weeks of age, most infants display a first social smile, which typically enhances powerful feelings of love between caregiver and child. Psychological

scientists refer to this bond as an **attachment**, a strong, intimate, emotional connection between people that persists over time and across circumstances. Infant attachment leads to heightened feelings of safety and security; according to the British psychiatrist John Bowlby, who popularized its importance, it also motivates infants and caregivers to stay in close contact. Bowlby argued that infants have an innate repertoire of attachment behaviours that motivate adult attention. For instance, they prefer to remain close to caregivers, act distressed when caregivers leave and rejoice when they return, and put out their arms to be lifted. Thus attachment is adaptive. Infants who exhibit attachment behaviours have a higher chance of survival through adult protection and consequently are more likely to pass along their genes to future generations.

Adults generally seem predisposed to responding to infants, as in picking up and rocking a crying child. They also tend to respond to infants in ways that infants can understand, as in making exaggerated facial expressions and speaking in a higher-pitched voice. The next time you observe an adult talking to a baby, notice how even the gruffest men with deep voices change their voices to a higher pitch. Babies attend to high-pitched voices; in virtually every culture studied, men, women, and even children intuitively raise their voices' pitch when talking to babies, and babies respond by maintaining eye contact with the adults (Fernald, 1989; Vallabha, McClelland, Pons, Werker, & Amano, 2007). Bowlby argues that these behaviours motivate infants and caregivers to stay in proximity.

**ATTACHMENT IN OTHER SPECIES** Attachment is important for survival not only in humans but also in many other species. For instance, infant birds communicate hunger through crying, thereby prompting caregivers to find food for them. Some bird species seem to have a critical period in which infants become strongly attached to a nearby adult, even one from another species. This pattern, first noticed in the nineteenth century, occurs for birds such as chickens, geese, and ducks. Because these birds can walk immediately after hatching, they are at risk of straying from their mothers. Therefore, within about 18 hours after hatching, these birds will attach themselves to an adult (usually to their mothers) and then follow the object of their attachment. The Viennese ethologist Konrad Lorenz called such behaviour *imprinting* and noted that goslings that became imprinted on him did not go back to their biological mothers when later given access to them. However, such birds preferentially imprint on a female of their species if one is available (**FIGURE 11.7**).

During the late 1950s, the American psychologist Harry Harlow described one of the most striking examples of nonhuman attachment. At that time, psychologists generally believed infants needed mothers primarily as food sources. For Freudians, the mother was the source of libidinal (life or emotional or sexual) pleasures (see Chapter 13, “Personality”). For behaviourists, the mother was valued as the result of secondary reinforcement, given her role as the provider of food (see Chapter 6, “Learning”). But explanations of attachment that were based on Freudian thinking or learning theory struck Harlow as unsatisfactory, because he recognized that infants needed comfort and security in addition to food.

In a now-famous series of experiments, Harlow placed infant rhesus monkeys in a cage with two different “mothers.” One surrogate mother was made of bare wire and could give milk through an attached bottle. The second surrogate mother was made of soft terry cloth and had a monkeylike head (rudimentary features—eyes, nose, mouth, and ears—attached to a flat circle) but could not give milk. Which of these two substitute mothers do you think the infant monkeys preferred—the wire one that provided milk or the soft and cuddly one that looked more like a monkey?

The monkeys' responses were unmistakable: They clung to the cloth mother most of the day and went to it for comfort in times of threat. The monkeys

**attachment** A strong emotional connection that persists over time and across circumstances.



(a)



(b)

**FIGURE 11.7 Attachment** (a) To see if he could train birds to follow him in his ultralight airplane, the Canadian inventor Bill Lishman acted as a surrogate parent to goslings hatched in an incubator. Without a female of their species available, the goslings became imprinted to Lishman, who eventually taught them to migrate. (b) As portrayed in the movie *Fly Away Home* (1996), the geese followed his ultralight airplane all the way to the state of Virginia.

approached the wire mother only when they were hungry. Harlow tested the monkeys' attachment to these mothers in various ways, such as introducing a strange object into the cage. He repeatedly found that the infants were calmer, braver, and overall better adjusted when near the cloth mother. Hence, the mother-as-food theory of mother/child attachment was debunked. Harlow's findings established the importance of contact comfort—of allowing an infant to cling to and hold something soft—in social development (FIGURE 11.8).

**ATTACHMENT STYLE** Attachment behaviours begin during the first months of life and have been observed in children around the world, although normal attachment may vary somewhat depending on cultural practices (Kappenberg & Halpern, 2006). If Bowlby was correct in hypothesizing that attachment encourages proximity between infant and caregiver, then we might expect attachment responses to increase when children naturally start moving away from caregivers. And indeed, just when infants start to crawl, at around 8 to 12 months, they typically display *separation anxiety*, in which they become very distressed when they cannot see or are separated from their attachment figures. This pattern occurs in all human cultures.

To study attachment, the developmental psychologist Mary Ainsworth, who received her Ph.D. at the University of Toronto, created the *strange-situation test*. The test involves observing, through a one-way mirror, the child, the caregiver, and a friendly but unfamiliar adult in a series of eight semistructured episodes in a laboratory playroom. The crux of the procedure is a standard sequence of separations

**FIGURE 11.8 Scientific Method: Harlow's Monkeys and Their "Mothers"**

**Hypothesis:** Infant monkeys will form an attachment to a surrogate mother that provides warmth and comfort.

**Research Method:** Infant rhesus monkeys were put in a cage with two different "mothers":

- 1 One mother was made of cloth and looked like a monkey, but could not give milk.
- 2 The other was made of wire, but could give milk.



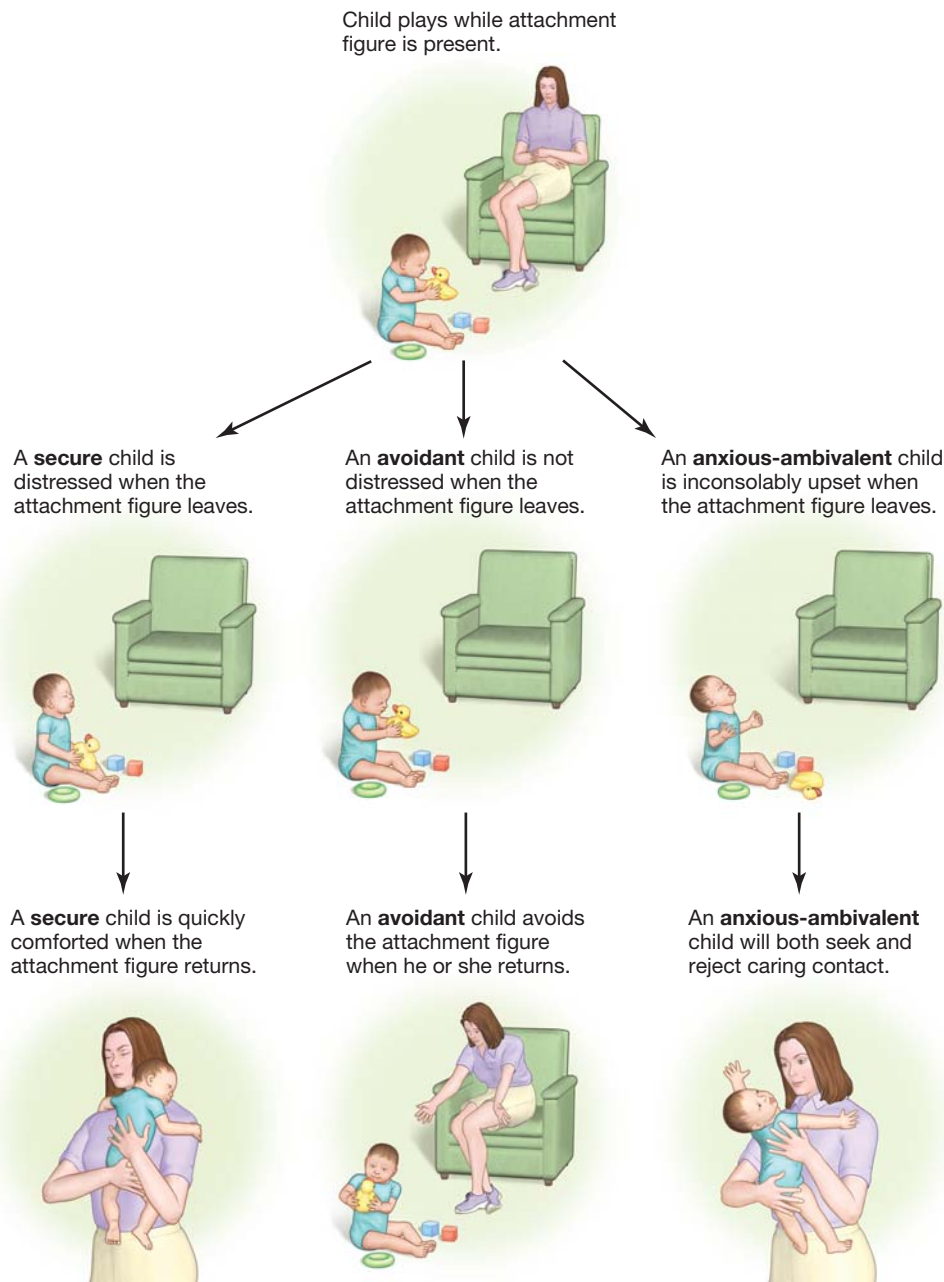
**Results:** The monkeys clung to the cloth mother and went to it for comfort in times of threat. The monkeys approached the wire mother only when they were hungry.

**Conclusion:** Infant monkeys will prefer and form an attachment to a surrogate mother that provides warmth and comfort over a wire surrogate mother that provides milk.

and reunions between the child and each adult. Over the course of the eight episodes, the child experiences increasing distress and a greater need for caregiver proximity. The extent to which the child copes with distress and the strategies he or she uses to do so indicate the quality of the child's attachment to the caregiver. Activity level and actions such as crying, playing, and paying attention to the mother and stranger are recorded. Using the strange-situation test, Ainsworth originally identified three types of child attachment: *secure*, *avoidant*, and *anxious-ambivalent*.

**Secure attachment** applies to the majority of children (approximately 65 percent). A secure child is happy to play alone and is friendly to the stranger while the attachment figure is present. When the attachment figure leaves, the child is distressed, whines or cries, and shows signs of looking for the attachment figure. When the attachment figure returns, the child is happy and quickly comforted, and often wants to be held or hugged. The child then returns to playing (FIGURE 11.9).

**secure attachment** Attachment style for a majority of infants, who are readily comforted when their caregiver returns after a brief separation.



**FIGURE 11.9** The Strange-Situation Test

**avoidant attachment** Attachment style in which infants ignore their caregiver when he or she returns after a brief separation.

**anxious-ambivalent attachment**

Attachment style in which infants become extremely upset when their caregiver leaves but reject the caregiver when he or she returns.

**disorganized attachment** Attachment style in which infants give mixed responses when their caregiver leaves and then returns from a short absence.

**Avoidant attachment** applies to approximately 20 percent to 25 percent of children. The avoidant child does not appear distressed or upset by the attachment figure's departure. If upset, the children may be comforted by the stranger. When the attachment figure returns, the child does not want a reunion, but rather ignores or snubs the attachment figure. If the child approaches the attachment figure, he or she often does so tentatively.

**Anxious-ambivalent attachment** applies to approximately 10 percent to 15 percent of a given sample. A child with an anxious-ambivalent style is anxious throughout the test. The child clings to the attachment figure after they enter the room; when the attachment figure leaves, the child becomes inconsolably upset. When the attachment figure returns, the child will seek and reject caring contact; for instance, the child may want to be held but then fight to be released. The child may cling to the attachment figure even while trying to hit him or her.

Other researchers have identified variants of these attachment styles. For instance, some children show inconsistent or contradictory behaviours, such as smiling when seeing the caregiver but then displaying fear or avoidance. These children have been described as having **disorganized attachment** (Main & Solomon, 1986).

Researchers examining the role of a child's personality or temperament in determining that child's attachment style have found that children with behavioural problems—such as children who rarely smile, are disruptive, or are generally fussy—are more likely to be insecurely attached (that is, anxious-ambivalent or avoidant). The caregiver's personality also contributes to the child's attachment style. Emotionally or behaviourally inconsistent caregivers tend to have children with an anxious-ambivalent attachment style, whereas rejecting caregivers tend to have children with an avoidant attachment style. It is tempting to conclude from these data that parents' behaviour *causes* children to have different attachment patterns, but the proper conclusion is that the caregiver's personality *contributes to* the child's attachment style. (See the discussion of causation and correlation in Chapter 2, "Research Methodology.") When parent behaviours and child behaviours are related, a third variable might be causing parent and child to behave in related ways, the parent's behaviours might be influencing the child's behaviours, or the child's behaviours might be influencing the parent's behaviours. In the latter case, for example, a "difficult" baby may elicit less caring behaviour than a baby with a more content temperament.

**CRITICAL THINKING SKILL**

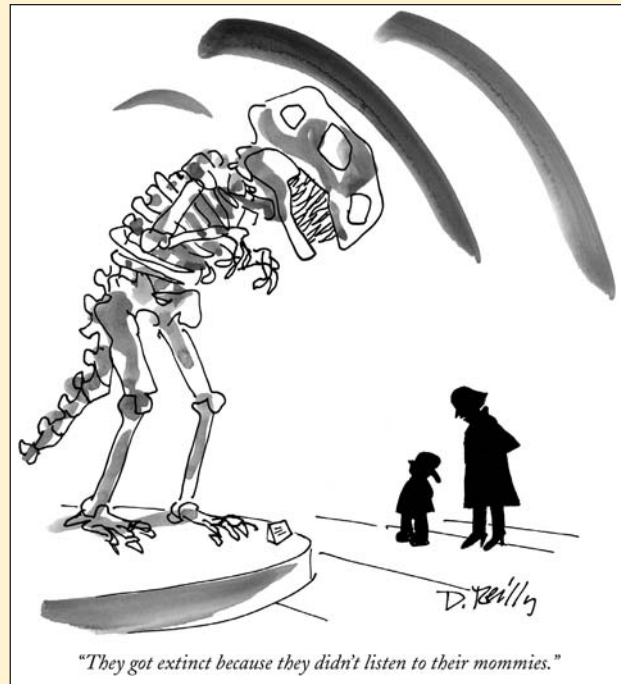
## Understanding That "Some" Does Not Mean "All"

As discussed in Chapter 2, researchers performing a longitudinal research study will test the same participants repeatedly over time. In a longitudinal study of attachment styles, researchers found that children who were rated as securely attached at 12 months of age (using the strange-situation test) were more socially competent in primary school and had more positive romantic relationships as young adults than those who were not securely attached (Simpson, Collins, Tran, & Haydon, 2007). These results show the importance of having positive attachments early in life: Such relationships are predictive of better attachment and adjustment over the next several decades of life.

What do these research findings say about a person who was not securely attached as an infant and did not develop a close and early bond with an adult? Should that person just give up now and forget about having positive romantic relationships? Of course not. Having a secure attachment in

infancy makes it *more likely* that an adult will have healthy romantic attachments. But that attachment does not guarantee the result, nor does the lack of attachment to a caregiver in infancy mean that a person will not have strong romantic relationships later in life.

In trying to apply these results to our own lives, however, we might misinterpret the take-home message as something like “If I was securely attached to my caregiver in infancy, I will have better romantic relationships as a young adult.” That is, in thinking about such findings, we tend to change relative probabilities (e.g., “If securely attached as an infant, a person is *more likely* to have healthy romantic relationships later in life”) to absolute statements (e.g., “If securely attached as an infant, a person *will* have healthy romantic relationships later in life” or the converse, “If *not* securely attached as an infant, a person *will not* have healthy romantic relationships later in life,” which is equally wrong). The problem arises when we convert terms such as *some* and *more* into *all*. By focusing on the properly limited meanings of a study’s terms, we can draw correct conclusions from that study’s results.



**CHEMISTRY OF ATTACHMENT** In many studies, scientists working at the biological level of analysis have discovered that the hormone oxytocin is related to social behaviours, including infant/caregiver attachment (Carter, 2003; Feldman, Weller, Zagoory-Sharon, & Levine, 2007). Oxytocin plays a role in maternal tendencies, feelings of social acceptance and bonding, and sexual gratification. In the mother and the infant, oxytocin promotes behaviours that ensure the survival of the young. For instance, infant sucking triggers the release of oxytocin in the mother, and this release stimulates biological processes in the mother that move milk into the milk ducts so the infant can nurse. In a study of mothers and their newborn infants, oxytocin was associated with several measures of attachment, such that higher levels of this hormone were predictive of better maternal attachment.

## SUMMING UP

### What Shapes a Child?

The human genome consists of instructions for building a functioning human being, but from the earliest moment of human development, environmental factors influence how each individual is formed. Throughout the prenatal period, various environmental agents, from the mother’s hormones to substances she consumes, can alter the formation of the fetus and its cognitive capacities. Once the child is born, learning is constrained by the development of both brain and body. Except in cases of abuse or some serious illnesses, children crawl and walk when their bodies develop the appropriate musculature and when their brains mature sufficiently to coordinate motor actions. Almost from the moment of birth, humans are social creatures, forming bonds of attachment with caregivers. The quality of these attachments, as well as the children’s attitudes, values, and beliefs, are shaped by interactions with their caregivers. Parents and other caregivers influence many aspects of children’s lives.

## MEASURING UP

1. Which of the following research findings would support the idea that humans have sensitive learning periods?
  - a. Relative to many other animals, humans are almost helpless at birth.
  - b. Children with minimal exposure to language before age 12 can never learn to speak.
  - c. Children with minimal exposure to language before age 12 can learn to speak, but their learning will happen poorly and with great difficulty.
  - d. There are individual differences in the rates of human physical development.
2. Identify the type of attachment that each of the following statements describes. The types are secure, avoidant, anxious-ambivalent, and disorganized.
  - \_\_\_\_\_ a. The child's behaviour is inconsistent or contradictory, as in showing fear when the caregiver returns.
  - \_\_\_\_\_ b. The child does not appear distressed when the caregiver leaves and tends to ignore the caregiver when he or she returns.
  - \_\_\_\_\_ c. The child is distressed when the caregiver leaves but quickly comforted when he or she returns.
  - \_\_\_\_\_ d. The child clings to the caregiver, appears inconsolable when the caregiver leaves, but displays accepting and rejecting behaviours when he or she returns.

### LEARNING OBJECTIVES

Provide examples of techniques psychologists use to find out what infants know and can do.

List and describe the stages of development proposed by Piaget.

Trace the development of language in infants and in older children.

## How Do Children Learn about Their Worlds?

In the first few years of life, children normally acquire many skills and absorb many kinds of knowledge. However, they most likely retain very few memories of learning to walk, talk, read, reason, and do countless other things. In studying the early years of human development, psychological scientists seek to understand if children learn through their interactions with the environment, if they are born with innate cognitive abilities, or both. Throughout psychology's history, scientists have vigorously debated the contributions of nature and nurture to development. Nearly everyone now agrees that both are important, and current research focuses on how genes and experience interact to make us who we are.

### Perception Introduces the World

To learn, children need to obtain information from the world. They do so principally through their senses. As noted above, newborns have all their senses at birth, although some of their senses are poorly developed. The development of their sensory capacities allows infants to observe and evaluate the objects and events around them. The infants then use the information gained from perception to try to make sense of how the world works.

**INFANT-RESEARCH TECHNIQUES** How can we tell what a baby knows about the world? Psychological scientists have devised clever experiments for gauging what infants perceive about the objects and events in the infants' environments. Based on the observation that infants tend to look longer at stimuli that interest them, one type of experiment uses the *preferential-looking technique*: Researchers



show an infant two things. If the infant looks longer at one of the things, the researchers know the infant can distinguish between the two and finds one more interesting.

Other experiments are based on the *orienting reflex*, humans' tendency to pay more attention to new stimuli than to stimuli to which they have become habituated, or grown accustomed (Fantz, 1966). Even from birth, an infant will look away more quickly from something familiar than from something unfamiliar or puzzling. By using their knowledge of habituation, researchers can create a response preference in an infant for one stimulus over another. For example, they might show the infant a picture or an object until the infant is familiar enough with it that the infant adapts to the stimulus or becomes bored—the amount of time the infant looks at the stimulus declines. At that point, the researchers can measure whether the infant reacts to a change in the stimulus: If shown a new picture or new object, will the infant look longer at it? If so, the infant is noticing a difference between the old and new stimuli. If the infant looks at the new stimulus the same amount of time she looks at the old stimulus, the researchers assume the infant does not distinguish between the two. Such tests are used to gauge everything from infants' perceptual abilities—how and when they can perceive colour, depth, and movement, for instance—to their understanding of words, faces, numbers, and laws of physics. So what do we know about infants' early perceptual abilities? What can they learn about their worlds?

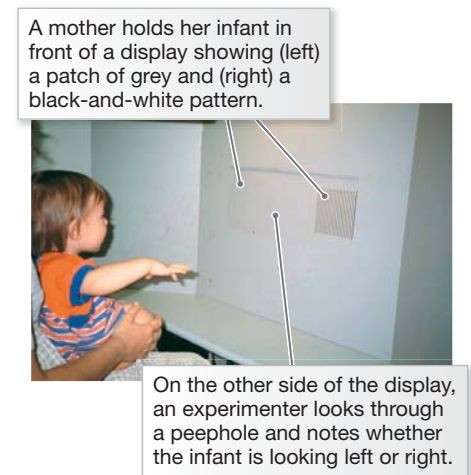
**VISION** The ability to distinguish differences among shapes, patterns, and colours develops early in infancy. Developmental psychologists use the preferential-looking technique to determine how well an infant can see—that is, the infant's *visual acuity*. Infants respond more to objects with high-contrast patterns, for example, than to other stimuli. In the early 1960s, Robert Fantz and other developmental psychologists showed infants patterns of black-and-white stripes as well as patches of grey and observed the infants' reactions (FIGURE 11.10). In these studies, the mother or another caregiver was asked to hold the infant in front of a display of the two images. The experimenter, not knowing which image was on which side, would observe through a peephole to see where the infant preferred to look (FIGURE 11.11). This research revealed that infants look at stripes with high contrast more readily than at grey images. The smaller the stripes get—that is, the less contrast between the images—the more difficult it becomes for infants to distinguish them from the grey patches. When infants look at both images equally, researchers assume the infants cannot tell the difference between the two.

Research has indicated that though infants' visual acuity for distant objects is poor when they are first born, it increases rapidly over the first six months (Teller, Morse, Borton, & Regal, 1974). Adult levels of acuity are not reached until about one year. The increase in visual acuity is probably due to the development of the infant's visual cortex as well as the development of cones in the retina (as noted in Chapter 5, "Sensation and Perception," the cones are important for perceiving detail).

To assess when depth perception emerges in infancy, the perceptual psychologist Robert Fox and his colleagues (1980) showed infants *stereograms*, in which one view of an image is shown to one eye and another view to the other; this information is then converted into depth perception. If infants cannot use this *disparity information* (the differences in images seen by their eyes) to perceive depth, they will see only a random collection of dots. To determine whether infants can see stereograms, Fox devised an experiment in which a baby wearing special viewing



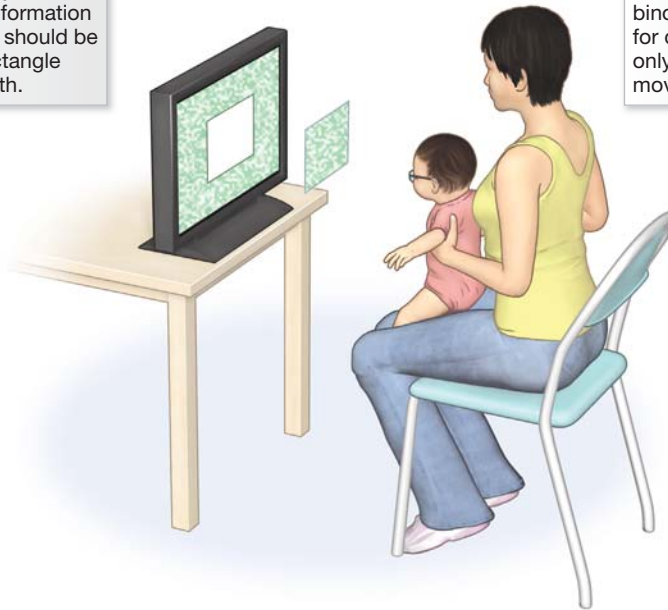
**FIGURE 11.10 Vision in Infancy** Robert Fantz was the first to determine that infants prefer patterns with high contrast. A more thorough understanding of infants' visual abilities has led parents to buy mobiles and toys that use some of Fantz's testing patterns.



**FIGURE 11.11 Testing Visual Acuity in Infants** This infant's visual acuity is being tested with the preferential-looking technique.

A baby with the ability to use binocular disparity information for depth perception should be able to see a 3-D rectangle moving back and forth.

A baby without the ability to use binocular disparity information for depth perception will see only a field of dots and no movement.



**FIGURE 11.12 Fox's Experiment to Test Binocular Disparity** This test determines whether the baby can use binocular disparity as a cue to depth.

glasses looks at a screen while seated on the parent's lap (**FIGURE 11.12**). Fox's results indicate that the ability to perceive depth develops between three and a half and six months of age.

**AUDITORY PERCEPTION** When infants are presented with rattle sounds in their right or left ears, they turn in the direction of the sounds; this movement indicates both that they have perceived the sound and that they know where it is coming from. Detailed analysis of the tone levels that infants can hear indicates that by six months babies have nearly adult levels of auditory function (DeCasper & Spence, 1986). Infants also seem to have some memory for sounds. Using habituation techniques, researchers have determined that infants can recognize sounds they have heard before. By measuring an infant's rate of sucking on a rubber nipple, researchers can determine if the infant is aroused in response to a specific sound. Anthony DeCasper and William Fifer (1980) used operant conditioning (discussed in Chapter 6, "Learning") to determine what sounds two-day-old infants can remember. In their study, each infant wore earphones and was given a nipple linked to recordings of his or her mother's voice and a stranger's voice. If the infant paused for a longer time between sucking bursts, the mother's voice played. If the infant paused for a shorter time, the stranger's voice played. Even at this young age, the newborns learned to alter their sucking patterns to hear their mother's voices more often. Using a biological level of analysis, researchers sought to determine whether the brain regions activated when someone hears speech are similar for infants and adults. In adults, different brain regions respond to speech and to nonspeech (Vouloumanos, Kiehl, Werker, & Liddle, 2001). Would infants' brains show the same distinction? Researchers compared adults' and infants' brain responses to speech and to nonspeech, using *event-related potentials* (EEG measures) that pick up neural activity from the scalp (Dehaene-Lambertz & Gliga, 2004). As they expected, three-month-old infants showed neural responses similar to those obtained from adults. This finding suggests that, from the first three months of life through adulthood, there is a continuity in how the brain processes speech.

## Memory Improves over Childhood

The development of memory also helps children learn about the world around them, as they use new information to build on what they already know. In two experiments, the American developmental psychologist Carolyn Rovee-Collier (1999) revealed that from a very young age infants possess some types of memory, though that memory is quite rudimentary. In one experiment, a mobile hanging over a crib was attached to an infant's ankle with a ribbon. The infant learned that he or she could move the mobile by kicking. The rate at which the infant kicked when the mobile was not attached served as the baseline. When the infant was tested later, the ribbon was attached to the ankle but not to the mobile, so the kicks no longer moved the mobile. If the baby recognized the mobile, presumably it would kick faster than the baseline rate to try to make the mobile move. Infants ranging in age from 2 months to 18 months were trained for two days on the mobile and then tested after different lengths of time. The findings indicated that older infants remembered longer. By 18 months, they could remember the event for several weeks (FIGURE 11.13).

FIGURE 11.13 **Scientific Method: The Memory-Retention Test**

**Hypothesis:** Very young infants have memory.

**Research Method:**

- 1 The rate at which an infant in a crib kicked under normal conditions was measured.
- 2 A mobile was hung over the crib and attached to the infant's ankle with a ribbon, so that when the infant kicked, the mobile moved.
- 3 The rate at which the infant kicked with the ribbon attached was measured against the normal rate of kicking.



- 4 Later (at different delay intervals), each infant was placed in the crib, and the kicking rate was measured. A high rate of kicking indicated that the infant remembered that kicking moved the mobile.

**Results:** Among infants ranging from 2 months to 18 months old, older infants remembered the mobile for longer periods.

**Conclusion:** Very young infants have memory, but it is quite rudimentary.

**infantile amnesia** The inability to remember events from early childhood.

**INFANTILE AMNESIA** What is your earliest memory? Most adults remember few events that occurred before they were three or four years old. Freud referred to this inability to remember events from early childhood as **infantile amnesia**. Psychologists have offered various explanations for this phenomenon (Eacott, 1999). Some believe children begin to retain memories after developing the ability to create autobiographical memory based on personal experience—for instance, recalling that “a cat scratched me” rather than “cats scratch.” Other psychologists suggest that childhood memory develops with language acquisition because the ability to use words and concepts aids in memory retention.

**INACCURATE MEMORY** Young children often have source amnesia (difficulty knowing where they learned something; discussed in Chapter 7, “Attention and Memory”). For example, even when tested immediately after being presented with information, three-year-old children forget the source of the information faster than do five-year-old children (Gopnik & Graf, 1988). Evidence from investigations of source amnesia suggests that many of people’s earliest memories come from looking at pictures in family albums, watching home movies, or hearing stories from their parents—not from actual memories of the events.

Children are also known to confabulate (make things up; also discussed in Chapter 7). The fact that children have underdeveloped frontal lobes may explain why they are more likely than adults to engage in this behaviour (on the roles of frontal lobes, see Chapter 3, “Biological Foundations”). Confabulation happens most when children are asked about personal experiences rather than general knowledge. In one study, preschool children were interviewed repeatedly and asked to remember if they had ever gotten their fingers caught in a mousetrap. They were asked to think hard about the event and to visualize the scene, who was with them, what they were wearing, and so on. After 10 weeks in which the children were to have thought about the event, a new interviewer repeated the question. Sixty percent of the children provided false narratives, telling a story about getting their fingers caught and behaving as if it really had happened. Many of the children developed very elaborate stories with numerous details about why their fingers had been caught and how it had felt (Bruck & Ceci, 1993).

Siblings sometimes argue about a memory, each claiming the same event really happened to them. A team of researchers (Ikier, Tekcan, Gülgöz, & Küntay, 2003) studied such disputed memories and undisputed memories and found many more disputed memories among identical twins than among fraternal twins and non-twin siblings, probably because identical twins are the same sex and tend to share many more life experiences than do other siblings. Most of the disputed memories were for events that occurred during the preschool years, when source memory is still developing.



**FIGURE 11.14 Jean Piaget** Piaget introduced the idea that cognitive development occurs in stages.

### Piaget Emphasized Stages of Development

Are infants merely inexperienced humans? Do they simply not have the skills and knowledge that adults normally have learned over time? Or do infants’ minds work in qualitatively different ways from those of adults? Through careful observations of young children, the Swiss psychologist Jean Piaget devised an influential theory about the development of thinking (**FIGURE 11.14**). One crucial aspect of Piaget’s research is that he paid as much attention to how children made errors as to how they succeeded on tasks. These mistakes, illogical by adult standards, provided insights into how young minds make sense of the world.





By systematically analyzing children’s thinking, Piaget developed the theory that children go through four *stages of development*—*sensorimotor*, *preoperational*, *concrete operational*, and *formal operational*—that reflect different ways of thinking about the world (FIGURE 11.15). From this perspective, it is not that infants know less than adults but rather that their view of how the world works is based on an entirely different set of assumptions than those held by adults. As discussed below, other researchers have challenged the idea of stages of development.

Piaget proposed that during each stage of development children form new *schemas*. As defined and discussed in Chapter 7, schemas are ways of thinking, conceptual models of how the world works. Piaget believed that each stage builds on the previous one through two learning processes: **Assimilation** is the process through which a new experience is incorporated in an existing schema; **accommodation** (a different term than the one presented in Chapter 5) is the process through which a schema is adapted or expanded to include the new experience.

**assimilation** The process by which a new experience is placed into an existing schema.

**accommodation** The process by which a schema is changed to incorporate a new experience that does not easily fit into an existing schema.

**FIGURE 11.15** Piaget’s Stages of Cognitive Development

Stage	Characterization
<b>1</b> <b>Sensorimotor</b> (birth–2 years)	<ul style="list-style-type: none"> <li>• Differentiates self from objects</li> <li>• Recognizes self as agent of action and begins to act intentionally; for example, pulls a string to set a mobile in motion or shakes a rattle to make a noise</li> <li>• Achieves object permanence: realizes that things continue to exist even when no longer present to the senses</li> </ul> 
<b>2</b> <b>Preoperational</b> (2–7 years)	<ul style="list-style-type: none"> <li>• Learns to use language and to represent objects by images and words</li> <li>• Thinking is still egocentric: has difficulty taking the viewpoint of others</li> <li>• Classifies objects by a single feature; for example, groups together all the red blocks regardless of shape or all the square blocks regardless of colour</li> </ul> 
<b>3</b> <b>Concrete operational</b> (7–12 years)	<ul style="list-style-type: none"> <li>• Can think logically about objects and events</li> <li>• Achieves conservation of number (age 7), mass (age 7), and weight (age 9)</li> <li>• Classifies objects by several features and can order them in a series along a single dimension, such as size</li> </ul> 
<b>4</b> <b>Formal operational</b> (12 years and up)	<ul style="list-style-type: none"> <li>• Can think logically about abstract propositions and test hypotheses systematically</li> <li>• Becomes concerned with the hypothetical, the future, and ideological problems</li> </ul> 

**sensorimotor stage** The first stage in Piaget's theory of cognitive development, during which infants acquire information about the world through their senses and respond reflexively.

**object permanence** The understanding that an object continues to exist even when it cannot be seen.



1 A six-year-old understands that two identical short glasses of water contain the same amount of water.



2 She pours the water from one of the short glasses into a tall glass.



3 When asked which glass has more water, she points to the taller glass, even though she poured the water from the equivalent shorter glass.

**FIGURE 11.16 The Preoperational Stage and the Law of Conservation** In the preoperational stage, children cannot yet understand the concept of conservation.

**SENSORIMOTOR STAGE (BIRTH TO TWO YEARS)** According to Piaget, from birth until about age two children are in the **sensorimotor stage**, acquiring information only through their senses. Thus infants understand objects only when they reflexively react to those objects' sensory input—such as when they suck on a nipple, grasp a finger, or recognize a face. As they begin to control their movements, they develop their first schemas: conceptual models consisting of mental representations of the kinds of actions that can be performed on certain kinds of objects. For instance, the sucking reflex begins as a reaction to the sensory input from the nipple: Infants simply respond reflexively by sucking. Soon they realize they can suck other things, such as a bottle, a finger, a toy, a blanket. Piaget described sucking other objects as an example of assimilation to the schema of sucking. But sucking a toy or a blanket does not result in the same experience as the reflexive sucking of a nipple. The difference between these experiences leads to accommodation with respect to the sucking schema—children must adjust their understanding of sucking.

Piaget believed that all the sensorimotor schemas eventually merge into an exploratory schema. In other words, infants learn they can act on objects—manipulate them to understand them—rather than simply react to them. If you have spent time watching an infant learn about the world, you may have noticed that every new object goes into the infant's mouth. Caregivers may worry about the cleanliness of this way of learning about the world, but the behaviour is typical for infants in the sensorimotor stage of development.

According to Piaget, one cognitive concept related to this stage is **object permanence**, the understanding that an object continues to exist even when it is hidden from view. Piaget noted that not until nine months of age will most infants search for objects they have seen being hidden. Even at nine months, when infants will begin to snatch a blanket away to find a hidden toy, their search skills have limits. For instance, suppose during several trials an eight-month-old child watches an experimenter hide a toy under a blanket and the child then finds the toy. If the experimenter then hides the toy under a different blanket, in full view of the child, the child will still look for the toy in the first hiding place. Full comprehension of object permanence was, for Piaget, one key accomplishment of the sensorimotor period.

**PREOPERATIONAL STAGE (TWO TO SEVEN YEARS)** In the **preoperational stage**, according to Piaget, children can think about objects not in their immediate view and have developed various conceptual models of how the world works. During this stage, they begin to think symbolically—for example, taking a stick and pretending it is a gun. Piaget believed that what they cannot do yet is think “operationally”—they cannot imagine the logical outcome of performing certain actions on objects. They base their reasoning not on logic but on immediate appearance. For instance, children at this stage have no understanding of the law of conservation of quantity: that even if a substance's appearance changes, its quantity may remain unchanged. For instance, if you pour a short, fat glass of water into a tall, thin glass, you know the amount of water has not changed. However, if you ask children in the preoperational stage which glass contains more, they will pick the tall, thin glass because the water is at a higher level. The children will make this error even when they have seen someone pour the same amount of water into each glass—and even when they do it themselves (**FIGURE 11.16**).

**CONCRETE OPERATIONAL STAGE (7 TO 12 YEARS)** At about seven years of age, children enter the **concrete operational stage**, where they remain until adolescence. Piaget believed that humans do not develop logic until they begin to think about and understand operations. In other words, they then can figure out

the world by thinking about how events are related. A classic *operation* is an action that can be undone: A light can be turned on and off; a stick can be moved across the table and then moved back. According to Piaget, the ability to understand that an action is reversible enables children to begin to understand concepts such as conservation of quantity. Although this development is the beginning of logical thinking, Piaget believed that children at this stage reason only about concrete things—objects they can act on in the world. They do not yet have the ability to reason abstractly, or hypothetically, about what might be possible.

**FORMAL OPERATIONAL STAGE (12 YEARS TO ADULTHOOD)** The **formal operational stage** is Piaget's final stage of cognitive development. Formal operations involve abstract thinking, characterized by the ability to form a hypothesis about something and test it through deductive logic. For instance, at this stage teens can systematically begin to test a theory or solve a problem. Piaget described giving students four flasks of colourless liquid and one flask of coloured liquid, then telling them that by combining two of the colourless liquids, they could obtain the coloured liquid. Adolescents, by systematically trying different combinations, can obtain the correct result. Younger children, who just randomly combine liquids, cannot. One example of psychological science in action is the influence on education of Piaget's research: In Canada, for example, subjects that require abstract reasoning, such as algebra or the scientific method, usually are not taught until around grade seven, when most of the children are 12 years old.

**CHALLENGES TO PIAGET'S THEORY** Piaget revolutionized the understanding of cognitive development and was right about many things. However, many subsequent studies have challenged his views. For example, some critics dispute the idea that every person goes through the stages of development in the same order. Piaget also believed that as children progress through each stage, they all use the same kind of logic to solve problems. His framework thus leaves little room for differing cognitive strategies or skills among individuals—or among cultures. Some evidence supports his view, but many children seem to move back and forth between stages. Some developmental psychologists have revised many of Piaget's theories while preserving his basic ideas. These theorists believe that different areas in the brain are responsible for different skills, and that the development of different skills therefore does not have to follow strict stages (Bidell & Fischer, 1995; Case, 1992; Fischer, 1980).

## Infants Have Early Knowledge about the World

Piaget suggested that children are not capable of understanding much of the world around them until they go through the various stages of cognitive development. However, recent research indicates that children understand much more and at much earlier ages than was previously believed. Tests using the preferential-looking technique have revealed that infants as young as three months of age can remember an object even when it is no longer in plain sight, a finding that seems to contradict Piaget's ideas about object permanence. Similarly, infants' reactions to novel stimuli indicate that they have cognitive skills quite early in life. For example, if three-month-old infants watch events that do not make rational sense, they will stare at the impossible or unexpected results longer than they would stare at the results of events that make sense.

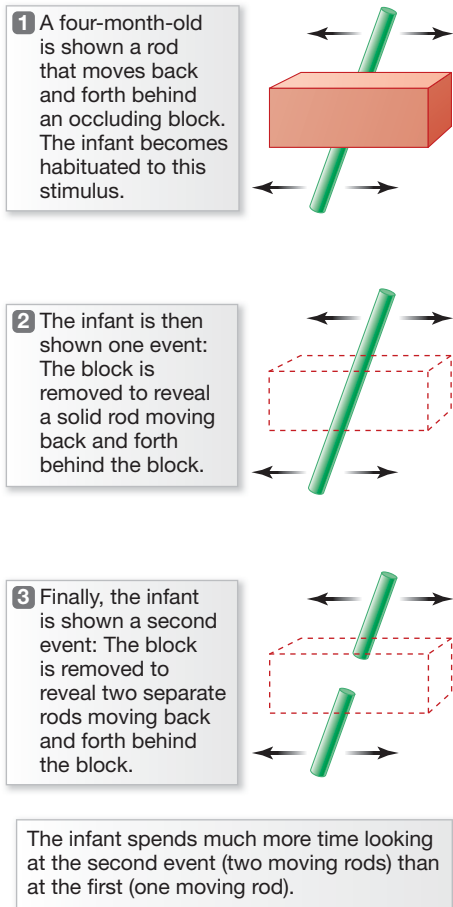
Suppose you show an infant an apple, lower a screen in front of the apple, and then raise the screen to show the apple. Then you perform the same actions, but

**preoperational stage** The second stage in Piaget's theory of cognitive development, during which children think symbolically about objects, but reason is based on appearance rather than logic.

**concrete operational stage** The third stage in Piaget's theory of cognitive development, during which children begin to think about and understand operations in ways that are reversible.

**formal operational stage** The final stage in Piaget's theory of cognitive development; it involves the ability to think abstractly and to formulate and test hypotheses through deductive logic.

this time raise the screen to show a carrot—a surprising, impossible event. If the infant looks longer at the carrot than it had looked at the apple, you would deduce that the infant expected to see the apple (Baillargeon, 1995). By responding differently to such an impossible event than to possible ones, infants demonstrate some understanding that an object continues to exist when it is out of sight, even though they might not reach for a hidden object in Piaget’s object permanence test. Piaget’s task probably required too much of infants, perhaps by making them reach for the object. Baillargeon’s apple/carrot test revealed that object permanence occurs earlier than Piaget believed.



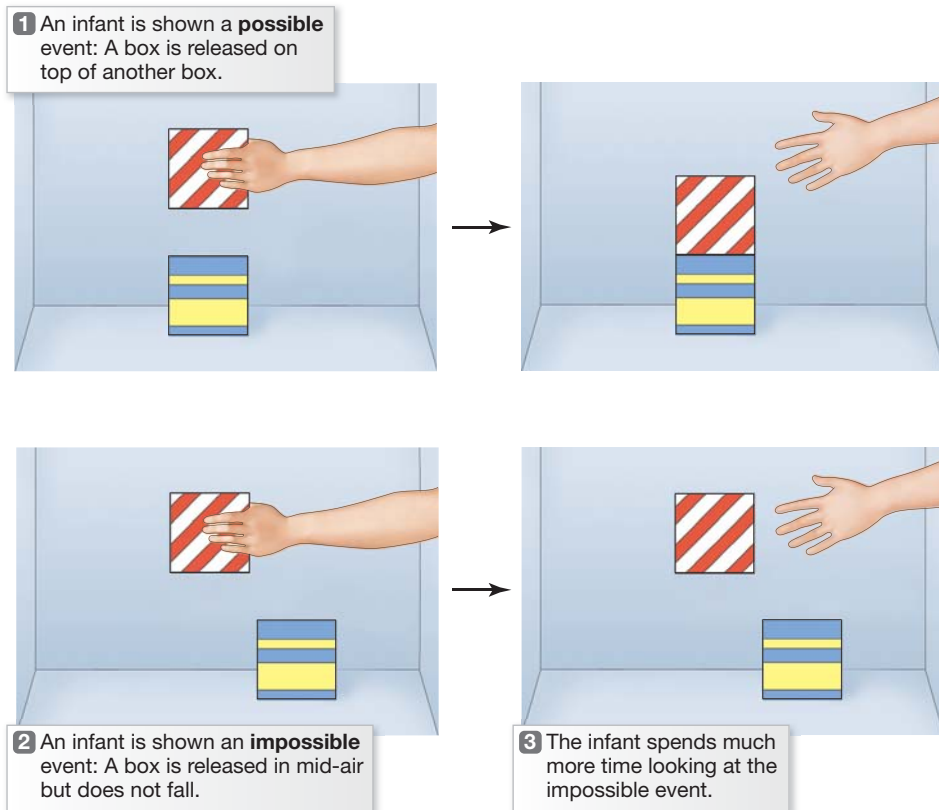
**FIGURE 11.17 The Perceptual Effect of Occlusions in Early Infancy** Understanding the relation between movement and physical properties requires cognitive skills. Infants appear to use movement to infer that objects moving together are continuous.

**UNDERSTANDING THE LAWS OF NATURE: PHYSICS** The American developmental psychologist Elizabeth Spelke and her colleagues have conducted numerous studies indicating that infants have a primitive understanding of some of the basic laws of physics. Consider one such example. Humans are born with the ability to perceive movement: A newborn will follow a moving stimulus with his or her eyes and head and prefer to look at a moving stimulus over a stationary one. Experiments indicate that as infants get older, they use movement information to determine if an object is continuous—that is, if it is all one object, even if the infant cannot see the entire thing because it is partially hidden (Kellman, Spelke, & Short, 1986). In one experiment, the researchers showed four-month-old infants a rod moving back and forth behind a block. Once habituated, the infants were shown two scenes: one in which the block was removed and there was a single rod, and another in which the block was removed and there were two small rods. The infants looked longer at the two small rods (**FIGURE 11.17**). This response indicated that they expected the rod moving behind the block to be one continuous object rather than two small ones. Understanding the relation between the movement and the physical properties of the rod requires various cognitive skills. It requires the ability to see the rod as an object separate from the block and to surmise that since the two ends are moving together, they must be part of the same whole rod, even though part of rod is hidden. If the experiment is conducted with a stationary rod, however, the infants do not look longer at the two small rods. Therefore, infants appear to use movement to infer that objects moving together are continuous, whereas for infants two stationary objects may or may not be continuous.

In a series of studies using impossible events, the Quebec native Renée Baillargeon and her colleagues (Baillargeon, 2008; Wang & Baillargeon, 2008) found that at a very young age children begin to understand what is necessary to support an object in space. The experimenters determined that, by three months of age, infants expect a box on a platform to remain stable if a person holding the box releases it, whereas those infants expect a box with nothing under it to fall if a person holding the box releases it (**FIGURE 11.18**). Thus children seem to have an intuitive sense of the laws that govern the physical world.

**UNDERSTANDING THE LAWS OF NATURE: MATHEMATICS** How much do you think infants and toddlers know about counting and other mathematical operations? Piaget believed that young children do not understand numbers and therefore must learn counting and other number-related skills through memorization. His experiments consisted of, for example, showing four-to-five-year-old children two rows of marbles. Both rows had the same number of marbles, but in one row the marbles were spread out. The children usually said the longer row had more marbles (**FIGURE 11.19**), and Piaget concluded that children’s understanding of quantity—of the concepts *more than* and *less than*—had to do not with number but with length.

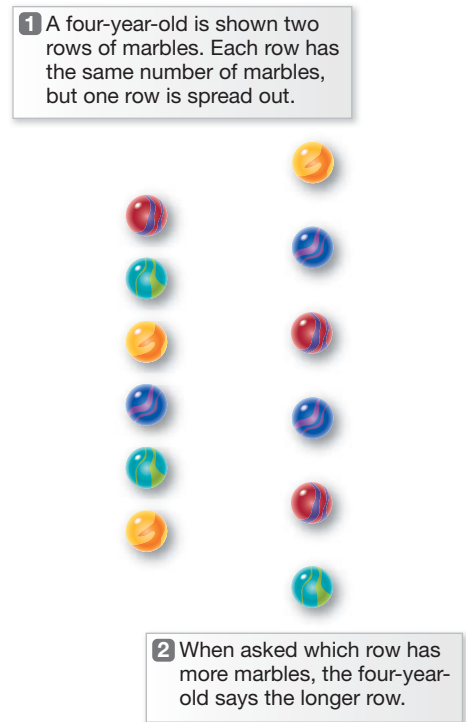




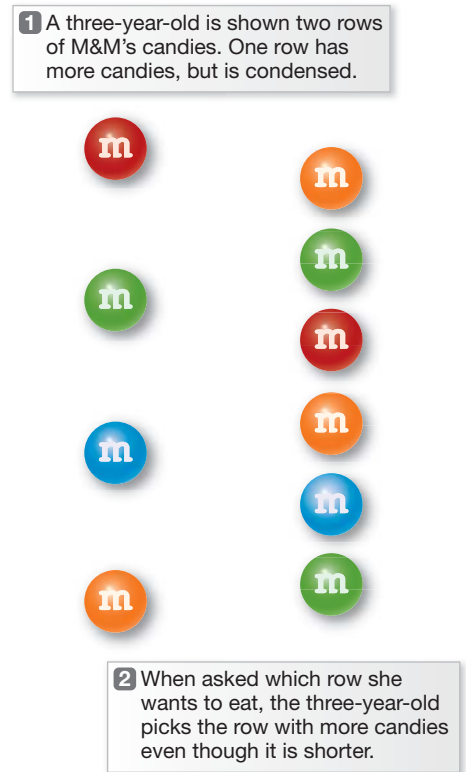
**FIGURE 11.18 Understanding the Laws of Nature** Infants seem to intuitively sense that a box placed in mid-air must fall.

Challenging Piaget's view, Jacques Mehler and Tom Bever (1967), a native Spaniard and an American, argued that children younger than three years of age can understand *more than* and *less than*. To demonstrate their point, they cleverly repeated Piaget's experiment using M&M's candy. They showed the children two rows of four M&M's each and asked if the rows were the same. When the children said yes, the researchers then transformed the rows. For instance, they would add two candies to the second row, but compress that row so it was shorter than the row with fewer candies. Then they would tell the children to pick the row they wanted to eat. More than 80 percent picked the row with more M&M's, even though it was the visually shorter row (FIGURE 11.20). This research indicated that when children are properly motivated, they understand and can demonstrate their knowledge of *more than* and *less than*. Despite Piaget's enormous contributions to the understanding of cognitive development, the growing evidence that even infants have innate knowledge challenges his theory of distinct stages of cognitive development. For example, subsequent scientific findings indicate that Piaget underestimated young children's mental capacities.

As researchers have developed better methods for studying what infants know and can do, they have learned that very young infants have some amazing numerical abilities. For example, at what age would you guess that children have a basic idea of addition and subtraction? Researchers explored this question with a sample of nine-month-olds (McCrink & Wynn, 2004). They used the habituation paradigm to see if the infants were surprised (looked longer) when they were presented with wrong answers to addition and subtraction problems. Normal nine-month-olds watched a computer monitor where, in the addition condition, five blocks were



**FIGURE 11.19 Piaget's Marble Test**



**FIGURE 11.20 The M&M's Version of Piaget's Marble Test** Children who might not have succeeded on Piaget's marble test were able to choose the row that contained more items when those items were M&M's and the test question was *Which row would you like to eat?*

covered by a panel and then five more blocks moved behind the panel. When the panel was removed, you would expect to see ten blocks, and so did the infants: They looked at the screen several seconds longer when the panel lifted and only five blocks were visible than when ten blocks were visible. In the subtraction condition, ten blocks moved behind a screen, and then five moved out. When the screen was removed, the infants looked longer when ten blocks were shown than when five were shown. These infants showed a remarkable understanding of quantity.

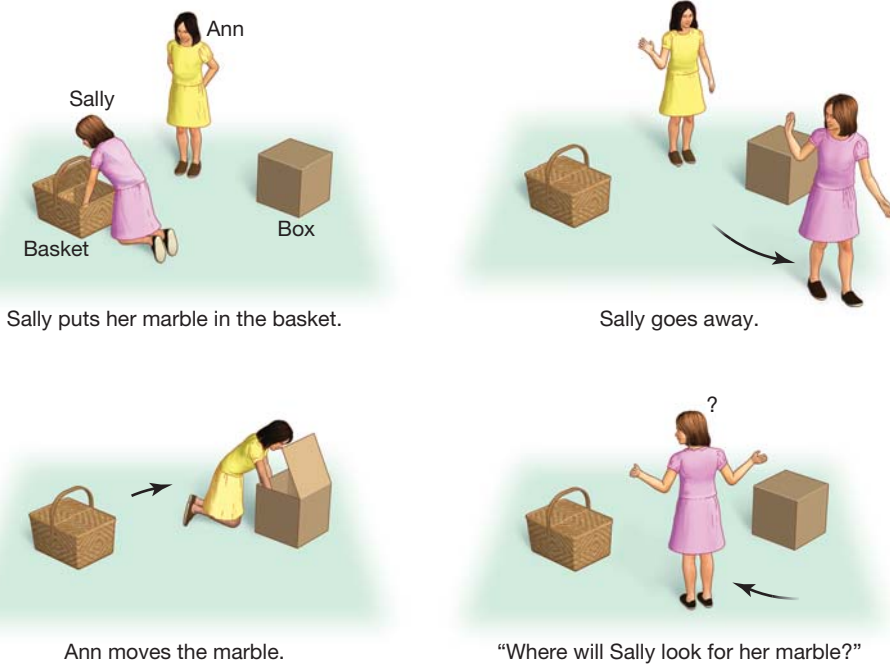
## Humans Learn from Interacting with Others

According to current thinking among developmental psychologists, early social interactions between infant and caregiver are essential to understanding other people and communicating with them through language. In turn, these skills enable us to live in society, where we need to be aware of other people's intentions, to behave in ways that generally conform to others' expectations, to develop moral codes that guide our actions, and so on. To safely (that is, defensively) perform a routine activity such as driving, for example, requires predicting others' actions, however potentially erratic those actions.

**theory of mind** The term used to describe the ability to explain and predict other people's behaviour as a result of recognizing their mental state.

**THEORY OF MIND** Knowing that other people have mental states and using that knowledge to recognize another person's mental state—to infer what the person is feeling or thinking—together constitute **theory of mind**. In theorizing about theory of mind, David Premack proposed that very young children are not good at understanding how others think. He characterized children in the preoperational stage as egocentric: They cannot see another person's point of view, only their own. For instance, children at this stage might stand in front of a television and, because they can see the picture just fine, not understand they are blocking the screen for others. Evidence from the past two decades, however, has shown that young children are less egocentric than Piaget believed. Beginning in infancy, young children come to understand that other people perform actions for reasons—that the actions are intentional (Gergely & Csibra, 2003; Somerville & Woodward, 2005). The recognition of actions' intentionality reflects a growing capacity for theory of mind and allows people to understand, predict, and attempt to influence others' behaviour (Baldwin & Baird, 2001).

In one study, an adult began handing a toy to an infant. On some trials, the adult became unwilling to hand over the toy (e.g., teasing the infant with the toy or playing with it himself or herself). On other trials, the adult became unable to hand it over (e.g., “accidentally” dropping it or being distracted by a ringing telephone). Infants older than nine months showed greater signs of impatience (such as reaching for the toy) when the adult was unwilling than when the adult was unable (Behne, Carpenter, Call, & Tomasello, 2005). In a study that suggests the ability to understand intentions is developed by 13 months of age, infants watched animations of a caterpillar, which searched behind a screen for food. On some trials, the caterpillar had information as to whether a particular food was behind the screen; on other trials, the caterpillar did not have this information. To determine whether the infants expected the caterpillar to find the food, the researchers measured the amounts of time the infants looked at the screen. The infants' expectations appeared to depend on what they believed the caterpillar knew (Surian, Caldi, & Sperber, 2007). In another study, 15-month-old children imitated the actions of an adult trying to pull apart the halves of a dumbbell. On some trials, the children watched the adult's hand slip off the dumbbell before he or she successfully separated it. However, the children imitated the goal of separating the dumbbell rather than the adult's actual movements, such as having the hand slip off (Meltzoff, 1995).



**FIGURE 11.21 A Classic Test for a Child’s Theory of Mind** When a child acquires theory of mind, he or she is able to understand that different individuals have both different perspectives and knowledge based on their individual experiences.

These studies and others (e.g., Onishi & Baillargeon, 2005) provide strong evidence that in the first year of life children begin to read intentions and that by the end of the second year, perhaps even by 13 to 15 months of age, they become very good at reading them (Baillargeon, Li, Ng, & Yuan, 2009).

In this light, consider the *false-belief test*, which measures children’s ability to predict actions. To complete the test successfully, children must understand that people can act on the basis of false information. In a classic example, the child watches Sally place a marble in a basket and leave the room; the child then sees Ann come in, remove the marble from the basket, and place it in a box. The child is then asked to guess where Sally will look for the marble when she comes back in the room (FIGURE 11.21). To answer correctly, the child must develop a theory: Sally put the marble in the basket; Sally does not know Ann moved the marble, so Sally will look in the basket. Children normally are able to solve this problem by age four or five, most likely because by that age they have both sufficient language skills and the ability to coordinate deliberate actions with beliefs.

Children’s success at the false-belief test and children’s full development of theory of mind appear to coincide with the maturation of the brain’s frontal lobes. If the capacity for theory of mind is thus linked to brain development, children in different cultures ought to solve the false-belief test at about the same age. Indeed, a recent study found that children from Canada, India, Peru, Samoa, and Thailand reached the false-belief milestone at around age five (Callaghan et al., 2005). When developmental findings are similar across multiple cultures, the results are considered *culturally universal*, influenced more heavily by biological maturation than by cultural practices (FIGURE 11.22).

The frontal lobes’ importance for theory of mind is also supported by research with adults. In brain imaging studies, prefrontal brain regions become active when



(a)



(b)

**FIGURE 11.22 Culturally Universal Development** Around the world—for example, in (a) Africa and (b) Asia—children display universal aspects of human development.

people are asked to think about others' mental states. People with damage to this region have difficulty attributing mental states to characters in stories (Stone, Baron-Cohen, & Knight, 1998). Brain imaging studies of theory of mind conducted in Canada, the United States, England, France, Germany, Japan, and Sweden have found similar patterns of activity in prefrontal regions (Frank & Temple, 2009). These findings support the idea that the ability is universal and biologically based.

Like the abilities to understand math and physics, theory of mind might develop independently of other brain functions. While children with the developmental disorder autism (discussed in Chapter 14, "Psychological Disorders") cannot solve the false-belief problem, children with Down syndrome can solve it. This finding suggests that theory of mind is not governed by reasoning and general intelligence, since children with Down syndrome are impaired in those areas.

**MORAL REASONING AND MORAL EMOTIONS** Moral development concerns the way people learn to decide between behaviours with competing social outcomes. In other words, it involves the choices people make that affect others, such as whether to take actions that may harm others or that may break implicit or explicit social contracts. Ideally, morality develops during childhood and into adulthood. Theorists typically have divided it into *moral reasoning*, which depends on cognitive processes, and *moral emotions*. Of course, cognition and emotions are intertwined: Research has shown that if people lack adequate cognitive abilities, their moral emotions may not translate into moral behaviours; similarly, moral reasoning is enhanced by moral emotions.

Psychologists who study the cognitive processes of moral behaviour have focused largely on the American psychologist Lawrence Kohlberg's stage theory. Kohlberg (1984) tested moral-reasoning skills by asking people to respond to hypothetical situations in which a main character was faced with a moral dilemma, such as having to steal a drug to save his dying wife. Kohlberg was most concerned with the reasons children and adults provided for their answers. He devised a theory of moral judgment that involved three levels of moral reasoning. At the **preconventional** level, children classify answers in terms of self-interest or pleasurable outcomes. For example, a child at this level may say, "He should steal the drug if he really likes his wife." At the **conventional** level, responses conform to rules of law and order or focus on others' disapproval, as in "He shouldn't take the drug because it is wrong to steal, so everyone will think he is a bad person." At the highest, **postconventional** level, responses centre around complex reasoning about abstract principles and values, such as "Sometimes people have to break the law if the law is unjust." Moral reasoning theories have been faulted for emphasizing the cognitive aspects of morality. Some theorists contend that moral reasoning, as such, fails to predict moral behaviour; they believe instead that moral actions, such as helping others in need, are influenced more by emotions than by cognitive processes.

Research on moral behaviour's emotional components has focused largely on *empathy* and *sympathy*, called moral emotions because they are related to moral behaviours. Empathy arises from understanding another's emotional state and feeling what the other person is feeling or would be expected to feel in the given situation. In contrast, sympathy arises from feelings of concern, pity, or sorrow for another (Eisenberg, 2000). In other words, empathy involves feeling *with* the other person, whereas sympathy involves feeling *for* the other person. Along with embarrassment, the moral emotions are considered self-conscious emotions, because they require comprehension of oneself as a causal agent and an evaluation of one's own responses. Moral emotions form early in life but emerge later than primary emotions (such as happiness or anger), so they are also called *secondary emotions*.

**preconventional** Earliest level of moral development, in which self-interest determines what is moral.

**conventional** Middle stage of moral development, in which rules and the approval of others determines what is moral.

**postconventional** Highest stage of moral development, in which decisions about morality depend on abstract principles.

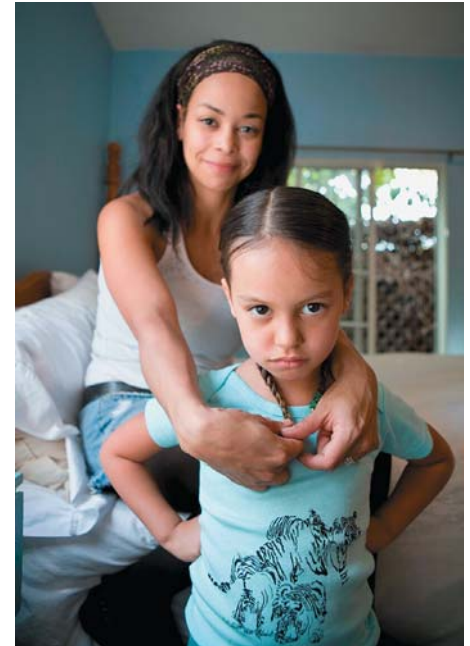
Recent research has shown that parents' behaviours influence their children's level of both moral emotions and prosocial behaviour. Parents of sympathetic children tend to have certain characteristics: They are high in sympathy, they allow their children to express negative emotions in ways that do not harm others, they do not express hostility in the home, they help their children cope with negative emotions, and they promote an understanding of and focus on others (FIGURE 11.23). In contrast, parents of children high in shame tend to show frequent anger, to be lax in discipline, and not to respond positively to the children's appropriate behaviour (Ferguson & Stegge, 1995). Thus not all children progress through the stages of moral development at the same rate or in the same order. Research has shown the value of inductive reasoning (coming to a general conclusion from specific instances; discussed in Chapter 8, "Thinking and Intelligence") with children about their behaviour. Parents' displays of inductive reasoning—as in "You made Chris cry. It's not nice to hit"—promote their children's sympathetic attitudes, appropriate feelings of guilt, and awareness of others' feelings.

**PHYSIOLOGICAL BASIS OF MORALITY** Some evidence from the biological level of analysis indicates that moral emotions are based in physiological mechanisms that help people make decisions. Antonio Damasio's somatic marker theory states that people have a visceral response (they seem to feel it in the gut or stomach) to real or imagined outcomes and that this response aids decision making. Damasio has found that patients with damage to the prefrontal cortex fail to become emotionally involved in decision making because their somatic markers are not engaged (see Chapter 9, "Motivation and Emotion"). Damasio and his colleagues (Anderson, Bechara, Damasio, Tranel, & Damasio, 1999) studied two people who had experienced prefrontal damage during infancy. Both individuals showed severe deficiencies in moral and social reasoning. When given Kohlberg's moral-dilemma task, both patients scored at the pre-conventional level. These patients also neglected social and emotional factors in their life decisions. Both failed to express empathy, remorse, or guilt for wrongdoing, and neither had particularly good parenting skills. One engaged in petty thievery, was verbally and physically threatening (once to the point of physical assault), and frequently lied for no apparent reason. Thus the frontal lobes appear to support the capacity for morality. However, children develop a sense of morality through socialization, especially from their parents.

## Language Develops in an Orderly Fashion

Communication through language allows humans to learn much more than other animals can. Language enables us to live in complex societies, because through it we learn the history, rules, and values of our culture or cultures. Through language we are able to communicate across cultures, sharing, for example, the new inventions and technologies that have shaped modern civilization. How does this remarkable ability, communication through language, develop?

As the brain develops, so does the ability to speak and form sentences. As children develop social skills, they also improve their language skills. There is some variation in the rate at which language develops, but overall the stages of language development are remarkably uniform across individuals. According to Michael Tomasello (1999)—a researcher at the Max Planck Institute, in Germany—the early social interactions between infant and caregiver are essential to understanding other people and being able to communicate with them through language. Research has demonstrated that infants and caregivers attend to objects in their environment



**FIGURE 11.23 Parental Behaviour Affects Children's Behaviour** Parents who are high in sympathy and allow their children to express negative emotions without shame or hostility tend to have sympathetic children.

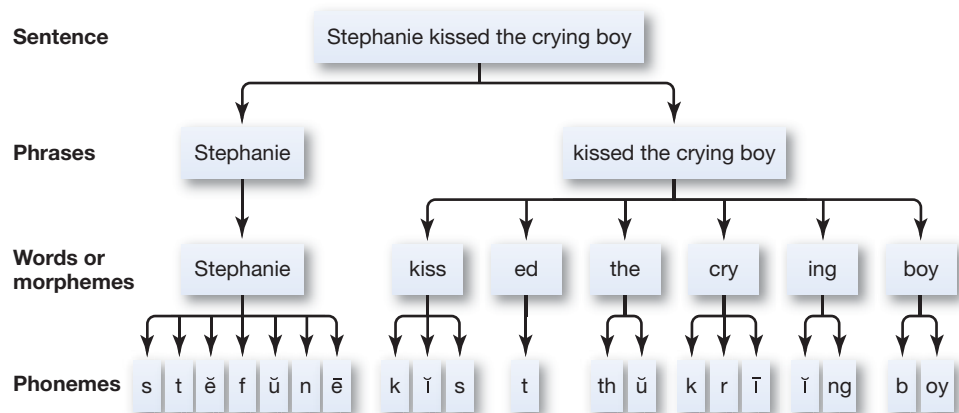
together; this joint attention facilitates learning to speak (Baldwin, 1991). However, the ability to speak can be disrupted by social isolation and lack of exposure to language, as in Genie's case (discussed at this chapter's opening).

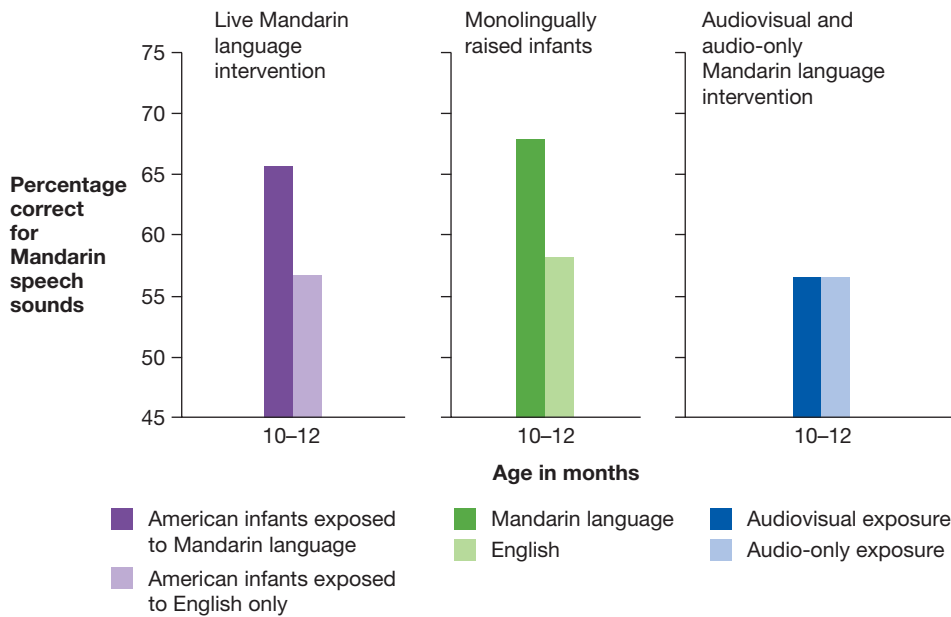
**FROM ZERO TO 60,000** Language is a system of using sounds and symbols according to grammatical rules to communicate. It can be viewed as a hierarchical structure (FIGURE 11.24), in which sentences can be broken down into smaller units, or *phrases*, which can be broken down further into words, each of which consists of *morphemes* (the smallest units that have meaning, including suffixes and prefixes), which consist of *phonemes* (basic sounds). The system of rules that govern how words are combined into phrases and how phrases are combined to make sentences is a language's *syntax*.

Research on the early language capacities of infants has shown that newborns are already well on their way to language learning (Kuhl, 2004; Werker, Gilbert, Humphrey, & Tees, 1981). The psychologist Janet Werker, at the University of British Columbia, and colleagues (Byers-Heinlein, Burns, & Werker, 2010) found that the language or languages spoken by mothers during pregnancy influenced listening preferences in Vancouver-born newborns. Newborns whose mothers spoke only English during pregnancy showed a robust preference for English sentences compared to Tagalog sentences (Tagalog is a major language of the Philippines). Newborns of mothers who spoke Tagalog and English during pregnancy paid attention to both languages, a finding that implies these newborns had sufficient bilingual exposure as fetuses to learn about each language before birth. Patricia Kuhl, at the University of Washington, and her colleagues (2006; Kuhl et al., 2006; Kuhl, Tsao, & Liu, 2003) found that up to six months of age, a baby can discriminate all the speech sounds that occur in all natural languages, even if the sounds do not occur in the language spoken in the baby's home. To study how an infant learns the speech sounds of his or her own language, the researchers used a habituation technique: An experimenter distracted the baby with a toy on one side, and speech sounds were emitted from a box on the other side—for example, *ba, ba, ba*. Then a new speech sound was introduced—for example, *la, la, la*. If the baby turned toward the new sound, the researchers determined that the baby could tell the difference between *la* and *ba*.

In one study, the researchers compared babies from Japanese-language homes to those from English-language homes (Kuhl et al., 2006). In Japanese, the /r/ and /l/ sounds are grouped into a single phonemic category, but these are separate speech sounds in English, where, for example, *rake* and *lake* mean different things. When infants were six months to eight months old, American and Japanese infants were about 65 percent correct in their ability to discriminate between the /r/ and

FIGURE 11.24 The Units of Language





**FIGURE 11.25 Mandarin Chinese Phonetic Discrimination**

American infants exposed to live Mandarin speakers correctly identified almost the same percentage of Mandarin speech sounds as infants raised hearing only Chinese. By contrast, infants who saw videos of the Mandarin speakers or heard their audiotapes performed at the same level as infants who heard only English. Live interaction is critical for learning speech sounds.

/l/ phonemes, but by the time they were ten months to twelve months old, the American infants were better able to discriminate these speech sounds and the Japanese infants were less able to do so.

In an extension of this research, Kuhl and colleagues studied whether American babies who were exposed to a foreign language would learn to discriminate the speech sounds in that language (Kuhl, Tsao, & Liu, 2003). In the four-week study, native speakers of Mandarin, in 12 sessions lasting approximately 25 minutes each, spoke only in Mandarin to nine-month-old American infants. The researchers then tested these infants on their ability to discriminate speech sounds found in Mandarin but not in English. As the first graph in **FIGURE 11.25** shows, the infants who interacted with the Mandarin speakers were much better at discriminating Mandarin speech sounds than were infants who did not. In fact, as the second graph shows, the American infants who interacted with the Mandarin speakers were almost as good at discriminating speech sounds in Mandarin as were infants raised hearing only Chinese.

The researchers further wondered whether infants who watched videos of the Mandarin speakers or listened to audiotapes of them speaking would also learn Mandarin speech sounds. As the third graph shows, neither watching the videos nor hearing the tapes enhanced the infants' ability to discriminate Mandarin speech sounds. The learning setting had to include a live interaction to work, a finding that reinforces the importance of social interactions in language learning.

From hearing differences between sounds immediately after birth and continuing to learn the sounds of their own languages, babies go on to develop the ability to speak. Humans appear to go from babbling as babies to employing a full vocabulary of about 60,000 words as adults without working very hard at it, and speech production follows a distinct path. During the first months of life, newborns' actions—crying, fussing, eating, and breathing—generate all their sounds, which are cries, gurgles, or grunts. Cooing and laughing appear at three to five months. From five to seven months, babies begin babbling, using consonants and vowels. From seven to eight months, they babble in syllables (*ba-ba-ba, dee-dee-dee*). By the first year, the syllables are mixed (*ba-dee, dah-dee*), and those babbles begin to take on the sounds and rhythms of the infant's native language. Babbling may be an infant's way of testing the system—checking what the basic parts are and how they are put together.

Language's onset is marked by the first words a baby utters and appears to understand. Babies tend to utter their first words around age one. Babies most often first utter two types of words. One type, *performatives*, consists of wordlike sounds that are learned in a context and that a baby may not be using to represent a meaning. For instance, a baby says "hello" or something that sounds like it when holding a phone. Does the baby know that *hello* is a greeting used to talk to someone on the other end of the line? Or is the baby simply imitating what it sees people do when they pick up the phone? Chances are it is the latter if the baby does not say "hello" in other appropriate settings. *True words*, in contrast, are clearly meant to represent concepts. For instance, *cat* names the family pet; *book*, a bedtime story. When babies develop single words, they often use those words to identify things present in the immediate environment. They can also refer to things physically absent, as when a baby points to the cookie jar and says "cookie." Curiously, first words tend to be the same throughout the world. Most first words identify objects (*cat, sky, nose, book*); the rest tend to be simple action words (*go, up, sit*), quantifiers (*all gone! more!*), qualities or adjectives (*hot*), socially interactive words (*bye, hello, yes, no*), and even internal states (*boo-boo* after being hurt; Pinker, 1984). Thus even very young children use words to perform a wide range of communicative functions, including naming, commenting, and requesting.

By about 18 months, children begin to put words together, and their vocabularies start to grow rapidly. Rudimentary sentences of roughly two words emerge, and these mini-sentences, though missing words and grammatical markings, have a logic, or syntax. Typically, the words' order indicates what has happened or should happen: *Throw ball. All gone* translates as *I threw the ball, and now it's gone*. The psychologist Roger Brown, often referred to as the father of child language for his pioneering research, called these utterances **telegraphic speech** because children speak as if sending a telegram—just bare-bones words put together according to conventional rules.

**telegraphic speech** The tendency for children to speak using rudimentary sentences that are missing words and grammatical markings but follow a logical syntax.

As children begin to use language in more sophisticated ways, one relatively rare but telling error they make is to overapply new grammar rules they learn. Children may start to make mistakes at ages three to five with words they used correctly at age two or three. For example, when they learn that adding *-ed* makes a verb past tense, they then add *-ed* to every verb, including irregular verbs that do not follow that rule, saying "runned" or "holded" even though they may have said "ran" or "held" at an earlier age. Similarly, they may overapply the rule to add *-s* to form a plural, saying "mouses" and "mans," even if they said "mice" and "men" at a younger age.

Although such overgeneralizations are rare (Marcus, 1996; Marcus et al., 1992), they reflect an important aspect of language acquisition. Children are not simply repeating what they have heard others say, because they most likely have not heard anyone say "runned." Instead, these errors occur because children are able to use language in a generative way. They therefore make more errors with words used less frequently (such as *drank* and *knew*) because they have heard the irregular form less often. Adults tend to do the same thing, but they will more likely make errors on the past tenses of words they do not use often, such as *trod, strove, or slew* (saying "treaded," "strived," or "slayed"; Pinker, 1994).

**ACQUIRING LANGUAGE WITH THE HANDS** If the perception and production of sound are the key neurological determinants of early language acquisition, then babies exposed to signed languages should acquire these languages in fundamentally different ways than babies acquire spoken language. If, however, what makes human language special is its highly systematic patterns and the human brain's sensitivity to them, then babies should acquire signed language and spoken language in highly similar ways. To test this hypothesis, Laura Ann Petitto and her



students at McGill University videotaped deaf babies of deaf parents in households using two entirely different signed languages: American Sign Language (ASL) and the signed language of Quebec, *langue des signes québécoise* (LSQ). They found that deaf babies exposed to signed languages from birth acquire these languages on an identical maturational timetable as hearing babies acquire spoken languages (Petitto, 2000; **FIGURE 11.26**). In demonstrating that speech does not drive all human language acquisition, this research shows that humans must possess a biologically endowed sensitivity to aspects of language patterns—a sensitivity that launches a baby into the course of acquiring language.

**UNIVERSAL GRAMMAR** Much linguistic and psycholinguistic research is aimed at understanding the detailed steps by which language is assembled, produced, and understood. The American linguist Noam Chomsky transformed the field when he argued that language must be governed by *universal grammar*, or innate knowledge of a set of universal and specifically linguistic elements and relations that form the heart of all human languages.

Until Chomsky came on the scene in the late 1950s, linguists had focused on analyzing language and identifying basic components of grammar. All languages include similar elements, such as nouns and verbs, but how those elements are arranged varies considerably across languages. In his early work, Chomsky argued that the way people combine these elements to form sentences and convey meaning is only a language's surface structure, the sound and order of words. He introduced the concept of *deep structure*: the implicit meanings of sentences. For instance, *The fat cat chased the rat* implies that there is a cat, it is fat, and it chased the rat. *The rat was chased by the fat cat* implies the same ideas even though on the surface it is a different sentence. Chomsky believed we automatically and unconsciously transform surface structure to deep structure, the meaning being conveyed. Research has shown that we remember a sentence's underlying meaning, not its surface structure. According to Chomsky, humans are born with a *language acquisition device*, which contains universal grammar, but exposure to a native language narrows down which grammatical rules a person learns. Of course, environment greatly influences a child's acquisition of language; indeed, the fact that you speak English rather than (or in addition to) Swahili is determined entirely by your environment.

The Russian psychologist Lev Vygotsky developed the first major theory that emphasized the role of social and cultural context in the development of both cognition and language. According to Vygotsky, humans are unique because they use symbols and psychological tools, such as speech, writing, maps, art, and so on, through which they create culture. Culture, in turn, dictates what people need to learn and the sorts of skills they need to develop. For example, some cultures value science and rational thinking, whereas others emphasize supernatural and mystical forces. These cultural values shape how people think about and relate to the world around them. Vygotsky distinguished between elementary mental functions, such as innate sensory experiences, and higher mental functions, such as language, perception, abstraction, and memory. As children develop, their elementary capacities are gradually transformed, primarily through culture's influence.

Central to Vygotsky's theories is the idea that social and cultural context influences language development, which in turn influences cognitive development. Children start by directing their speech toward specific communications with others, such as asking for food or for toys. As children develop, they begin directing speech toward themselves, as when they give themselves directions or talk to themselves while playing. Eventually, children internalize their words into inner speech: verbal thoughts that direct both behaviour and cognition. From this perspective, your thoughts are



**FIGURE 11.26 Acquiring Signed Language** Deaf infants have been shown to acquire signed languages at the same rates that hearing infants acquire spoken languages.



**FIGURE 11.27 Creole Languages** Creole languages evolve from a mixing of languages. In Suriname, where this boy is reading a classroom blackboard, over 10 languages are spoken. The official language, Dutch, comes from the nation's colonial background; the other tongues include variants of Chinese, Hindi, Javanese, and half a dozen original creoles, among them Sranan Tongo (literally, "Suriname tongue").

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based on the language you have acquired through your society and through your culture, and this ongoing inner speech reflects higher-order cognitive processes.

Interaction across cultures also shapes language. The term *creole* describes a language that evolves over time from the mixing of existing languages (FIGURE 11.27). A creole language may develop, for example, when a culture colonizes a place, as when the French established themselves in southern Louisiana and acquired slaves who were not native French speakers. The creole develops out of rudimentary communications, as populations that speak several languages attempt to understand each other, often mixing words from the colonists' and natives' languages into a *pidgin*, an informal creole that lacks consistent grammatical rules. The linguist Derek Bickerton (1998) has found that the colonists' children impose rules on their parents' pidgin, developing it into a creole. Bickerton argues that this is evidence for built-in, universal grammar: The brain changes a nonconforming language by applying the same basic rules to it. Bickerton also has found that creoles formed in different parts of the world, with different combinations of languages, are more similar to each other in grammatical structure than to long-lived languages.

**LEARNING TO READ** Reading, like speaking, is nearly effortless for most adults. When we look at letters, we see words and automatically derive meaning from them. But learning to read is challenging for many children, who struggle to figure out which symbols are letters, which letters clump together to make words, and which words go together to make meaningful sentences. So what is the best way to teach children to read?

There are two major schools of thought regarding how to teach reading. Traditional methods use *phonics*, which teaches an association between letters and their phonemes, or sounds. Children learn to spell out words by how they sound. Because of the complexity of the English language, in which the sounds of letters can vary across words, some educators have advocated *whole-language* approaches, which emphasize words' meanings and how words are connected in sentences. The whole-language approach has dominated in many Canadian schools for the past two decades, perhaps in part because the philosophy that guides its instruction emphasizes student interest and enjoyment of reading. But does it do a better job than phonics in helping children learn to read?

In different forms, the phonics method has been popular for over 200 years. In phonics, children learn to make the appropriate sounds for the letters of the English alphabet. They learn a small number of simple words that teach the sounds of letters for most words of the English language. Because of English's irregularities, children first learn the general rules and then learn to recognize exceptions to those general rules. This approach emphasizes memorizing the mappings between letters and their sounds rather than building vocabulary or processing words' meanings.

The general idea behind whole-language instruction is that children should learn to read the way they learn to talk. We do not process speech by breaking down the stream into phonemes; instead, we understand speech as a series of connected words that have meaning in the context of an entire sentence. Thus, according to whole-language proponents, breaking down words into sounds is unnatural, frustrating, and boring. Instead, students should learn to read naturally and unconsciously, by learning individual words and then stringing them together.

Psychological science has made tremendous contributions to understanding not only how children learn to read but also which educational practices work best for most children. A group of psychologists who are experts in reading reviewed the vast literature on how children learn to read and published a comprehensive report for educators' benefit. From this research, they found that classroom and laboratory research over the past three decades has consistently found evidence that phonics

instruction is superior to whole-language methods in creating proficient readers (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001). This result applies especially to children at risk of becoming poor readers, such as those whose parents do not read to them on a regular basis. The benefits of the whole-language approach are that it motivates students by making reading fun and encourages students to be creative and thoughtful. However, basic reading skills are best provided through phonics—and reading is not fun when children struggle to identify words.

The debate over phonics and whole-language approaches is an excellent example of how scientific research can contribute to important societal issues. The whole-language movement was a progressive philosophy that tried to foster a love of learning. Yet the science of reading is clear—phonics works best (FIGURE 11.28). By sharing their research with those who set education policy, psychological scientists are helping children be better readers.

**ANIMAL COMMUNICATION** Nonhuman animals have ways of communicating with each other, but no other animal uses language the way humans do. Scientists have tried for years to teach language to chimpanzees, one of our nearest living relatives. Chimps lack the vocal ability to speak aloud, so studies have used sign language or visual cues to determine whether they understand words or concepts such as causation. Although chimpanzees can learn some words and have some sense of causation, other research challenges the idea that this learning means they have innate language abilities. Consider the work of the psychologists Herbert Terrace, Laura Ann Petitto, and Tom Bever, who set out to test Noam Chomsky's assertion that language was a uniquely human trait by attempting to teach American Sign Language to a chimpanzee, whom they named Neam Chimpsky (nicknamed Nim; FIGURE 11.29). But after years of teaching Nim, the team admitted that Chomsky might be right.

Nim, like all other language-trained chimps, consistently failed to master key components of human language syntax. While Nim was quite adept at communicating with a small set of basic signs (“eat,” “play,” “more”), he never acquired the ability to generate creative, rule-governed sentences; he was like a broken record, talking about the same thing over and over again in the same old way. Crucially, unlike even the young child who names, comments, requests, and more with his or her first words, Nim and all the ASL-trained chimps used the language almost exclusively to make requests. In the end, the chimps could use bits and pieces of language only to obtain outcomes—to get things (food, more food) from their caretakers—rather than to express meanings, thoughts, and ideas by generating language (Petitto & Seidenberg, 1979).



**FIGURE 11.28 Phonics versus Whole-Language Approaches** Although the whole-language method of teaching children to read has been popular for over 20 years, researchers have found that phonics—popular for over 200 years—is a more effective way to create proficient readers. Here, as part of phonics instruction, children associate vowel sounds with representative words.



**FIGURE 11.29 Laura Ann Petitto with Nim Chimpsky**

## SUMMING UP

### How Do Children Learn about Their Worlds?

Children acquire information through perception. Research, drawing on the fact that young infants look longer at novel stimuli than at familiar stimuli, indicates that infants are capable of learning at very young ages. Piaget emphasized that most young children's cognitive development occurs in consistent stages, each of which builds on previous stages. Though his theory was influential, recent evidence suggests that infants understand much more about objects' physical properties than Piaget believed and that he underestimated infants' innate and early knowledge. For instance, infants can use laws of physics and even demonstrate a basic understanding of addition and subtraction. An important part of learning occurs through social interaction, as young children develop the ability for theory of mind,

a capacity that allows people to live in human society. A developing memory system helps children build a store of useful knowledge. The human capacity for language is innate, as there appear to be built-in methods of acquiring words and forming them into sentences. Although language development occurs in an orderly fashion, the specific language a child develops is influenced by environmental and cultural factors. These processes develop together to enable young children to learn and survive as they become members of society.



## MEASURING UP

1. Match each of Piaget's stages of cognitive development with its description. The stages are concrete operational, formal operational, preoperational, and sensorimotor.  
\_\_\_\_\_ a. Children can think about objects they cannot see and can play symbolically.  
\_\_\_\_\_ b. Children can think abstractly and form hypotheses.  
\_\_\_\_\_ c. Object permanence develops along with first schemas.  
\_\_\_\_\_ d. Children show evidence of logical thinking, but still cannot think about abstract concepts.
2. Indicate whether each of the following statements about language learning is true or false.
  - a. The ability to differentiate between common phonemes (speech sounds) develops around the time children begin kindergarten.
  - b. The average adult knows approximately 250,000 words.
  - c. Telegraphic speech is the use of a few words to convey meaning.
  - d. Deaf children acquire sign language much more slowly than hearing children acquire spoken language.
  - e. An infant younger than six months of age can discriminate speech sounds from only the language to which he or she is regularly exposed.

### LEARNING OBJECTIVES

Provide examples of the pervasive effects of gender roles.

Describe the research findings about the effects of divorce on children.

Explain the determinants of gender identity.

**social development** The maturation of skills or abilities that enable people to live in a world with other people.

## How Do Children and Adolescents Develop Their Identities?

As a child develops and learns more about the world, the child begins creating a sense of identity—of who he or she is. Identity formation is an important part of **social development**, the maturation of the skills and abilities that enable people to interact with others. Many factors, including gender, shape the sense of personal identity, which is further influenced by the culture in which a child is raised as well as that culture's beliefs about characteristics such as race and age.

As a child grows older and enters adolescence, the child seeks to understand how he or she fits into the world and to imagine what kind of person he or she will become later in life. Establishing a personal identity means breaking away from childhood beliefs by questioning and challenging parental and societal ideas (Erikson, 1968). Three major changes are believed to cause adolescents to question who they are: (1) changing physical appearance, which leads to changes in self-image; (2) more-sophisticated cognitive abilities, which prompt increased introspection; and (3) heightened pressure to prepare for the future—in particular, to make career choices. Teenagers explore alternative belief systems and wonder what they would be like if they were raised in other cultures, by other parents, or in other historical times. In general, adolescence is a period of struggling to answer essential questions such as *Who am I?* and *Where am I going?* The way an individual answers these questions depends on numerous factors in his or her environment.

## Social Systems Influence Development

Urie Bronfenbrenner (1995) proposed the *biocultural systems theory*, which emphasizes the way biology and cultural systems interact to affect development. According to the native Russian Bronfenbrenner, we can understand development best by considering the context in which it occurs. He theorized that four levels of systems affect the developing person. The *microsystem* is at the centre and has the most immediate effects on a child. The *microsystem* includes, for example, the family and the cultural factors in each child's classroom, which exert direct effects on the developing child (rather than schooling as a whole). An external system, the *exosystem*, includes less direct influences—such as parents' workplaces or the church the family attends—which create expectations about both behaviours and belief systems and indirectly regulate how much time and energy parents spend with their children. The *macrosystem* is the larger sociocultural context in which the child is reared (for example, being raised in an Asian culture or a South African culture). The *chronosystem* consists of the norms and rules in effect at the historical time when the child is reared. Bronfenbrenner's "system of systems" led to interdisciplinary work in child development because it hypothesized that social and historical contexts are essential to understanding how people develop. Bronfenbrenner co-founded Head Start, a massive federal program in the United States, designed to help children in low-income families develop the skills and abilities fostered by middle-class families (FIGURE 11.30). His emphasis on larger social systems translated psychological research into public policy and created a role for government in fostering positive development. Bronfenbrenner's theory emphasizes cultural effects on the way people develop their senses of identity.



**FIGURE 11.30 Head Start** A Head Start class in Billings, Montana, demonstrates a traditional Crow Indian dance.

## Friends Influence Identity and Behaviour

Developmental psychologists increasingly recognize peers' importance in shaping identity. Children, regardless of their cultures, tend to spend much of their time interacting with other children, usually playing in various ways. In helping children learn, and practice, skills that will be valuable in adulthood, play is the work of childhood and deserves the same respect we give to the demands of adult life. In developmental terms, attention to peers begins at the end of the first year of life, when infants begin to imitate other children, smile, and make vocalizations and other social signals to their peers (Brownell & Brown, 1992). Children of all ages learn how to behave from their friends, in part because for behaving appropriately they receive social rewards and for behaving inappropriately they receive social punishments. For example, children's math grades are correlated with the average math and verbal skills of the children in their peer group (Kurdek & Sinclair, 2000). Children and their peer group have similar academic motivation, but we cannot know if they select friends who are similar to them or they become similar to their friends (Crosnoe, Cavanagh, & Elder, 2003). Early friends are both playmates and teachers.

How children and adolescents compare their strengths and weaknesses with those of their peers also influences the development of identity. As part of the search for identity, teenagers form friendships with others whose values and worldviews are similar to their own. Despite wide differences in the experiences of teenagers around the world, adolescent peer groups tend to be described by a fairly small set of stereotypic names: jocks, brains, loners, druggies, nerds, and other not-so-flattering designations.

**PARENTS VERSUS PEERS** The impact of parents versus peers on young people has become a controversial topic in developmental psychology. People often describe individuals as "coming from a good home" or as having "fallen in with the wrong crowd"; these clichés reflect the importance placed on both parents and peers in

influencing an individual. Judith Rich Harris (1995) has suggested that beyond choosing where to live and what schools to send their children to, parents contribute surprisingly little to children's social development. In fact, after reviewing numerous psychological studies, Harris concluded that parents have "no important long-term effects on the development of their child's personality" (p. 458). As mentioned in Chapter 3 and discussed in greater detail in Chapter 13, once you control for shared genes, siblings raised in the same house are no more alike than strangers plucked off the street. Likewise, twin studies indicate that growing up with the same parents has only a small influence on personality.

Harris has posited that a child's peers are the most important influence when it comes to socialization. Harris's work is based largely on her *group socialization theory*, which posits that children learn two sets of behaviours, one set for inside the home and one set for outside. The behaviours and responses children learn inside the home, typically those taught by their parents early in life, are not useful in outside social contexts. According to Harris, only those behaviours learned outside the home have long-term effects on personality and on adult behavioural outcomes. Although Harris's theoretical stance has received a great deal of criticism, it has stimulated a fresh look at children's social lives and peers' important influence on children.

In contrast to Harris's theory, much research has confirmed that parents have substantial influence throughout an individual's life. Significantly, researchers have emphasized that neither the peer group nor the family can be assigned the primary role in a child's social development. Instead, the two contexts play complementary roles. B. Bradford Brown and his colleagues (1993) have argued that parents' influence can be direct or indirect. Parents not only contribute to specific individual behaviours but also affect social development indirectly by influencing the choices the child makes about what kind of crowd to join. In observations of 695 young people from childhood through adolescence, Robert Cairns and Beverly Cairns (1994) found that parents and teachers played a major role in realigning social groups so they were consistent with family norms. Thus parents and peers seem to be important in children's development.

### Parental Style Can Affect Children's Well-Being

Exactly how important are caregivers in shaping the developing child? Do parents affect their children's well-being? Most parents believe their actions profoundly affect how their children turn out and want their children to turn out well, so for their children's sake they sacrifice time, effort, and money. Although some scholars, such as Harris, believe parents' importance has been overemphasized, parenting clearly matters at the extremes, when children are celebrated or when they are abused. Genie, the girl discussed at this chapter's opening, would have turned out quite differently had her parents not abused her. But the evidence suggests that even beyond such extremes caregivers influence children's social development.

Important support for the significance of child/parent interaction comes from the New York Longitudinal Study, begun in 1956 by Stella Chess and Alexander Thomas. The study ran for six years, assessing 141 children from 85 middle- to upper-middle-class families. Chess and Thomas (1984) focused on what they considered the crucial ingredient in child/parent interaction: each child's biologically based temperament, as a combination of typical mood, activity level, and emotional reactivity. For example, general fussiness is not necessarily a signal of a child's temperament type; instead, the frequency of the fussiness as well as the intensity of the fussiness and how easily it can be controlled are better indicators. (The concept of temperament is explored more fully in Chapter 13, "Personality.")

Chess and Thomas found that the fit between the child's temperament and the parents' behaviours is most important in determining social development. For instance, most parents find it frustrating to raise a difficult child, who will tend to have negative moods and a hard time adapting to new situations. Parents who openly demonstrate their frustration with their child's behaviour or insist on exposing the child to conflict often unwittingly encourage negative behaviours. For example, if the child is extremely uneasy about entering a new setting, pushing the child can lead to behavioural problems. If the child is very distractible, forcing him or her to concentrate for long periods may lead to emotional upset. In the study, parents who responded to a difficult child calmly, firmly, patiently, and consistently tended to have the most positive outcomes. These parents tended not to engage in self-blame for their child's negative behaviours, and they managed to cope with their own frustration with and disappointment in their child. Chess and Thomas also noted that overprotectiveness can encourage a child's anxiety in response to a new situation, thereby escalating the child's distress. Ultimately, then, the best style of parenting is dynamic and flexible, takes into account the parents' personalities, the child's temperament, and the particular situation.

Other research has shown that parents have multiple influences on their children's attitudes, values, and religious beliefs. Children learn about the world in part from the attitudes expressed by their parents, such as prejudices regarding certain groups of people. Especially nurturing parents tend to raise children who experience more-social emotions, such as appropriate guilt, perhaps because the parents encourage an empathetic attitude toward others. Parents also help determine the neighbourhoods in which their children live, the schools they attend, and the extracurricular activities that provide exercise and stimulation—all of which will likely influence the child subtly and not so subtly. Thus, for example, parents who avoid or limit television, regularly go on family hikes, and participate in various sports may have children who are more physically fit than those who plunk their children down in front of the television for hours per day. Of course, nature might contribute to these differences as well: Athletic people might possess genes that promote fitness and pass them along to their children, who might respond positively to being active because they have a genetic predisposition to liking exercise and benefiting from it. As shown throughout this book, biological and environmental influences interact to produce behaviour.

### Divorce Is Difficult for Children

The rise in divorce rates since the 1960s has prompted concern about divorce's effects on children. In Canada, more than one-third of marriages end in divorce. The overall picture that emerges from research suggests that divorce is associated with numerous problems for children (**FIGURE 11.31**). Although some children—especially intelligent, socially mature, and responsible ones—cope very well with their parents' divorces, the experience can be quite difficult for many others (Hetherington, Bridges, & Insabella, 1998). Compared with children whose parents stay together, those whose parents divorce tend to do less well in school, have more conduct disorders and psychological problems, and have poor social relations and low self-esteem (Amato, 2001). Children of divorce are also more likely to get divorced as adults, a phenomenon suggesting either that divorce's negative effects continue after childhood or that parents pass on genes to their children predisposing the children to divorce (e.g., by producing particular temperaments). Either way, why is divorce associated with so many negative outcomes?

Divorce may damage a child's relationship with one or both parents, as when the parent with custody moves far away from or restricts contact with the noncustodial

## Real World PSYCHOLOGY



**FIGURE 11.31 Divorce** Divorce can be associated with numerous problems for children when it creates conflict and depression in the household. The parents in this divorced family take turns staying in the family house with their children.

## Real World PSYCHOLOGY

parent. The child then loses a potentially important source of both emotional support and guidance. But children who live in households filled with conflict might have psychological problems whether or not their parents stay together. Perhaps people who get divorced differ in important ways from those who stay married—they may be more irritable or depressed or may have difficulty coping with conflict, and these personal factors may interfere with their ability to be effective parents. Maybe all these things contribute to negative outcomes for the children of divorce. So what does research show about why divorce is harmful to children?

The past 30 years have seen a significant decline in two-parent families. Approximately 20 percent of Canadian children live with a lone parent. Although children with two parents fare best, children who lose a parent through death have fewer problems than children of divorce (Amato & Keith, 1991). Children raised by single mothers, though, share many of the problems of children of divorce (Clarke-Stewart, Vandell, McCartney, Owen, & Booth, 2000). The overall evidence indicates that the absence of a biological father is associated with a number of negative outcomes (Dunn, 2004). One study found that girls raised without fathers were much more likely to initiate early sexual activity and were much more likely to become pregnant at a young age (Ellis et al., 2003). However, having a stepfather does not resolve these problems—if anything, living with a step-parent may be associated with an increase in psychological problems (Amato & Keith, 1991). Thus two parents are not always better than one.

Why might children of divorce and children raised by single parents be at a disadvantage compared with children from two-parent homes? An alarming number of single mothers live in poverty, and many rely on assistance to provide for their children's basic needs. For mothers and their children, divorce is often associated with a significant decline in financial resources, and such economic decline predicts at least some of divorce's negative outcomes on children. Mothers threatened with poverty need to devote considerable time and energy to obtaining money, and their efforts may leave them feeling so overburdened, stressed, and hassled that they have little time or energy for parenting. When the father stays involved in the family economically and emotionally, divorce's effect is reduced considerably (Pett, Wampold, Turner, & Vaughan-Cole, 1999).

Do divorce's economic consequences make it better to stay married for the sake of the children? Just because people do not get divorced does not mean they are happily married. Frequent arguments, fighting, and even physical abuse characterize some long-term marriages. The available evidence suggests that living in a high-conflict family is associated with even greater negative outcomes than is parental divorce (Amato & Keith, 1991). If it is not divorce but living in conflict that causes problems, then children should show the negative outcomes associated with divorce well before the parents separate. Indeed, longitudinal studies offer evidence of greater behavioural and emotional problems among children whose parents later divorce compared with those whose parents stay together (Clarke-Stewart et al., 2000).

In thinking about divorce, keep in mind that data are always about group averages; even if, on average, divorce negatively affects children, many children of divorce do just fine. If your parents have divorced, you are not doomed to being divorced yourself. (Recall the critical skill, discussed above, of not confusing *some* with *all*; this skill might seem simple, but in specific contexts people can be misled by automatically applying group results to themselves or to any single person.) Since some of divorce's negative effects on children are known to result from the reduced income following divorce, feelings of abandonment and turmoil, and the parental hostility surrounding divorce, parents and others can take many actions to reduce these negative effects. Both mothers and fathers need to remain actively involved in their children's lives; parents need to learn how to reduce the turmoil that accompanies divorce by working out



arrangements in the children's best interests. On a societal level, newly divorced parents may need financial aid, and/or job training, to avoid poverty. Although divorce is never easy, parents must work together to minimize its impact on their children.

**CRITICAL THINKING SKILL**

## Recognizing and Avoiding Either/Or Thinking

The Caston brothers share unfortunate bonds (FIGURE 11.32). As boys, all three suffered neglect and abuse. Now grown, they are in prison for separate murders. Not all neglected and abused children become hardened criminals, and not all hardened criminals were neglected and abused. However, 48 percent of state prisoners report that at least one family member has spent time in prison (Johnson, 2008). How can we understand the forces that cause members of the same family to murder or commit other crimes? Is it nature or nurture that leads people into crime? This question often arises when complex psychological phenomena are discussed.

The nature/nurture question is one example of either/or thinking. Two choices are offered with the implication that one is correct, one is incorrect, and there are no other options. Either/or thinking, also called black-and-white thinking, is the tendency to see issues as falling into one of two categories, whereas complex topics almost always involve shades of grey. Either/or thinking is sometimes difficult to recognize in context. For example, a 2007 survey from a member of the U.S. Congress asked constituents if they were in favour of amnesty for aliens who were in the United States illegally or whether illegal aliens should be deported as quickly as possible. When presented with two choices, most people select the alternative that seems better and do not consider other possibilities. Every time you are presented with an either/or choice, stop to consider other possibilities to avoid being misled into automatically accepting the idea that there are only two possible options (FIGURE 11.33). Most complex problems have many possible solutions.



**FIGURE 11.32 Caston Brothers**  
All three Caston brothers (top to bottom: Jesse, Frank, and Sonny) would grow up to be convicted of separate murders.

**FIGURE 11.33**

List your thesis (A) and its opposite, or antithesis (B).	Supply at least one or two reasons <b>supporting</b> each position, provide evidence for each reason, and evaluate the strength of each piece of evidence.	Supply at least one or two reasons <b>contradicting</b> each position, provide evidence for each reason, and evaluate the strength of each piece of evidence.
↓	↓	↓
	<b>Supporting Reasons and Evidence</b>	<b>Contradicting Reasons and Evidence</b>
<b>A. Nature leads people into crime.</b>	1. <i>Strength</i> 2. <i>Strength</i>	1. <i>Strength</i> 2. <i>Strength</i>
<b>B. Nurture leads people into crime.</b>	1. <i>Strength</i> 2. <i>Strength</i>	1. <i>Strength</i> 2. <i>Strength</i>



## Gender Identity Is Determined by Biology and Cultural Norms

How would you define yourself? Which characteristics would you mention? Most people believe that gender—being female or male—is a major component of who they are. Now try to imagine yourself as the same person but a member of the opposite sex. For many of us this is hard to do. But how different are women and men? Certain physical differences are obvious, but how do women and men differ psychologically? According to evolutionary theory, sex differences ought to reflect different adaptive problems men and women have faced, and this notion is generally supported by research. However, since men and women have faced similar adaptive problems, they are similar on most dimensions.

Many differences between males and females have as much to do with socialization as with genetics. Some psychological scientists use the term *sex* to refer to biological differences and the term *gender* for differences between males and females that result from socialization. However, this distinction is not always easy to make, because the biological and psychosocial aspects of being female or male are usually so entwined that we cannot separate them. Each person is treated in certain ways based on his or her biological sex, and each person's behaviours reflect both biological components and social expectations. For example, as discussed in Chapter 3, researchers have identified some differences between the brains of men and of women, but they have not yet determined whether these differences are the result of genetics, of the way girls and boys are treated during development, or, more likely, a combination of both. Nor do we know how or if sex-related brain differences translate into thoughts and actions.

Whether you think of yourself as female or male is your **gender identity**, which shapes how you behave. Children as young as one or two years old can tell you whether they are boys or girls. Once boys and girls discover that they are boys or girls, they seek out activities that are culturally appropriate for their sex. **Gender roles** are culturally defined norms that differentiate behaviours, and attitudes, according to maleness and femaleness. In North American culture, for example, most parents and teachers discourage girls from playing too roughly and boys from crying. The separation of boys and girls into different play groups is also a powerful socializing force. **Gender schemas** are cognitive structures that influence how people perceive the behaviours of females and of males. They play powerful roles in establishing gender identity, acting as lenses through which people see the world.

The behaviours boys and girls display are determined in part by cultural rules about sex-appropriate behaviours. Men's and women's gender roles differ because of cultural influences, social expectancies, and learning. Children develop their expectations about gender through observing their parents, peers, and teachers, as well as through media. Most high-level politicians and firefighters are male, most nurses and secretaries are female, and so on. Children learn to extrapolate from these statistical facts which jobs are "appropriate" for the sexes. As mentioned in Chapter 8, for example, when young children are asked to draw a picture of a scientist, most draw a man (Chambers, 1983). In addition, children's toys often reflect stereotyping (FIGURE 11.34). The next time you visit a toy store, inventory which toys' packages depict boys and which depict girls. You will find that boys are rarely shown with baby dolls or doll houses and girls are rarely shown in contact sports gear. These messages and many others provide information for children about how they should and should not behave.

**gender identity** Personal beliefs about whether one is male or female.

**gender roles** The characteristics associated with males and females because of cultural influence or learning.

**gender schemas** Cognitive structures that influence how people perceive the behaviours of females and males.

### FIGURE 11.34 Try for Yourself: The Development of Gender Roles

Which of these toys are intended for boys and which are intended for girls?



Situational factors can also contribute to gender-specific behaviour. A study of young women talking to their boyfriends or their casual male friends on the telephone illustrates how situation can alter gender-related responses. When the women talked to their boyfriends, their voices changed to a higher pitch and became softer and more relaxed than when they talked to their male friends. The way they spoke to their boyfriends was also more babyish, feminine, and absent-minded, as rated by objective judges. When asked, the women said they knew they had spoken in two different ways and that they did so to communicate affection for their boyfriends (Montepare & Vega, 1988).

**BIOLOGICAL BASES OF SEXUAL IDENTITY** On April 27, 1966, Janet and Ron Reimer brought their seven-month-old twins, Bruce and Brian, to St. Boniface Hospital in Winnipeg for routine circumcision. Bruce was operated on first, and his penis was badly damaged in a very rare accident during this common and minor procedure. Its condition deteriorated over the next several days, and within the week it had shrivelled up and disappeared. (After what happened to Bruce, no attempt was made to circumcise Brian.) The accident and the events that followed changed not only the lives of the Reimer family but also psychologists' beliefs about the concept of gender.

As recounted in John Colapinto's book *As Nature Made Him: The Boy Who Was Raised as a Girl* (2000), Janet and Ron investigated whether Bruce should undergo sexual reassignment and be raised as a girl. Previous sexual reassignment cases had involved hermaphrodite children, who were born with ambiguous genitalia; the process had never been attempted on a child born with normal genitalia. The Reimers contacted the world-renowned (and controversial) sexologist John Money at Johns Hopkins University, and Money convinced them that sexual reassignment was the best course of action for Bruce's psychological well-being. Bruce was castrated (his testes were removed) when he was 22 months old, renamed Brenda, and raised as a girl (**FIGURE 11.35**). Throughout the 1970s and 1980s, media accounts and psychology textbooks recounted the story as demonstrating that Brenda was happy and well-adjusted and that gender was the result of socialization rather than biology. Unfortunately, Colapinto's recent analysis indicates that Brenda's sexual reassignment was a failure from the start.

Brenda's life can be described as tumultuous at best, hellish at worst. Although her parents let her hair grow long, dressed her in feminine colours and clothing styles, and encouraged her to play with other girls, by all accounts Brenda was not comfortable or happy being a girl. She was teased incessantly for her roughness and aggressiveness. Brenda grew even more uncomfortable after receiving hormones at age 11 to initiate the development of secondary sexual characteristics. The development of her breasts resulted in intense embarrassment and horror for Brenda that did not fade with time.

As the years passed, Janet and Ron were finally forced to consider that Brenda was not—nor would ever truly be—a girl. After 15 years of family and peer problems and intense psychological troubles, Brenda was told the truth about what had happened. A flood of emotions welled up within her, but the most overwhelming feeling was relief. As Brenda later recalled, "I was relieved. Suddenly it all made sense why I felt the way I did. I wasn't some sort of weirdo. I wasn't crazy."

Brenda immediately decided to return to being male. She stopped hormone therapy. She changed her name to David, which she chose because of the biblical story of David and Goliath. New surgical techniques allowed physicians to provide David



**FIGURE 11.35 Brian and Bruce Reimer** This photo shows Brian and Bruce (Brenda) Reimer as children. Only his short haircut distinguishes Brian as the boy. The fact that they were identical twins made the situation ideal for studying the effects of culture on gender identity.



**FIGURE 11.36 David (Bruce) Reimer** This photo shows David (Bruce) living as a man.

with a functional artificial penis that could be used for sexual intercourse. At age 23, he met and married a woman with three children, and for many years he lived an apparently happy family life (**FIGURE 11.36**). After a while, however, his marriage failed, and a series of financial setbacks along with the death of his twin brother led him to become despondent. David killed himself in May 2004 at age 38. Most psychologists believe the stress of being a boy raised as a girl contributed to identity problems that troubled him throughout his adult life. The lesson from David's life is that gender identity is not shaped solely by whether a person is treated as a boy or as a girl; biology has a strong effect on whether people identify as female or male. In hindsight, it seems clear that simply changing the sexuality of a child's genitals will not turn that person from a boy into a girl or vice versa, but the general ideas of the 1960s favoured environmental explanations for most differences between men and women.

### People Define Themselves in Terms of Race and Ethnicity

How individuals develop a sense of their own and others' racial and ethnic identities is an important component of social development. Researchers have studied how children learn the racial and ethnic categories prevalent in their community, identify their own race and ethnic group, and form stable attitudes toward their own and others' groups (Spencer & Markstrom-Adams, 1990).

Several studies have demonstrated that by three months of age, infants can discern racial differences in the faces of strangers (Bar-Haim, Ziv, Lamy, & Hodes, 2006). The researchers, Israelis, recorded how long young infants—Caucasian children living in Israel, Ethiopian children living in Africa, and children of Ethiopian descent living in Israel—looked at African faces and Caucasian faces. Infants generally looked longer at faces from their own race, a finding the researchers interpreted as a preference for the infants' own race. The only infants who did not show this pattern were children of Ethiopian descent who were living in Israel. These children did not seem to prefer faces of either race. The researchers theorized that this cross-race finding was caused by high levels of interracial contact during the first three months of life (**FIGURE 11.37**).

The process of identity formation in a country such as Canada, where people of so many races and ethnicities live together, is particularly complicated. Because of prejudice and discrimination and the accompanying barriers to economic opportunities, children of ethnic minorities often face challenges with regard to the development of their ethnic identities. Children entering middle childhood have acquired an awareness of their ethnic identities to the extent that they know the labels and attributes that the dominant culture applies to their ethnic groups. Many researchers believe that during middle childhood and adolescence, children in ethnic minority groups often engage in additional processes aimed at ethnic identity formation (Phinney, 1990). The factors that influence these processes vary widely among individuals and groups.

The increase in interracial relationships in Canada and many other countries means that a growing proportion of the population is racially mixed, and people increasingly identify themselves as biracial and multiracial to reflect their full racial and ethnic heritages. The golfer Tiger Woods, for example, refers to his multiracial identity as “Cablinasian,” a term he invented to reflect his mother's being Thai and his father's being a mix of African American, Caucasian, and Native American. More and more people respond to questions of racial and ethnic identity by refusing to be pigeonholed into one category.

FIGURE 11.37 **Scientific Method: Learning Racial Differences**

**Hypothesis:** Infants can discriminate racial differences in the faces of strangers.

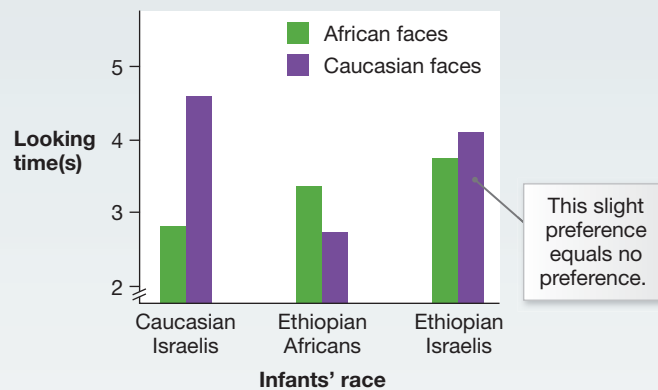
**Research Method:**

- 1 Infants were shown pictures of African and Caucasian faces.
- 2 Experimenters measured how long the infants looked at the pictures.



**Results:** Infants generally looked longer at faces of their own race. Infants of African descent who lived in predominantly Caucasian cultures did not seem to prefer either race.

**Conclusion:** Infants prefer faces of their own race, unless they have experienced high levels of interracial contact during the first three months of life.



## SUMMING UP

### How Do Children and Adolescents Develop Their Identities?

How people define themselves is influenced by cultural beliefs about factors such as race, sex, and age. Even young children classify themselves on the basis of biological sex, but how they come to understand the meaning of being a boy or a girl is largely determined through their socialization into gender roles, in which children adopt behaviours viewed as appropriate for their sex. Adolescents struggle for identity by questioning social values and personal goals, as they try to figure out who they are and what they want to become. Moral development helps people define what they value and what is important to them. Race and ethnicity shape our beliefs and attitudes regarding how we fit into the cultures in which we are raised.

## MEASURING UP

1. Choose the statement that is true about divorce.
  - a. Children of divorce probably should not get married because they are likely to get divorced.
  - b. No data show negative effects of divorce on children.
  - c. Parents should always stay together for the sake of their children.
  - d. Reduced income and, often, poverty follow divorce and may be responsible for some of the negative effects of divorce on children.

2. The case study of Bruce/Brenda Reimer shows that \_\_\_\_\_.
  - a. gender identity has a strong biological component
  - b. gender identity depends almost completely on the way a child is raised
  - c. it is fairly easy to teach children they are girls when biologically they are boys or to teach them they are boys when biologically they are girls
  - d. changing a child's name after the child has learned her or his name can cause problems with gender identity

### LEARNING OBJECTIVES

Describe Erikson's life challenges that mark adult development.

List and describe the cognitive changes that occur as we age.

## What Brings Meaning to Adulthood?

For many years, developmental psychologists focused on childhood and adolescence, as if most important aspects of development occurred by age 20. In recent decades, researchers working in a wide range of fields have demonstrated that important changes in physiology, in cognition, and in social behaviour continue throughout adulthood into old age. Therefore, many contemporary psychological scientists consider development from a lifespan perspective, trying to understand how mental activity and social relations change over the entire course of life. Such research shows that we should not equate growing old with despair. In fact, many positive things happen as we grow older. Although aging is associated with significant cognitive and physical decline, it is an important part of life and can be very meaningful. And as medical advances allow people to live longer, understanding old age becomes especially important.

One of the first researchers to take this approach was Erik Erikson, who proposed a theory of development emphasizing age-related psychological processes and their effects on social functioning across the lifespan. Erikson thought of identity development as composed of eight stages, which ranged from an infant's first year to old age (TABLE 11.1). He further conceptualized each stage as having a developmental "crisis," or development challenge to be confronted. Each challenge provides

**Table 11.1 Erikson's Stages of Identity**

STAGE	AGE	IDENTITY CHALLENGE	SUCCESSFUL RESOLUTION OF CHALLENGE
Infancy	0–2	Trust versus mistrust	Children learn that the world is safe and that people are loving and reliable.
Toddler	2–3	Autonomy versus shame and doubt	Encouraged to explore the environment, children gain feelings of independence and positive self-esteem.
Preschool	4–6	Initiative versus guilt	Children develop a sense of purpose by taking on responsibilities, but also develop the capacity to feel guilty for misdeeds.
Childhood	7–12	Industry versus inferiority	By working successfully with others, children learn to feel competent.
Adolescence	13–19	Ego identity versus role confusion	By exploring different social roles, adolescents develop a sense of identity.
Young adulthood	20s	Intimacy versus isolation	Young adults gain the ability to commit to long-term relationships.
Middle adulthood	30s to 50s	Generativity versus stagnation	Adults gain a sense that they are contributing to the future and caring for future generations.
Old age	60s and beyond	Integrity versus despair	Older adults feel a sense of satisfaction that they have lived a good life and developed wisdom.

an opportunity for psychological progress, but if progress is not made, further psychosocial development is impaired. This section focuses on the three of Erikson's stages that take place during adulthood.

The challenge in Erikson's sixth stage, *intimacy versus isolation*, involves forming and maintaining committed friendships and romantic relationships. Essentially, it involves finding someone with whom to share your life. The seventh-stage challenge, *generativity versus stagnation*, takes place during middle life. This stage involves producing or giving back to society, and it usually includes parenthood or engaging in activities, such as volunteering, that bring additional meaning to life. Erikson's last stage, *integrity versus despair*, takes place in old age. Integrity refers to a sense of honesty about oneself. In this stage, older adults reflect on their lives and respond either positively to having had a worthwhile life or with regret and sadness at what has passed. Having a good life could be defined as having intimate relations, giving back to society, and viewing one's life with a sense of integrity. Erikson's theory highlights the way people care about different things as they grow older. The following sections examine the physical, cognitive, and social changes that occur during adulthood and how they affect people's quality of life.

## Adults Are Affected by Life Transitions

For many young people, university is a magical time of life: meeting new friends, learning new ideas, having a good time—all as adolescence emerges into adulthood. People in their twenties and thirties undergo significant changes as they pursue career goals and make long-term commitments in relationships, as in getting married and raising children. All this corresponds to Erikson's idea that we face challenges as we mature through adulthood. In essence, the major challenges of adulthood reflect the need to find meaning in our lives. If life involved only getting up in the morning, working, eating, and sleeping, what would be the point? Most people seek more than that from life. They want jobs that fulfill them, and they want family members to share their lives.



**CAREER** Children commonly are asked what they want to be when they grow up. Although some university students are committed to achieving specific career goals, many others struggle to find careers they hope will be satisfying. Most people work approximately 100,000 hours in their lives, so a career plays an important role in their overall happiness. A “good job” not only provides material rewards but also brings a sense of accomplishment and purpose. The right career helps you feel that you contribute to society and that other people recognize you for doing so. It brings meaning to your life and helps you grow as a person and become better able to fulfill your life's goals. So how do you find the right job?

Selecting a career path is rarely easy. Sometimes, people who have been toiling in corporate or professional jobs have midlife crises in which they realize that their jobs fail to bring them any meaningful satisfaction. Such situations may result when people focus on making money rather than on finding the right job that will allow them to be the type of person, spouse, parent, or community member they want to be. Career counsellors often advise people to follow their passions rather than the

## Real World PSYCHOLOGY

wishes of parents or family members. You do not necessarily need a specific plan, but you must be honest with yourself: Assess your strengths and weaknesses and try to develop a general idea of the kind of career you can pursue effectively and are likely to find fulfilling. From Erikson's perspective, the desire for generativity inspires us to want to give something of ourselves to society. The right career allows us to pursue our interests and gain a sense of accomplishment while balancing family and other life goals.

**MARRIAGE** In adulthood, people devote a great deal of effort to achieving and maintaining satisfying relationships. Indeed, the vast majority of people around the world marry at some point in their lives or form some type of permanent bond with a relationship partner, although people today marry later in life and the percentage who marry is declining slowly in most industrialized countries. The search for the right partner is an important feature in contemporary Western cultures, while in many Eastern cultures parents (and other elders) decide whom their sons and daughters will marry. It is hard for many Westerners to imagine, but arranged marriages tend to be stable, and in general the people who marry this way report being quite satisfied.

As discussed in Chapter 10, marriage has many health advantages. Numerous theories account for married people's longevity, most of them focusing on the ways marital partners can support each other, such as helping each other deal with stress or assisting each other in meeting life's demands. Married people may also influence their partners' healthful behaviour by encouraging them to eat properly, to get exercise, and so on. In an international study of marriage and subjective well-being, involving more than 59,000 people from 42 countries, researchers found that marriage's effect on well-being was fairly similar in all the countries studied despite their diversity (Diener, Gohm, Suh, & Oishi, 2000). Not only were there cross-cultural similarities in response to marriage, but men and women derived approximately equal benefits from marriage (FIGURE 11.38). One small difference among

**FIGURE 11.38 Marriage across Cultures**

Notice the similarities and differences at the marriages of (a) a Sami couple in Norway, (b) an Amhara couple in Ethiopia, and (c) a Hani couple in China.



(a)



(b)



(c)



countries was the finding that the benefits of being married compared with being divorced were slightly higher in collectivistic countries, which emphasize the common good and group values rather than individual achievement. (Countries considered collectivistic in the study included China, South Korea, Nigeria, Turkey, and Brazil. Individualistic countries included Canada, the United States, Great Britain, the Netherlands, and Switzerland.)

According to national surveys, at any given time the vast majority of married people report satisfaction with their marriages. Those reporting the most satisfaction have sufficient economic resources, share decision making, and together hold the view that marriage should be a lifelong commitment (Amato, Johnson, Booth, & Rogers, 2003). Yet, as mentioned above, in contemporary Canadian society approximately one-third of all marriages end in divorce. (A slight decline in the divorce rate over the last few years may be attributable to factors such as the increasing number of adults who are not marrying and the later ages at which people are marrying.)

**HAVING CHILDREN** According to Erikson, one major way that people satisfy the challenge of generativity is through having children. The arrival of a first child is a profound event for most couples, changing their lives in almost every respect. Responding to an infant's cries and trying to figure out why the child is distressed often cause anxiety and frustration for first-time parents. But new parents also experience great joys—seeing a baby's first social smile, watching the first few tentative steps, and hearing a child say “Mommy” or “Daddy” provide powerful reinforcement for parents. Parents often become immersed in their children's lives, making sure the children have playmates, exposing them to new experiences, and trying to make them happy and healthy. Being a parent is central to many adults' self-definitions.

Many people are eager to have children, but research shows that children can strain marriages, especially when time and money are tight. A consistent finding is that couples with children, especially with adolescent children, report less marital satisfaction than those who are childless (Belsky, 1990). Although satisfaction might be lower, the marriages of those with children appear to be more stable. For many people, having children is not about happiness but about redefining their lives to reflect the value they place on family. They look forward to coaching their kids in sports, encouraging them in school, and watching them grow up, have careers, get married, and provide grandchildren. For many people, children, along with career and marriage, give life meaning.

## Aging Can Be Successful

In Western societies, people are living much longer, and the number of people over age 85 is growing dramatically. Indeed, it is becoming commonplace for people to live beyond 100. By 2030, nearly 1 in 5 North Americans will be over age 65, and these older people will be ethnically diverse, well educated, and physically fit. With this “greying” of the population in Western societies, much greater research attention has been paid to the lives of people over age 60.

Our view of the elderly is likely to change a great deal as the baby boom generation ages. Consider music stars—such as Bruce Springsteen, Geddy Lee, and the Rolling Stones—who remain popular and vibrant well into their fifties, sixties, and beyond, certainly in defiance of common stereotypes of old people (FIGURE 11.39).

However, the body and mind inevitably start deteriorating slowly at about age 50. Trivial physical changes include the greying and whitening of hair and the wrinkling of skin. Some of the most serious changes affect the brain, whose frontal



**FIGURE 11.39 Changing Views of the Elderly** All three members of Rush—Alex Lifeson (left), Geddy Lee (right), and Neil Peart (not shown)—are in their late fifties. They have been recording and touring since the early 1970s and show no sign of stopping. If they continue making music during the coming decades, will we have to revise our sense of “the elderly”?

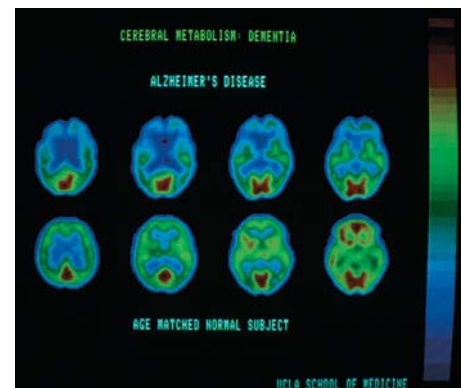
lobes shrink proportionally more than other brain regions. Although scientists once believed that cognitive problems such as confusion and memory loss were an inevitable, normal part of aging, they now recognize that most older adults remain alert as they grow older, although they do everything a bit more slowly. Older adults who experience a dramatic loss in mental ability often suffer from *dementia*, a brain condition in which thinking, memory, and behaviour deteriorate progressively. Dementia has many causes, including excessive alcohol intake and HIV, but for older adults the major causes are Alzheimer's disease and small strokes that affect the brain's blood supply. After age 70, the risk of dementia increases with each year of life. Approximately 3 percent to 5 percent of people will develop Alzheimer's disease by age 70 to 75, and then the proportion of people with the disease doubles every five years. The cause of Alzheimer's is not currently known, but evidence suggests that genes contribute to its development. One gene involved in cholesterol functioning has been shown to be predictive of Alzheimer's, although how this gene is related to the disease is not currently known (Corder et al., 1993). The initial symptoms of Alzheimer's disease are typically minor memory impairments, but the disease eventually progresses to more serious difficulties, such as forgetting daily routines. Eventually, the person loses all mental capacities, including memory and language (FIGURE 11.40).

Despite the physical, social, and emotional challenges of aging, most older adults are surprisingly healthy and happy. Indeed, some individuals thrive in old age, especially those with adequate financial resources and good health (Crosnoe & Elder, 2002). Most older adults consider themselves in good health. Moreover, older adults report being just as satisfied with life, if not more so, than younger adults (Mroczek & Kolarz, 1998). Indeed, except for dementia, older adults have fewer mental health problems, including depression, than younger adults.

According to the Stanford University psychologist Laura Carstensen's *socioemotional selectivity theory*, as people grow older they perceive time to be limited and therefore adjust their priorities to emphasize emotionally meaningful events, experiences, and goals (Carstensen, 1995; Fung & Carstensen, 2004). For instance, they may choose to spend more time with a smaller group of close friends and avoid new people. They may spend an increasing amount of time reflecting on their lives and sharing memories with family members and friends. As they reminisce about their lives, older adults report more positive than negative emotions (Pasupathi &



(a)



(b)

**FIGURE 11.40 Alzheimer's Disease** (a) A wife helps her husband, who is an Alzheimer's patient. (b) These PET scans compare the brain of an Alzheimer's patient with a healthy brain.

Carstensen, 2003). In essence, older adults want to savour their final years by putting their time and effort into meaningful and rewarding experiences.

According to Erikson, older adults find meaning by looking back and evaluating what they have done with their lives. To the extent that they consider their time well spent, older adults are satisfied and can live their final years gracefully. The crisis at this stage can be triggered by events that highlight the mortal nature of human life, such as the death of a spouse or close friend, or by changing social and occupational roles, such as retirement. Resolving such challenges allows people to come to terms with the reality of death. Although people of all ages are concerned with the meaning of life, it often becomes a preoccupation for the elderly.

## Cognition Changes during Aging

Cognitive abilities eventually decline with age, but it is difficult to pinpoint exactly what causes the decline. One of the most consistent and identifiable changes is a slowing of mental processing speed. Experiments that test the time it takes to process a sensory input and react with a motor response show an increase in response time as early as an individual's mid-twenties (Era, Jokela, & Heikkinen, 1986). This increase becomes larger as the individual ages. Some sensory-perceptual changes occur with age and may account for some of the observed decline. For instance, as we age, our sensitivity to visual contrast decreases, so activities such as climbing stairs or driving at night may become more difficult and more dangerous. Sensitivity to sound also decreases with age, especially the ability to tune out background noise. This change may make older people seem confused or forgetful when they simply are not able to hear adequately. Aging also affects memory and intelligence, as discussed below.

**MEMORY** Older people have difficulty with memory tasks that require the ability to juggle multiple pieces of information at the same time. Tasks in which attention is divided, such as driving while listening to the radio, also prove difficult. Some scientists believe these deficits reflect a decreased ability to store multiple pieces of information in working memory simultaneously (Salthouse, 1992). Consistent evidence indicates that the frontal lobes, which play an important role in working memory (see Chapter 7, "Attention and Memory"), typically shrink as people grow older, and many other cognitive skills that rely on the frontal lobes show impairment with advancing age.

Generally speaking, long-term memory is less affected by aging than is short-term or working memory, although certain aspects of long-term memory appear to suffer in advanced age. Older people often need more time to learn new information, but once they learn it, they use it as efficiently as younger people. The elderly also are better at recognition than at retrieval tasks. For example, they have no trouble recognizing words that have been shown to them if they are asked, "Did you see the word *cat*?" But if they are asked what word they saw, or whether they saw an animal name, they do not do as well. Consistent with the socioemotional selection theory is the finding that older people show better memory for positive than for negative information (Kennedy, Mather, & Carstensen, 2004), perhaps because they selectively ignore negative events (Mather & Carstensen, 2003).

Why do older adults show poor memory? Do they use less efficient strategies for encoding information to be remembered? In an intriguing study, Jessica Logan and colleagues (2002) examined the memory processes of adults in their twenties



and adults in their seventies and eighties. As expected, the older adults performed worse than the young adults. They showed less activation in left hemisphere brain areas known to support memory and greater activation in right hemisphere areas that do not aid memory. In a second study, the researchers sought to determine whether the memory deficit could be reduced if they gave the older subjects a strategy to improve memorization. As discussed in Chapter 7, the more deeply an item is encoded, the better it is remembered. Accordingly, the researchers asked older participants to classify words as concrete or abstract, a strategy that leads to deeper encoding. Undertaking this classification produced better memory and greater activation of the left frontal regions. These findings suggest that one reason for the decline in memory observed with aging is that older adults tend not to use strategies that facilitate memory, which raises the possibility that cognitive training might be useful for postponing age-related memory deficits. Another reason for declines in working memory is age-related reductions in dopamine activity in the frontal lobes. Researchers at the Karolinska Institute, in Sweden, blocked dopamine activity in younger adults and found that performance on a working memory task was similar to that found for older adults (Fischer et al., 2010).

**INTELLIGENCE** Research has indicated consistently that intelligence, as measured on standard psychometric tests, declines with advanced age. As we age, do we really lose IQ points? Or do older people just have a shorter attention span or lack the motivation to complete such tests? As discussed in Chapter 8, some researchers have distinguished between fluid intelligence and crystallized intelligence (Horn & Hofer, 1992). Many standardized tests measure fluid intelligence, the ability to process new general information that requires no specific prior knowledge (as in recognizing an analogy or arranging blocks to match a picture). Associated with speed of mental processing, fluid intelligence tends to peak in early adulthood and decline steadily as we age. Crystallized intelligence refers to more-specific knowledge, which must be learned or memorized, such as vocabulary, or knowledge of specialized information or reasoning strategies. This type of intelligence usually increases throughout life and breaks down only when declines in other cognitive abilities prevent new information from being processed.

The Seattle Longitudinal Study addressed the question of aging's effects on intelligence, tracking adults age 25 to 81 over seven years and administering tests of cognitive abilities such as verbal and mathematical skills (Schaie, 1990). The study found that intellectual decline does not occur until people are in their sixties or seventies. Further, people who were healthy and remained mentally active demonstrated less decline. Although memory and the speed of processing may decline, the continued ability to learn new information may mitigate those losses in terms of daily functioning. There has been a great deal of excitement lately about the possibility that active social engagement may help older adults maintain their cognitive abilities. For instance, older adults who have more extensive social contacts and remain active through leisure pursuits may be less susceptible to dementia and Alzheimer's disease (Fratiglioni, Paillard-Borg, & Winblad, 2004). Because life expectancies are much longer today than ever before, much more research is likely to be devoted to understanding how people can maintain their cognitive capacities to get the most out of their final years.

## **SUMMING UP**

### **What Brings Meaning to Adulthood?**

Researchers increasingly have been studying humans across the entire lifespan, from conception to old age. Adulthood requires people to meet certain challenges, such as establishing a career, getting married, and raising a family. An overriding theme that emerges from studying life transitions is that people seek meaning in their lives and that they do so increasingly as they age. Although older adults are often characterized as feeble and senile, they are for the most part healthy, alert, and vital. Indeed, one of the biggest surprises in recent research is the finding that older people are often more satisfied with their lives than are younger adults. Despite declines in memory and speed of mental processing, humans generally maintain their intelligence into very old age, especially if they engage in social and mental activities that help keep their mental skills in shape.

## **MEASURING UP**

1. Erikson proposed that certain challenges typify the passage through adulthood to old age. Which of the following statements represents these challenges?
  - a. As adults, we have the challenge of making a living and caring for our children and other family members.
  - b. Across all societies, people have to face the challenge created by a limited lifespan.
  - c. In adulthood, people face the challenge of creating and maintaining close relationships, giving back to society, and responding well to the lives they have lived.
  - d. Adults face spiritual challenges that can cause midlife crises and depression.
2. Indicate whether the following statements describe cognitive aging. Either mark the statement "CA" or leave it blank.
  - \_\_\_ a. Measures of fluid intelligence decline.
  - \_\_\_ b. Measures of crystallized intelligence decline.
  - \_\_\_ c. Working (short-term) memory declines.
  - \_\_\_ d. Declines in long-term memory are usually the earliest signs of cognitive aging.
  - \_\_\_ e. The frontal lobes of the brain shrink throughout adulthood.
  - \_\_\_ f. Speed of learning remains mostly unchanged until very old age.

## **CONCLUSION**

Throughout the journey of human development, the interacting forces of nature and nurture shape us into unique persons. At birth, we are not capable of advanced cognitive feats, but our mental processes mature as we do. As the brain develops, especially as the frontal lobes become organized, we become social creatures capable of communicating through language, but we also begin to define ourselves as individuals with specific values, morals, beliefs, hopes, and dreams.

## CHAPTER SUMMARY

### What Shapes a Child?

- **Development Starts in the Womb:** Many factors in the prenatal environment, such as nutrition and hormones, can affect development. Exposure to teratogens (e.g., drugs, alcohol, viruses) can result in death, deformity, or mental disorders.
- **Brain Development Promotes Learning:** Brain development involves both maturation and experience. The brain's plasticity allows changes in the development of connections and in the synaptic pruning of unused neural connections. The timing of experiences necessary for brain development is particularly important in the early years.
- **Attachment Promotes Survival:** The emotional bond that develops between a child and a caregiver increases the child's chances of survival. Attachment styles are generally categorized as secure, avoidant, anxious-ambivalent, and disorganized. At the biological level, the hormone oxytocin facilitates attachment.

### How Do Children Learn about Their Worlds?

- **Perception Introduces the World:** Experiments using habituation and the preferential-looking technique have revealed infants' considerable perceptual ability. Vision and hearing develop rapidly as neural circuitry develops.
- **Memory Improves over Childhood:** Infantile memory is limited by a lack of both language ability and autobiographical reference. Source amnesia is common in children. Confabulation, common in young children, may result from underdevelopment of the frontal lobes.
- **Piaget Emphasized Stages of Development:** Jean Piaget proposed that through interaction with the environment, children develop mental schemas and proceed through stages of cognitive development. In the sensorimotor stage, children experience the world through their senses and develop object permanence. In the preoperational stage, children's thinking is dominated by the appearance of objects rather than by logic. In the concrete operational stage, children learn the logic of concrete objects. In the formal operational stage, children become capable of abstract, complex thinking.
- **Infants Have Early Knowledge about the World:** Experiments using the habituation paradigm have revealed that infants innately understand some basic laws of physics and of mathematics.
- **Humans Learn from Interacting with Others:** Being able to infer another's mental state is known as theory of mind. Through socialization, children move from egocentric thinking to being able to take another's perspective.
- **Language Develops in an Orderly Fashion:** Infants can discriminate phonemes. Language proceeds from sounds to words to telegraphic speech to sentences. According to Noam Chomsky, all human languages are governed by universal grammar, an innate set of relations between linguistic elements. According to Lev Vygotsky, social interaction is the force that develops language. For language to develop, a child must be exposed to it during the sensitive period.

### How Do Children and Adolescents Develop Their Identities?

- **Social Systems Influence Development:** Urie Bronfenbrenner's biocultural theory of development recognizes four levels of context that affect development: The microsystem includes family and classroom; the exosystem includes less direct forces, such as parents' workplace norms; the macrosystem broadens to cultural aspects such as ethnicity; and the chronosystem consists of sociohistorical context.
- **Friends Influence Identity and Behaviour:** Social comparisons help shape children's development.
- **Parental Style Can Affect Children's Well-Being:** Although some psychologists believe that parents play a minimal role in their children's development, data show that parents influence many areas of their children's lives, including religiosity and how children experience emotions.
- **Divorce Is Difficult for Children:** Many children suffer adverse consequences when their parents divorce, but some children manage this life-changing event well. The reduced income following divorce likely contributes to the negative outcomes.
- **Gender Identity Is Determined by Biology and Cultural Norms:** Shaped by biology and culture, gender identity develops in children and shapes their behaviours (i.e., gender roles). Gender schemas are the cognitive constructs of gender.
- **People Define Themselves in Terms of Race and Ethnicity:** By three months of age, infants show a preference for faces of their own race, except for infants reared around large majorities of people from different races. By age four, children begin to categorize themselves and others with regard to race and ethnicity. Ethnic identity is complicated by social prejudice.

### What Brings Meaning to Adulthood?

- **Adults Are Affected by Life Transitions:** Erikson believed that people develop throughout the lifespan and theorized that each stage of life presents important social issues to be resolved. For adults, development focuses on generativity with regard to career and family. Marriage is a central issue, though in Western societies about half of contemporary marriages fail.
- **Aging Can Be Successful:** As the population in many Western societies ages, more research is being done on aging, which inevitably brings physical and mental changes. Dementia has various causes, including Alzheimer's disease. Most older adults are healthy, remain productive, and become selective about their relationships and activities.
- **Cognition Changes during Aging:** Short-term memory, particularly when attention is divided or tasks are complex, is affected by aging. Crystallized intelligence increases; fluid intelligence declines in old age as processing speed declines. Being mentally active and socially engaged preserves cognitive functioning.

## KEY TERMS

accommodation, p. 499	concrete operational stage, p. 500	formal operational stage, p. 501	preconventional, p. 506	social development, p. 514
anxious-ambivalent attachment, p. 492	conventional, p. 506	gender identity, p. 520	preoperational stage, p. 500	synaptic pruning, p. 486
assimilation, p. 499	critical periods, p. 488	gender roles, p. 520	secure attachment, p. 491	telegraphic speech, p. 510
attachment, p. 489	developmental psychology, p. 482	gender schemas, p. 520	sensitive periods, p. 488	teratogens, p. 484
avoidant attachment, p. 492	disorganized attachment, p. 492	infantile amnesia, p. 498	sensorimotor stage, p. 500	theory of mind, p. 504
		object permanence, p. 500		
		postconventional, p. 506		

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## ■ PRACTICE TEST

1. A one-week-old infant normally can \_\_\_\_\_.
  - a. differentiate between sweet and nonsweet tastes
  - b. display social smiles
  - c. grasp a caregiver's finger
  - d. make eye contact
  - e. orient toward loud sounds
  - f. recognize his or her name
  - g. roll over from stomach to back
  - h. see a caregiver across the room
  - i. turn his or her head toward the smell of the mother's breast milk
  - j. turn toward a nipple near his or her mouth
2. Which of the following statements best summarizes the key finding from Harry Harlow's study of infant rhesus monkeys?
  - a. Contact with "mothers" who provided food promoted normal cognitive development.
  - b. Contact with "mothers" who provided food promoted normal social development.
  - c. Contact with comforting "mothers" promoted normal cognitive development.
  - d. Contact with comforting "mothers" promoted normal social development.
3. A nine-month-old child watches as three cubes are covered by a panel, then as three more cubes appear to move behind the panel. Once the panel is lifted, only three cubes appear. Which of the following statements describes the infant's likely reaction?
  - a. The infant quickly will lose interest in the screen.
  - b. The infant will try to grab the three remaining cubes.
  - c. The infant will stare at the researcher's face.
  - d. The infant will stare at the three remaining cubes for a relatively long time.
4. Imagine reading a young child a story. In the story, Schuyler calls Emma a mean name. Emma retaliates by biting Schuyler. You ask the child what she thinks about the fact that Emma bit Schuyler. Three possible responses appear below. Label each as typical of one of the levels of moral reasoning described by Kohlberg: preconventional, conventional, or postconventional.
  - a. "Emma is mad."
  - b. "It is not okay to hurt people just because they hurt you."
  - c. "It is wrong to bite people. Emma is going to get a time out."
5. Indicate whether each of the following phenomena is associated with the scholarship of Chomsky or with that of Vygotsky.
  - a. culture dictating what people need to learn
  - b. culture being created through symbols
  - c. deep structure
  - d. language acquisition device
  - e. language development influencing cognitive development
  - f. social context influencing language development
  - g. surface structure
  - h. universal grammar
6. Which of the following conclusions about the relationship between parenting style and child well-being is supported by empirical research? Optimal social development occurs when \_\_\_\_\_.
  - a. parents accompany a child in the exploration of novel environments and novel situations
  - b. parents attempt to grant a child's every wish
  - c. parents determine the child's needs without input from the child
  - d. the parenting style fits the child's temperament
7. Which of the following comments violate the critical thinking skills addressed in this chapter: understanding that some does not mean all and avoiding either/or thinking? Choose all that apply.
  - a. "Alcoholism runs in my family, but that doesn't mean I'll necessarily become a problem drinker."
  - b. "I can't believe I drank a beer before I knew I was pregnant! My baby is going to suffer from fetal alcohol syndrome."
  - c. "I don't care who my kid's friends are. I've raised him to be a good boy, and they can't change who he is."
  - d. "My teen has a pretty hyper disposition, but all that caffeine he drinks isn't helping the situation."
8. Igor is 83 years old. Which of his behaviours and cognitions are consistent with the socioemotional selectivity theory?
  - a. Anticipating he will die within the next few years, he sells his house and invests his money in a start-up company.
  - b. He gets together with his friends and family to reminisce about the good old days.
  - c. He spends his days sitting on the porch feeling sorry for himself.
  - d. He travels for a few months in Bolivia, a country he has always wanted to learn more about.
  - e. He volunteers his time mentoring boys in a residential home for troubled youth.
9. Which of the following characteristics describe most older adults? Select all that apply.
  - a. happy
  - b. mentally healthy
  - c. feeling more positive emotions than negative ones
  - d. greedy
  - e. physically well
  - f. senile

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## ■ PSYCHOLOGY AND SOCIETY

1. Think back to an early memory. Write a description of the memory and share it with people who might remember the same event. How are their memories of the event similar to and different from your recollection? Then apply concepts from this chapter—such as infantile amnesia, source amnesia, confabulation, and disputed memories—to analyze why the similarities and differences exist.
2. Visit a toy store and compare toys marketed to girls with those marketed to boys. How are the toys packaged? What images appear on the packages? What words are used to describe the toys? How would children play with the toys (e.g., quiet play versus loud play; solo play versus group play)? Write an essay reflecting on the messages about gender that these toys and their packaging communicate to kids.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.







# Social Psychology

ACCORDING TO THE GENEVA CONVENTIONS, prisoners of war must be treated with respect and dignity. Even amid the horrors of war, we expect the military to behave in a civilized and professional manner. This is why the human rights violations by Canadian soldiers in Somalia and the abuses at Abu Ghraib prison, in Iraq, are so shocking to us. In Somalia in 1993, 16-year-old Shidane Arone was tortured for hours and eventually murdered after being captured in an apparent attempt to steal some Canadian military equipment. In Iraq, starting in 2004, American soldiers brutalized and humiliated Iraqi detainees, threatening them with dogs, beating them with broom handles and chairs, and forcing them to lie on top of each other naked and simulate oral sex and masturbation. When photographs of the American soldiers' actions appeared on the Internet, outrage and condemnation of the deplorable

## How Do Attitudes Guide Behaviour?

- We Form Attitudes through Experience and Socialization
- Behaviours Are Consistent with Strong Attitudes
- Discrepancies Lead to Dissonance
- Attitudes Can Be Changed through Persuasion
- Critical Thinking Skill: Making Sound Arguments

## How Do We Form Our Impressions of Others?

- Nonverbal Actions and Expressions Affect Our Impressions
- We Make Attributions about Others

- Critical Thinking Skill: Identifying and Avoiding the Actor/Observer Discrepancy
- Stereotypes Are Based on Automatic Categorization
- Stereotypes Can Lead to Prejudice
- Co-operation Can Reduce Prejudice

## How Do Others Influence Us?

- Groups Influence Individual Behaviour
- We Conform to Social Norms
- We Are Compliant
- We Are Obedient to Authority

## When Do We Harm or Help Others?

- Aggression Can Be Adaptive

- Aggression Has Social and Cultural Aspects
- Many Factors May Influence Helping Behaviour
- Some Situations Lead to Bystander Apathy

## What Determines the Quality of Relationships?

- Situational and Personal Factors Influence Friendships
- Love Is an Important Component of Romantic Relationships
- Love Is Fostered by Idealization
- Making Love Last Is Difficult



(a)



(b)



(c)

**FIGURE 12.1 When Good People Go Bad** (a) Master Corporal Clayton Matchee, here being assisted by family members as he arrives for a military hearing at Court of Queen's Bench in Saskatoon, Saskatchewan, faced charges of torturing and beating to death a Somali teenager in 1993. According to Matchee, superior officers gave him and his fellow soldiers the freedom to abuse prisoners. (b) Were soldier-guards at Abu Ghraib who harassed, threatened, and tortured prisoners just a few "bad apples," or were they normal people reacting to an extreme situation? (c) In the Stanford prison study, student-guards took on their roles with such vigor that the study was ended early because of concerns for the well-being of the "guards" and the "prisoners."

conduct were immediate. In both the Canadian and U.S. cases, government officials quickly stressed that these were isolated incidents carried out by a small group of wayward soldiers. The idea that only a few troubled individuals were responsible for humiliating, torturing, and even killing prisoners is bizarrely comforting. Somehow we are relieved to know that their deviant behaviour does not reflect on ordinary people. Surely we would not be willing to inflict such humiliation and pain on prisoners, many of whom were just teenagers and young men rounded up for questioning. Or would we?

Would you beat up or humiliate someone simply because you were ordered to do so or were in a situation where others were doing so? Or would you defy authority or resist peer pressure? We do not know to what extent the soldiers in Somalia and Iraq were following orders, but even if we did know, how would we explain their willingness to perform those actions? Events such as these are not limited to a particular country or time and, sadly, are not as uncommon as we might hope. They challenge many commonsense notions about human nature and force us to consider questions about the dark side of humanity. People beat, rape, torture, and murder others. What is wrong with these people? What explains the violent side of human nature?

According to social psychologists, nothing typically is wrong with people such as the soldiers in Somalia and the guards at Abu Ghraib. Rather, they probably are normal people caught up in overwhelming situations that shape their actions. Social psychologists point out a number of situational factors that likely influenced the guards' behaviour at Abu Ghraib, such as the absence of any real authority in the prison and therefore a weakening of responsibility. Moreover, social psychologists know that people typically are obedient to authority, especially in times of war. Also, the working conditions promoted aggression: One of the Abu Ghraib units had expected to be in Iraq a short time, working in traffic control; instead, they found themselves in an overcrowded prison, where they worked long hours, six or seven days a week, in extremely hot temperatures while under frequent mortar attack. Finally, during wartime, people are especially likely to view the world as consisting of "us" and "them." Members of the enemy group are viewed as being all the same and are treated in a dehumanized fashion, often portrayed as not just inferior but evil. All of these factors contributed to the mistreatment of prisoners at Abu Ghraib.

In a classic study that illuminates the forces at work in situations like Abu Ghraib, the psychologists Philip Zimbardo and Chris Haney had male Stanford undergraduates play the roles of prisoners and guards in a mock prison (Haney, Banks, & Zimbardo, 1973). The students, who had all been screened and found to be psychologically stable, were randomly assigned to their roles. What happened was unexpected and shocking. Within days, the guards became brutal and sadistic. They constantly harassed the prisoners, forcing them to engage in meaningless and tedious tasks and exercises. Although the study was scheduled to last two weeks, it became necessary to stop it after only six days. The Stanford prison study demonstrated the speed at which apparently normal university students could be transformed into the social roles they were playing. Similarly, the guards at Abu Ghraib believed it was their job to "soften up" the prisoners for interrogation, and their actions were strikingly similar to those of the Stanford participants (FIGURE 12.1).

When people act brutally and sadistically, we assume they are brutal and sadistic. We neglect to consider the situation in which they have acted brutally and sadistically and to assess how much power it had in shaping their behaviour. This is not to suggest that individual traits are unimportant or that people are not responsible for their behaviour; however, many behaviours become more understandable within particular contexts.

Humans are social animals who live in a highly complex world. At any moment, hundreds of millions of people are talking with friends, forming impressions of strangers, arguing with family members, even falling in love with potential mates. Our

regular interactions with others—even imagined others—shape who we are and how we understand the world. Social psychology is concerned with how people influence other people's thoughts, feelings, and actions. Because almost every human activity has a social dimension, research in social psychology covers expansive and varied territory: how we perceive ourselves and others, how we function in groups, why we hurt or help people, why we fall in love, why we stigmatize and discriminate against certain people. In this chapter, you will learn the basic principles of how people interact with each other. You will see that research in social psychology provides insights into situations such as Abu Ghraib, revealing to us not that humans are inherently flawed or evil but rather that social context is powerful.

## How Do Attitudes Guide Behaviour?

How do you feel about the Abu Ghraib prisoner abuse scandal? You quite likely had feelings, opinions, and beliefs about it before you started reading this chapter, just as you have feelings, opinions, and beliefs about yourself, your friends, your favourite television program, and so on. These feelings, opinions, and beliefs are called attitudes. The concept of **attitudes**—our evaluations of objects, of events, or of ideas—is central to social psychology. Attitudes are shaped by social context and play an important role in how we evaluate and interact with other people. We have attitudes about all sorts of things, from trivial and mundane matters such as which deodorant works best to grand issues such as politics, morals, and religion—that is, the core beliefs and values that define who we are as human beings. Some of these attitudes we are aware of, whereas others we do not even know we hold. Some attitudes are complex and involve multiple components. You might enjoy eating ice cream but believe it is bad for your health. You might be disgusted with the Abu Ghraib prisoner abuse but have pity for the U.S. soldiers caught up in the horrific situation. This section considers how attitudes affect our daily lives.

### We Form Attitudes through Experience and Socialization

Direct experience of or exposure to things provides information that shapes attitudes. As we encounter new objects, we explore them and learn about them. In general, people develop negative attitudes about new objects more quickly than they develop positive attitudes (Fazio, Eisner, & Shook, 2004).

We talk about acquiring a taste for foods that we did not like originally, such as coffee or sushi, but how do we come to like something that we could not stand the first time we were exposed to it? Typically, the more a person is exposed to something, the more he or she tends to like it. In a classic set of studies, the Polish-born American psychologist Robert Zajonc (1968, 2001) exposed people to unfamiliar items a few times or many times. Greater exposure to the item, and therefore greater familiarity with it, caused people to have more positive attitudes about the item; this process is known as the *mere exposure effect*. For example, when people are presented with normal and reversed photographs of themselves, they tend to prefer the reversed images, which correspond to what they see when they look in the mirror (FIGURE 12.2). Their friends and family members prefer the true photographs, which correspond to how they view the people.

Attitudes can be conditioned (on conditioning, see Chapter 6, “Learning”). Advertisers often use classical conditioning: When we see an attractive celebrity paired with a product, we develop more-positive attitudes about the product. After conditioning, a formerly neutral stimulus, such as a deodorant, triggers the same attitude response as the paired object, such as Brad Pitt (if Brad Pitt were to endorse a deodorant).



#### LEARNING OBJECTIVES

Identify the processes by which attitudes are formed and changed.

Recognize situations in which people will most likely behave in ways consistent with their attitudes.

**attitudes** The evaluation of objects, events, or ideas.



**FIGURE 12.2 The Mere Exposure Effect** If he is like most people, Canadian prime minister Stephen Harper will prefer (**right**) his mirror image, with which he is more familiar, to (**left**) his photographic image.

Operant conditioning also shapes attitudes: If you are rewarded with good grades each time you study, you will develop a more positive attitude toward studying.

Attitudes are also shaped through socialization. Caregivers, media, teachers, religious leaders, and politicians guide our attitudes about many things, including what kinds of music we should like, how we should feel about people who behave in certain ways, and how we should treat the environment. Society socializes many of our basic attitudes, including which things are edible. For instance, many Hindus do not eat beef, whereas many Jews do not eat pork. Would you eat a worm? Most Westerners would find it disgusting. But in some cultures worms are a delicacy.

## Behaviours Are Consistent with Strong Attitudes

To the extent that attitudes are adaptive, they should guide behaviour. In general, the stronger and more personally relevant the attitude, the more likely it will predict behaviour, be consistent over time, and be resistant to change. For instance, someone who grew up in a strongly Conservative household, especially one where derogatory comments about Liberals were expressed frequently, will more likely vote Conservative than someone who grew up in a more politically neutral environment. Moreover, the more specific the attitude, the more predictive it is. For instance, your attitudes toward recycling are more predictive of whether you take your pop cans to a recycling bin than are your general environmental beliefs. Attitudes formed through direct experience also tend to predict behaviour better. No matter what kind of parent you think you will be, for example, once you have seen one child through toddlerhood, you will have formed very strong attitudes about child-rearing techniques, and these attitudes will predict how you approach the early months and years of your second child.

The ease with which a person can retrieve memories related to an attitude—*attitude accessibility*—predicts behaviour consistent with the attitude. The American researcher Russell Fazio (1995) has shown that easily activated attitudes are more stable, predictive of behaviour, and resistant to change. Thus the more quickly you recall that you like your psychology course, the more likely you will attend lectures and read the textbook.

Attitudes can be *explicit* or *implicit*. **Explicit attitudes** are those you know about and can report to other people. If you say you like bowling, you are stating your explicit attitude toward it. Anthony Greenwald and Mahzarin Banaji (1995) have noted that our many **implicit attitudes** influence our feelings and behaviours at an unconscious level. We access implicit attitudes from memory quickly, with little conscious effort or control. Just as implicit memory (see Chapter 7, “Attention and Memory”) allows us to perform actions, such as riding a bicycle, without thinking through all the required steps, so implicit attitudes shape behaviour without our awareness. For instance, you might purchase a product endorsed by a celebrity even though you have no conscious memory of having seen the celebrity use the product. (Maybe Brad Pitt *has* endorsed a deodorant?) Some evidence suggests that implicit attitudes involve brain regions associated with implicit memory in general (M. D. Lieberman, 2000). Also as with implicit memory, researchers assess implicit attitudes through indirect means, such as through behaviours rather than through self-reports.

One method researchers use to assess implicit attitudes is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998), a reaction time test that can identify implicit attitudes. The IAT measures how quickly we associate concepts or objects with positive or negative words (FIGURE 12.3). Responding more quickly to the association of *female = bad* than *female = good* indicates your implicit attitude about females. Implicit attitudes are also revealed in people’s behaviours. Under particular circumstances, for example, even people who claim to harbour

**explicit attitudes** Attitudes that people can report.

**implicit attitudes** Attitudes that influence our feelings and behaviour at an unconscious level.

### FIGURE 12.3 Try for Yourself: Implicit Association Test

On the website for Project Implicit® (<https://implicit.harvard.edu/implicit/langchoice/canada.html>), you can try your hand at various association tests on topics such as age, race, and gender.

After answering questions or responding to certain words and images, you will receive your results and information about the preferences of others.



no racist beliefs might respond differently to people of other races than to people of their own race (say, if a person of one race is in a situation where the majority of people are of a different race). Indeed, a recent meta-analysis of more than 100 studies found that, in socially sensitive situations in which people might not want to admit their real attitudes, the IAT is a better predictor of behaviour than are explicit self-reports (Greenwald, Poehlman, Uhlmann, & Banaji, 2009). For example, researchers from the University of Padua, in Italy, and the University of Western Ontario have shown that people's implicit attitudes can reliably predict their future choices for a political candidate, even when those same people explicitly state that they are undecided (Galdi, Arcuri, & Gawronski, 2008).

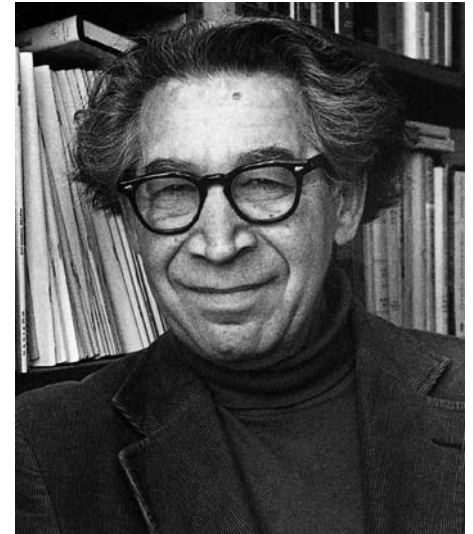
## Discrepancies Lead to Dissonance

Most people expect attitudes to guide behaviour. We expect people to vote for candidates they like and to avoid eating foods they do not like. In 1957, the American social psychologist Leon Festinger, studying how people resolved situations in which they held conflicting attitudes, proposed an elegant theory that was to become one of the most important catalysts of research in experimental social psychology (FIGURE 12.4). He proposed that **cognitive dissonance** occurs when there is a contradiction between two attitudes or between an attitude and a behaviour. For example, people experience cognitive dissonance when they smoke even though they know that smoking might kill them. A basic assumption of dissonance theory is that dissonance causes anxiety and tension and therefore motivates people to reduce the dissonance and relieve displeasure. Generally, people reduce dissonance by changing their attitudes or behaviours; they sometimes also rationalize or trivialize the discrepancies.

Dissonance theory provides important insights into many perplexing behaviours. Consider the American soldiers who served as prison guards at Abu Ghraib. Their treatment of prisoners likely was dissonant from their views on how people generally should be treated. In such poorly run, overcrowded wartime prisons, guards commonly develop extremely negative attitudes about their prisoners, even viewing them as subhuman. Although this might resolve dissonance for the guards, it encourages mistreatment of the prisoners. The following sections examine how dissonance affects attitudes and behaviour.

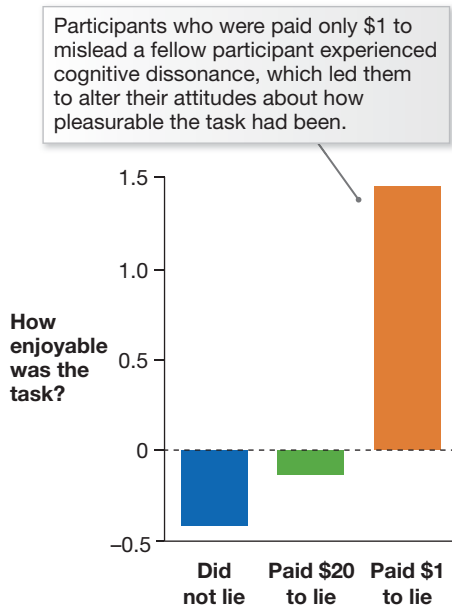
**POSTDECISIONAL DISSONANCE** According to cognitive dissonance theory, holding positive attitudes about two options but having to choose one of them causes dissonance. For example, a person might have trouble deciding which university to attend. The person might narrow the choice to two or three alternatives and then have to choose. *Postdecisional dissonance* then motivates the person to focus on one school's—the chosen school's—positive aspects and the other schools' negative aspects. Similarly, a person leaning toward buying a truck rather than a car might suddenly think of many reasons for owning a truck rather than a car, whereas a person buying a car might do just the opposite. This effect occurs automatically, with minimal cognitive processing, and apparently without awareness. Indeed, even patients with long-term memory loss may show postdecisional effects for past choices, even if the patients do not consciously recall the outcomes of those choices (Lieberman, Ochsner, Gilbert, & Schacter, 2001).

**ATTITUDE CHANGE** In one of the original dissonance studies (Festinger & Carlsmith, 1959), each participant performed an extremely boring task for an hour. The experimenter then paid the participant \$1 or \$20 to lie and tell the next participant that the task was really interesting, educational, and worthwhile. Nearly all the participants subsequently provided the false information. Later, under the guise



**FIGURE 12.4 Leon Festinger** Festinger developed the influential theory of cognitive dissonance.

**cognitive dissonance** An uncomfortable mental state due to conflicts between attitudes or between attitudes and behaviour.



**FIGURE 12.5 Cognitive Dissonances** In Festinger's dissonance study, participants performed an extremely boring task and then reported to other participants how enjoyable it was. Some participants were paid \$20 to lie, and some were paid \$1.



**FIGURE 12.6 Justifying Effort** In 2005, in response to revelations that a majority of members of McGill's football team hazed a rookie player on their team by sexually assaulting him with a broomstick, the university cancelled the remainder of the team's season. Such hazing rituals can have the paradoxical effect of increasing one's identification with a group when a member rationalizes his or her hazing as evidence that he or she really wants to belong to the group.

**persuasion** The active and conscious effort to change attitudes through the transmission of a message.

of a different survey, the same participants were asked how worthwhile and enjoyable the task had actually been. You might think that those paid \$20 remembered the task as more enjoyable, but just the opposite happened. Participants who had been paid \$1 rated the task much more favourably than those who had been paid \$20. According to the researchers, this effect occurred because those paid \$1 had insufficient monetary justification for lying. Therefore, to justify why they went along with the lie, they changed their attitudes about performing the dull experimental task. Those paid \$20 had plenty of justification for lying, since \$20 was a large amount of money in 1959 (roughly equivalent to \$140 today), so they did not experience dissonance and did not have to change their attitudes about the task (**FIGURE 12.5**). As this research shows, one way to get people to change their attitudes is to change their behaviours first, using as few incentives as possible. As discussed in Chapter 9, for example, giving children rewards for drawing creatively with coloured pens undermines how much they subsequently use the pens.

**JUSTIFYING EFFORT** If people's attitudes can be changed so easily by changes in their behaviour, what effect might extreme group-related behaviours, such as initiation rites, have on members' attitudes about the groups? On university campuses, administrators impose rules and penalties to discourage hazing, yet fraternities, sororities, and sports teams have continued to do it. They do not simply select new members and let them in without initiation because requiring people to undergo embarrassing or difficult rites of passage makes membership in the group seem much more valuable and makes the group more cohesive. To test these ideas, the American researchers Elliot Aronson and Judson Mills (1959) required women to undergo a test to see if they qualified to take part in a research study. One group of women had to read a list of obscene words and sexually explicit passages in front of the male experimenter, whereas a control group read a list of milder words (such as *prostitute*). Both groups then listened to a boring and technical presentation about mating rituals in lower animals. Women who read the embarrassing words reported that the presentation was much more interesting, stimulating, and important than did the women who read the milder words.

As this research shows, when people put themselves through pain, embarrassment, or discomfort to join a group, they experience a great deal of dissonance. After all, they typically would not choose to be in pain, embarrassed, or uncomfortable. Yet they made such a choice. They resolve the dissonance by inflating the importance of the group and their commitment to it. This justification of effort helps explain why people are willing to subject themselves to humiliating experiences such as hazing (**FIGURE 12.6**). More tragically, it may help explain why people who give up connections to families and friends to join cults or to follow enigmatic leaders are willing to die rather than leave the groups. If they have sacrificed so much to join a group, people believe, the group must be extraordinarily important.

## Attitudes Can Be Changed through Persuasion

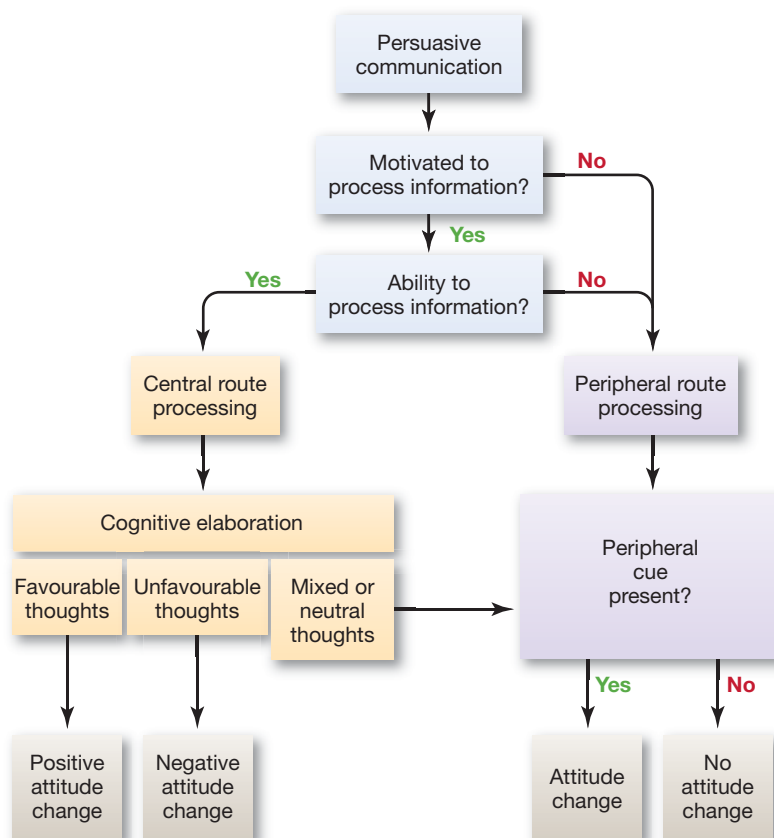
A number of forces other than dissonance can conspire to change attitudes. We are bombarded by television advertisements; lectures from parents, teachers, and physicians; public service announcements; politicians appealing for our votes; and so on. **Persuasion** is the active and conscious effort to change attitudes through the transmission of a message. The earliest scientific work on persuasion was conducted by Carl Hovland and his colleagues (1953), who emphasized that persuasion is most likely to occur when people pay attention to a message, understand it, and find it convincing; in addition, the message must be memorable, so its impact lasts over time.

Researchers have noted that persuasion leads to attitude change in two fundamental ways (FIGURE 12.7). According to Richard Petty and John Cacioppo's **elaboration likelihood model** (1986), persuasion works via two routes: The *central route*—in which people pay attention to arguments, consider all the information, and use rational cognitive processes—leads to strong attitudes that last over time and are resistant to change. The *peripheral route*—in which people minimally process the message—leads to more-impulsive action, as when a person decides to purchase a product because a celebrity has endorsed it.

The cues that influence a message's persuasiveness include the *source* (who delivers the message), the *content* (what the message says), and the *receiver* (who processes the message). Sources who are both attractive and credible are the most persuasive. Thus television ads for medicines and medical services often feature very attractive people playing the roles of physicians. The message is effective because of peripheral processing. Even better, of course, is when a drug company ad uses a spokesperson who is both attractive *and* an actual doctor. Credibility and persuasiveness may also be heightened when the receiver perceives the source as similar to himself or herself.

Of course, the arguments in the message are also important for persuasion. Strong arguments that appeal to our emotions are the most persuasive. Advertisers also use the mere exposure effect, repeating the message over and over in the hope that multiple exposures will lead to increased persuasiveness. For this reason, politicians often make the same statements over and over during campaigns. Those who want to persuade (including, of course, politicians) also have to decide whether to deliver one-sided arguments or to consider both sides of particular issues. One-sided arguments work best when the audience is on the speaker's side or is gullible. With a more skeptical crowd, speakers who acknowledge both sides but argue that one is superior tend to be more persuasive than those who completely ignore the opposing view.

**elaboration likelihood model** A theory of how persuasive messages lead to attitude changes.



**FIGURE 12.7 The Elaboration Likelihood Model** When people are motivated to consider information carefully, they process it via the central route, and their attitude changes reflect cognitive elaboration (left). When they are not motivated, they process information via the peripheral route, and their attitude changes reflect the presence or absence of shallow peripheral cues (right).

## Making Sound Arguments

In everyday language, the word *argument* refers to a dispute between people. In terms of *rhetoric*—the art of speaking or writing as a means of communication or persuasion—it has a somewhat different and more precise meaning: An argument consists of one or more statements, called reasons or premises, used to support a conclusion (i.e., to persuade the reader or listener that the conclusion is true or probably true). Such arguments appear in much of the information we consume, from blog entries to this textbook. An argument may include a qualifier, a constraint or restriction on the conditions under which the conclusion is supported. It may also include a counter-argument, or reasons that run counter to the conclusion: A person strengthens his or her argument by acknowledging alternative opinions, showing that various points of view have been taken into account in reaching the argument's conclusion.

Because an argument must have a conclusion and reasons—though not necessarily in that order—a statement such as

*Psychology is my favourite subject.*

is not an argument; it is just a simple statement about a preference. However,

*Get plenty of exercise because it helps relieve stress.*

is a simple argument, with one conclusion (*Get plenty of exercise*) and one reason that supports the conclusion (*because it helps relieve stress*). The argument

*Young children love to learn from books, so you should develop the habit of reading to your young child every day, even if you are feeling tired from work or family life.*

has a conclusion (*develop the habit of reading to your young child every day*), a reason (*Young children love to learn from books*), and a counter-argument (*even if you are feeling tired from work or family life*). Being tired is a reason for not reading to young children, but it is mentioned in a way that makes it seem like a weak counter-argument. The qualifier (*Young children*) specifies the condition under which the conclusion is valid.

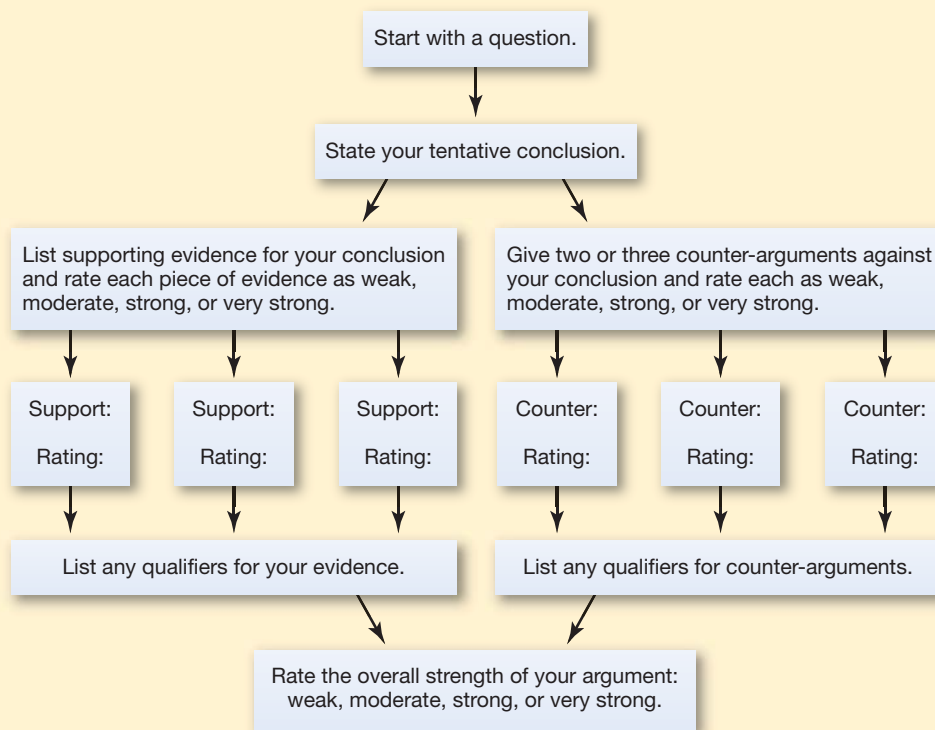
Making sound arguments is an essential critical thinking skill. If you develop the habit of systematically listing reasons and counter-reasons; weighing each reason as weak, moderate, or strong; and listing qualifiers, you will have greater confidence in the conclusions you come to, and you will be more persuasive in getting people to agree with your conclusions.

Suppose you wanted to address the relationship between media and violence (see the discussions in Chapter 6, “Learning”). Specifically, you want to argue that playing violent video games increases people's aggressiveness. You would first gather reasons supporting that conclusion, and then gather counter-reasons against that same conclusion. Some reasons, for and against, would be stronger than others. For example, one piece of evidence supporting the conclusion might be a large and well-controlled study that found teenage boys who played violent video games will more likely push people after playing these games. In contrast, if you and your friends spend hours every week playing violent video games, and all of you are not aggressive, you could list this “finding” as a reason that runs counter to the conclusion.



The results from the study would provide strong support for the conclusion, however, while your personal experience would be weak (because anecdotal) evidence against the conclusion. (On the weakness of anecdotal evidence, see the discussion of ESP in Chapter 5, “Sensation and Perception.”)

When making your own arguments or analyzing arguments presented to you, you must consider the strengths of both the reasons supporting the conclusion and those running counter to the conclusion. You need to combine this information to determine if the overall support for the conclusion is strong, medium, weak, or nonexistent. To assess the argument’s overall strength, you also need to take into account everything you know about good research and about critical thinking. Assessing arguments in this way is not about making everyone think the same; rather, it is about focusing on important information and becoming a better thinker (FIGURE 12.8).



**FIGURE 12.8 Think Critically: Argument Template**

SOURCE: Revised from Halpern, 2003.



## SUMMING UP

### How Do Attitudes Guide Behaviour?

Attitudes are evaluations of objects, of events, or of ideas. They are formed through socialization and direct experience and best predict behaviour when they are strong and easily accessible. Discrepancies between attitudes, or between attitudes and behaviour, lead to cognitive dissonance. Dissonance theory can be used to explain a wide range of human behaviour. Attitudes can be changed through persuasion centrally, when people think carefully about the issues, or peripherally, when they process the message to a much smaller extent.

## MEASURING UP

1. Identify the attitude formation(s) or change process(es) described in each of the following examples. Choose from cognitive dissonance, conditioning, mere exposure effect, persuasion, and socialization.
  - a. Miwa returns home from her first day of kindergarten. She tells her parents, "I don't like my teacher." A few weeks later, her parents hear Miwa talking about how much she likes her teacher.
  - b. Arnie always wears his seat belt, because his parents taught him to when he was a child.
  - c. Given the choice between a Coke or a Pepsi, Manish chooses a Coke. Later that night, he watches his favourite TV show and realizes that Coca-Cola is one of its sponsors.
  - d. Sam proclaims her love of coffee to her date. Later, the couple goes to a café. Although Sam is really craving an Italian soda, she orders a coffee.
2. For each of the following scenarios, indicate whether the attitude is likely to predict the subsequent behaviour. In a few words, explain why or why not.
  - a. Badu somewhat agrees that it is important to vote. Later, a friend asks Badu if he would like to go to the polling place with him.
  - b. When asked how she feels about eating fast food, Brooke immediately looks disgusted and proclaims, "Ick!" Later, a friend asks her to grab lunch at a popular fast food joint.
  - c. Zane writes a blog entry advocating fair treatment for all people. Later, a friend asks Zane to attend a protest supporting an increase in the wages earned by migrant farm workers.

### LEARNING OBJECTIVES

Differentiate among stereotypes, prejudice, and discrimination.

Anticipate attributional biases likely to emerge in social situations.

## How Do We Form Our Impressions of Others?

Social psychologists study attitudes because attitudes influence so many of our actions. As you might expect, the attitudes we hold about others are especially interesting to social psychologists. In addition to holding attitudes about other people, we also try to predict how people will act and try to understand why they act the way they do. Over the course of human evolution, one fact has remained constant: As social animals, we live in groups. Groups provide security from predators and from competing groups, mating opportunities, and assistance in hunting food and gathering it. At the same time, members within a group may compete for food and for mates. Mechanisms have therefore evolved for distinguishing members of one's own group from members of other groups, as well as for detecting dangers from within the group, such as deception, coercion, and infidelity. We constantly are required to make social judgments, assessing whether people are friends or foes, potential mates or potential challengers, honest or dishonest, trustworthy or unreliable, and so on. We also automatically classify people into social categories, and doing so can have major implications for how we treat them.

### Nonverbal Actions and Expressions Affect Our Impressions

Over the years, social psychology has confirmed the importance of first impressions on long-term evaluations of people. Suppose someone is walking toward you. You make a number of quick judgments, such as whether you know the person, whether the person poses danger, and whether you want to know the person better. How you initially feel about that person will be determined mostly by nonverbal behaviours. Facial expressions, gestures, walking style, and fidgeting are all

## Real World PSYCHOLOGY

examples of **nonverbal behaviour**, sometimes referred to as *body language* (FIGURE 12.9). Many factors influence impression formation, ranging from the observer's expectations and attitudes to what the observed person says, as well as his or her nonverbal gestures and physical appearance.

**FACIAL EXPRESSIONS** The first thing we notice about another person is usually the face. When human babies are less than an hour old, they prefer to look at and will track a picture of a human face rather than a blank outline of a head (Morton & Johnson, 1991). The face communicates a great deal, such as emotional state, interest, and distrust. People use their eyes, for example, to indicate anger, to flirt, to catch the attention of a passing waiter, and so on. Eye contact is important in social situations, though how we perceive it depends on our culture. People from Western cultures tend to seek eye contact when they speak to someone. If the other person does not meet their eyes, they might assume, perhaps incorrectly, that the person is embarrassed, ashamed, or lying, whereas they tend to view a person who looks them in the eyes as truthful and friendly. For this reason, people wearing sunglasses are often described as cold and aloof, and police officers sometimes wear sunglasses partly to seem intimidating. In other groups, such as certain Native American tribes, making direct eye contact, especially with the elderly, is considered disrespectful.

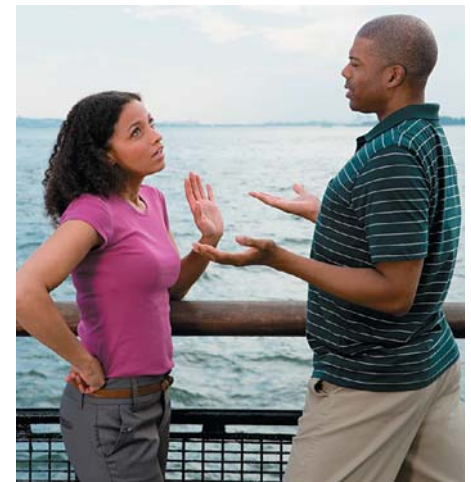
**BODY LANGUAGE** How much can be learned from nonverbal behaviour? The psychologists Nalini Ambady, an Indian native, and Robert Rosenthal, an American, have found that people can make accurate judgments based on only a few seconds of observation, what they refer to as *thin slices of behaviour*. For instance, videotapes of judges giving instructions to juries reveal that judges' nonverbal actions can predict whether juries find defendants guilty or not guilty. Judges, perhaps unconsciously, may indicate their beliefs about guilt or innocence through facial expressions, tone of voice, and physical gestures. In one study, participants viewed soundless 30-second film clips of university instructors lecturing. Based solely on nonverbal behaviours, the participants' ratings corresponded very highly to the ratings given by the instructor's students (Ambady & Rosenthal, 1993).

One important nonverbal cue is how people walk, known as *gait*. Gait provides information about affective state. People with a bounce in their step, who walk along swinging their arms, are seen as happy. By contrast, people who scurry along, taking short steps while stooped over, are perceived as hostile, while those taking long strides with heavy steps are perceived to be angry. In an intriguing study, researchers found that participants accurately judged sexual orientation at a better-than-chance rate after watching a 10-second silent video or a dynamic figural outline of someone walking or gesturing (Ambady, Hallahan, & Conner, 1999; FIGURE 12.10). What aspects of behaviour gave cues to sexual orientation? According to recent research, the extent to which body shape and body motion differed from those of the typical male or female was the primary cue used by perceivers (Johnson, Gill, Reichman, & Tassinari, 2007). Such thin slices of behaviour are powerful cues for impression formation.

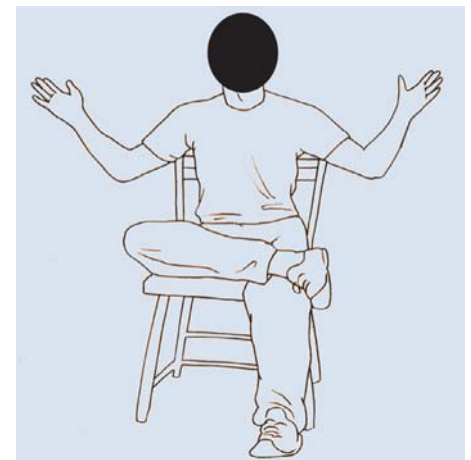
## We Make Attributions about Others

We constantly try to explain other people's motives, traits, and preferences. Why did she say that? Why is he crying? Why does she study so hard? and so on. **Attributions** are people's causal explanations for events or actions, including other people's behaviour. People are motivated to draw inferences in part by a basic need

**nonverbal behaviour** The facial expressions, gestures, mannerisms, and movements by which one communicates with others.



**FIGURE 12.9 Nonverbal Behaviour** People's body language affects our impressions of the people and their situations. For example, observers of this couple might assume they are having a conflict.



**FIGURE 12.10 Nonverbal Cues from Body Shape** After watching a 10-second clip of a figural outline such as this one, participants correctly guessed the figure's sexual orientation at a better-than-chance rate.

**attributions** People's causal explanations for why events or actions occur.

for both order and predictability. The world can be a dangerous place in which many unexpected things happen. People prefer to think that things happen for reasons, and that therefore they can anticipate future events. For instance, you might expect that if you study for an exam you will do well on it. Indeed, when a violent act, such as a rape or murder, appears to be senseless, people often make attributions about the victim, such as “she deserved it” or “he provoked it.” Such attributions are part of what is referred to as the *just world hypothesis*. From this perspective, victims must have done something to justify what happened to them. People might apply the just world hypothesis, for example, by saying that the Iraqi detainees at the Abu Ghraib prison probably did something that led them to be arrested and therefore were in a sense responsible for and deserving of the abuse they received. It is simply easier to believe that the prisoners, not the guards, must be guilty of criminal actions. Such attributions make the mistreatment seem more understandable and more justified and make the world seem safer and saner.

**personal attributions** Explanations that refer to internal characteristics, such as abilities, traits, moods, and effort.

**situational attributions** Explanations that refer to external events, such as the weather, luck, accidents, or the actions of other people.

**fundamental attribution error** The tendency to overemphasize personal factors and underestimate situational factors in explaining behaviour.

**ATTRIBUTIONAL DIMENSIONS** In any situation, there are dozens of plausible explanations for specific outcomes. Doing well on a test, for example, could be due to brilliance, luck, intensive studying, the test’s being unexpectedly easy, or a combination of factors. The Austrian psychologist Fritz Heider, the originator of attribution theory, drew the essential distinction between *personal* and *situational attributions*. **Personal attributions**, also known as *internal* or *dispositional attributions*, are explanations that refer to things within people, such as abilities, traits, moods, or efforts. By contrast, **situational attributions**, also known as *external attributions*, refer to outside events, such as the weather, accidents, or people’s actions. The American psychologist Bernard Weiner (1974) noted that attributions can vary on other dimensions, such as whether they are stable over time versus unstable, or controllable versus uncontrollable. For instance, weather is situational, unstable, and uncontrollable. Good study habits are personal, stable, and controllable. Weiner’s theory has been used to explain psychological states such as depression. As discussed in Chapters 13 and 14, depressed people attribute their failures to their own incompetence, which they believe is permanent. By contrast, those who are not depressed often self-servingly attribute their failures to situational, unstable, or uncontrollable attributes. Essentially, nondepressed people tend to attribute their failures to temporary aspects of situations, as in blaming failing a test on not getting enough sleep or on the professor’s creating a bad exam. By contrast, they attribute success to personal, permanent factors, as in doing well on an exam because they are smart.

**ATTRIBUTIONAL BIAS** So is it the person? Or is it the situation? When explaining other people’s behaviour, we tend to overemphasize the importance of personality traits and underestimate the importance of situation. This tendency is so pervasive that it has been called the **fundamental attribution error**. Theorists such as Fritz Heider and Harold Kelley have described people as intuitive scientists who try to draw inferences about others and make attributions about events. Unlike objective scientists, however, people tend to be systematically biased in their social-information processing. They make self-serving attributions consistent with their pre-existing beliefs, and they generally fail to take into account that other people are influenced by social circumstances (**FIGURE 12.11**). The American psychologist Edward Jones originated the idea of fundamental attribution error during the 1960s (though he called it the *correspondence bias*, emphasizing that people expect others’ behaviours to correspond with their own beliefs and personalities). In contrast, according to Jones, when people make attributions about themselves, they tend to focus on situations rather than on their personal dispositions, an error that, in conjunction with the fundamental attribution error, leads to the

*actor/observer discrepancy*. For instance, people tend to attribute their own lateness to external factors, such as traffic or competing demands, but they tend to attribute other people's lateness to personal characteristics, such as laziness or lack of organization.

A meta-analysis of 173 studies found that the actor/observer discrepancy is observed most commonly for negative events (Malle, Knobe, & Nelson, 2007). Indeed, we tend to attribute positive events to our dispositions and negative events to outside forces. (For a further examination of this tendency, the *self-serving bias*, see Chapter 13, "Personality.")

Is the fundamental attribution error really fundamental? Might there also be cultural differences in the attributional styles that typify people from Eastern and Western societies? Indeed, as discussed in Chapter 1, people in Eastern cultures tend to be more holistic in how they perceive the world, seeing the forest rather than individual trees. The variation within all cultures is important, of course, but on average the evidence indicates that people from Eastern cultures use much more information when making attributions than do people in Western cultures, and they are more likely to believe that human behaviour is the outcome of both personal and situational factors (Choi, Dalal, Kim-Prieto, & Park, 2003; Miyamoto & Kitayama, 2002). Although Easterners are more likely than Westerners to take situational forces into account, they still tend to favor personal information over situational information (Choi, Nisbett, & Norenzayan, 1999). Thus the basic predictions derived from the fundamental attribution error are found across cultures, though there is a difference in the extent to which people in different cultures attribute others' behaviours to personality traits rather than to the situations.



**FIGURE 12.11 Fundamental Attribution Error** As casual observers, we might wonder why these women in Mumbai, India, are fighting to board the train. Are they late for work? Is it the last train? But if we could see what is happening beyond the picture, we might see that the larger situation—the context in the station, in Mumbai, and so on—reveals other reasons for the women's urgency.

### CRITICAL THINKING SKILL

## Identifying and Avoiding the Actor/Observer Discrepancy

An important part of critical thinking is understanding the way we assign causes to our own and others' behaviours. According to the actor/observer discrepancy, people strongly tend to believe that individual attributes underlie other peoples' actions ("She failed the quiz because she is stupid") but to see their own actions as caused by circumstances ("I failed the quiz because I was tired"). With a little attention, you will begin to see people around you making such attributions. During a political campaign, listen to the way the various candidates explain their own behaviours and those of their opponents. This bias is especially noticeable when a candidate says or does something controversial. For example, a candidate who has changed his or her position on an important policy issue likely will claim to have done so for situational reasons, perhaps because of a lack of access to certain information when making the initial statement. However, if that candidate's opponent has changed position on another issue, the first candidate likely will attribute this change of stance to a lack of firm convictions or another personality flaw on the opponent's part.

It is easier to recognize the actor/observer discrepancy in others' thinking than in your own, but once you are aware of this bias, it becomes easier to avoid it. Consider the following scenario: If you have a quick encounter with someone who seems rude or inattentive, do you immediately think, "Wow, what a nasty person"? Now turn the situation around: Suppose a troubling family problem has made you late for class. As you rush across

campus, someone stops you and asks a question. How likely is it that you will think, “Can’t this person see I’m busy?” and be somewhat rude and inattentive? Yet you might feel justified in behaving this way because of your immediate situation. By learning to recognize the actor/observer discrepancy in your own thinking, you will be able to judge others’ behaviour more fairly and to take more responsibility for your own.

## Stereotypes Are Based on Automatic Categorization

**stereotypes** Cognitive schemas that allow for easy, fast processing of information about people based on their membership in certain groups.

What are Italians like—do they all have fiery tempers? Do all Canadians like hockey? Can white men jump? We hold attitudes and beliefs about groups because they allow us to answer these sorts of questions quickly. Such attitudes and beliefs are **stereotypes**, cognitive schemas that help us organize information about people on the basis of their membership in certain groups. Stereotypes are mental shortcuts that allow for easy, fast processing of social information. As discussed in Chapter 8, heuristic processing allows us to make quick decisions. Stereotyping occurs automatically and, in most cases, outside of our awareness. In and of themselves, stereotypes are neutral and simply reflect efficient cognitive processes. Indeed, some stereotypes are based in truth: Men tend to be more violent than women, and women tend to be more nurturing than men. However, these are true on average; not all men are violent, nor are all women nurturing.

People construct and use categories to streamline their impression formation and to deal with the limitations inherent in mental processing. That is, because of limited mental resources, people cannot scrutinize every person they encounter. Rather than consider each person as unique and unpredictable, they categorize people as belonging to particular groups about which they hold knowledge in long-term memory. For example, they might automatically categorize people on the basis of their clothing or hairstyles. Once they have categorized those people, they will have beliefs about them based on their stereotypes about the particular categories. That is, stereotypes affect impression formation (Kunda & Spencer, 2003). For example, people are more likely to falsely remember a male name than a female name as that of a famous person (the false fame effect, discussed in Chapter 7, “Attention and Memory”), apparently because of the stereotype that men are more likely than women to be famous (Banaji & Greenwald, 1995).

Once people form stereotypes, they maintain them by a number of processes. As schematic structures, stereotypes guide attention toward information that confirms the stereotypes and away from disconfirming evidence. People’s memories are also biased to match stereotypes. These biases lead to illusory correlations in which people believe relationships exist when they do not.

A professor who notices one black student performing poorly but fails to notice other black students doing well is confirming a false belief relating race to performance. Similarly, the same behaviour might be perceived in different ways so it is consistent with a stereotype. Thus a white man’s success may be attributed to hard work and determination, whereas a black man’s success may be attributed to outside factors, such as luck or affirmative action. A lawyer described as aggressive and a construction worker described as aggressive conjure up different images. Moreover, when people encounter someone who does not fit a stereotype, they



put that person in a special category rather than alter the stereotype, a process known as *subtyping*. Thus a racist who believes blacks are lazy may categorize a superstar such as Michael Jordan as an exception to the rule rather than as evidence for the stereotype's invalidity. Forming a subtype that includes successful blacks allows the racist to maintain the stereotype that most blacks are unsuccessful.

**SELF-FULFILLING EFFECTS** How does being treated as members of stereotyped groups affect people? Initially untrue stereotypes can become true through **self-fulfilling prophecy**, in which people come to behave in ways that confirm their own or others' expectations. In the 1960s, the psychologist Robert Rosenthal and a school principal, Lenore Jacobsen, conducted one of the most impressive early examinations of this process. In this study, elementary-school students took a test that supposedly identified some of them, called *bloomers*, as being especially likely to show large increases in IQ during the school year. Teachers were given a list of the bloomers in their classes. At the end of the year, standardized testing revealed that the bloomers showed large increases in IQ. As you might have guessed, the bloomers had been chosen at random rather than through the test, and therefore their increases in IQ seemed to have resulted from the extra attention and encouragement provided by the teachers. Thus teacher expectations turned into reality. Of course, negative stereotypes can become self-fulfilling as well. Teachers who expect certain students to fail might, however unconsciously, subtly undermine those students' self-confidence or motivation. For instance, offering unwanted help, even with the best intentions, can send the message that the teacher does not believe the students have what it takes to succeed.

In another study, each man believed he was speaking with either an attractive woman or an unattractive woman on the phone about a potential date (Snyder, Tanke, & Berscheid, 1977). The men who thought the women they talked with were attractive, based on a photo, rated the women as more sociable, poised, and humorous than did men who thought they were talking with unattractive women. Perhaps this finding is not surprising. In addition, however, other participants, who did not know which women were believed to be attractive, listened to only the women's sides of the conversations; those participants also rated the women believed to be attractive in more positive terms. That is, women interacting with men who believed they were attractive behaved more pleasantly than those interacting with men who believed they were unattractive. The women did not know they had been rated; they inferred the men's feelings from the conversations. In other words, the men's *behaviour* helped confirm the men's and women's stereotypes. This study is another example of the ways our thoughts and behaviours are influenced by events about which we are not consciously aware.

Yet another example of how expectations can affect performance is stereotype threat. As discussed in Chapter 8, stereotype threat applies to any group for which there is a negative stereotype. For instance, when women are asked to indicate if they are male or female and then tested on their math ability, they tend to perform more poorly than when they are not initially reminded of their sex (Shih, Pittinsky, & Ambady, 1999). Stereotype threat may partly explain the underlying disparity between the numbers of men and women in science careers. Stereotype threat is among the most studied topics in social psychology over the past decade, as researchers have sought to understand what causes it and how to prevent it. A recent review of the literature identified three interrelated mechanisms as responsible for producing decreased performances following threat: (1) physiological stress affecting prefrontal functioning; (2) a tendency for people to think about their performances, which can distract them from the tasks; and (3) attempts to suppress

**self-fulfilling prophecy** People's tendency to behave in ways that confirm their own or others' expectations.

negative thoughts and emotions, which require a great deal of effort (Schmader, Johns, & Forbes, 2008). A recent brain imaging study found that women exposed to a math stereotype threat showed reduced activity in brain regions associated with math performance and increased activation in brain regions involved in social and emotional processing, supporting the idea that stereotype threat undermines cognitive processes by raising performance anxiety (Krendl, Richeson, Kelley, & Heatherton, 2008). In each of these examples, people's beliefs about how others viewed them altered their behaviours in ways that confirmed the stereotypes, even though they had no conscious knowledge of these influences.

## Stereotypes Can Lead to Prejudice

Stereotypes may be neutral categories, but negative stereotypes of groups lead to prejudice and discrimination. **Prejudice** consists of the affective or attitudinal responses associated with stereotypes, and it involves negative judgments about people based on their group membership. **Discrimination** is the unjustified and inappropriate treatment of people as a result of prejudice. Prejudice and discrimination are responsible for much of the conflict and warfare around the world. Within all cultures, some groups of people are treated negatively because of prejudice. Social psychologists have spent the last half century studying the causes and consequences of prejudice as well as trying to find ways to reduce its destructive effects.

Why do stereotypes so often lead to prejudice and discrimination? Various researchers have theorized that only certain types of people are prejudiced, that people treat others as scapegoats to relieve the tensions of daily living, and that people discriminate against others to protect their own self-esteem. One explanation, consistent with the theme that the mind is adaptive, is that evolution has led to two processes that produce prejudice and discrimination: We tend to favour our own groups over other groups, and we tend to stigmatize those who pose threats to our groups.

**INGROUP/OUTGROUP BIAS** We are powerfully connected to the groups to which we belong. We cheer them on, fight for them, and sometimes are even willing to die for them. Those groups to which we belong are *ingroups*; those to which we do not belong are *outgroups* (FIGURE 12.12). As discussed in Chapter 6, when people participate in conditioning experiments in which aversive stimuli are paired with members of their own racial group or members of a different racial group, they more easily associate the negative stimuli with outgroup members (Olsson, Ebert, Banaji, & Phelps, 2005). This finding suggests that people are predisposed to be wary of others who do not belong to their own groups, since presumably outgroup members have been more dangerous over the course of human evolution. However, people low in race bias, on both implicit and explicit measures, are less likely to acquire negative associations to neutral stimuli in a classical conditioning paradigm (Livingston & Drwecki, 2007). That is, some people quickly learn that some neutral unfamiliar pictures are repeatedly paired with negative images whereas others resist making those associations. Livingston and Drwecki found that the latter group is less likely to show race bias, and Caucasian people in this group are more likely to be recognized by their black friends as not prejudiced.

The separation of people into ingroup and outgroup members appears to occur early in development. As noted in Chapter 5, people are better able to remember faces of people of their own race than those of people of other races. Researchers have found that three-month-old Caucasian infants in the United Kingdom recognize faces from their own group as well as they recognize faces from other groups (African, Middle Eastern, and Chinese). However, by six months of age the infants

**prejudice** Occurs when the attitude associated with a stereotype is negative.

**discrimination** The inappropriate and unjustified treatment of people based solely on their group membership.



**FIGURE 12.12 Ingroup/Outgroup Bias** People tend to identify strongly with the groups to which they belong. Here, Croatian and Turkish soccer fans clash before the Euro 2008 quarter-final soccer match between their two countries.



recognize only Caucasian and Chinese faces, and by nine months they recognize only Caucasian faces (Kelly et al., 2007). When researchers examined implicit race attitudes of Caucasian children using the IAT, they found that six-year-olds showed as much implicit race bias as 10-year-olds and adults, although by age 10 children reported more egalitarian explicit attitudes (Baron & Banaji, 2006).

Once people categorize others as ingroup or outgroup members, they treat them accordingly. For instance, due to the *outgroup homogeneity effect*, people tend to view outgroup members as less varied than ingroup members. McGill students may think Queen's students are all alike, but when they think about McGill students they cannot help but notice the wide diversity of different student types. Of course, for Queen's students, the reverse is true about McGill students and themselves. Similarly, most people recognize that residents of their home countries differ in substantial ways; but Westerners, for example, tend to view Arabs as being very similar to one another, sharing similar values and even attitudes about the West, while Arabs tend to hold the same sort of views about Westerners.

The consequence of categorizing people as ingroup or outgroup members is **ingroup favouritism**, in which people will more likely distribute resources to ingroup members than to outgroup members. In addition, people are more willing to do favours for ingroup members or to forgive their mistakes or errors. The power of group membership is so strong that people exhibit ingroup favouritism even if the groups are determined by arbitrary processes. The British researchers Henri Tajfel (a native of Poland) and John Turner (1979) randomly assigned volunteers to two groups, using meaningless criteria such as flipping a coin. Participants were then given a task in which they divided up money. Not surprisingly, they gave more money to their ingroup members, but they also tried to prevent the outgroup members from getting any money, even when they were told that the basis of group membership was arbitrary and that giving money to the outgroup would not affect how much money their own group obtained.

Why do people value members of their own groups? We can speculate that over the course of human evolution, personal survival has depended on group survival. Especially when there is competition for scarce resources, those who work together to keep resources within their group and deny resources to outgroup members have a selective advantage over those willing to share with the outgroup. At the psychological level, our group memberships are an important part of our social identity and contribute to our overall sense of self-esteem. In addition, women show a much greater automatic ingroup bias toward other women than men do toward other men (Rudman & Goodwin, 2004). Although men generally favour their ingroups, they fail to do so when the category is sex. Rudman and Goodwin speculate that men and women depend on women for nurturing and that both are threatened by male violence. Moreover, although women can freely express their affection for their female friends, males appear to be less comfortable doing so, perhaps because it might threaten their sexual identities.

**STEREOTYPES AND PERCEPTION** How can social psychology help us understand the tragic mistakes that police sometimes make, such as when they falsely conclude that an unarmed black man is holding a gun? In crossing levels of analysis, we find that implicit social attitudes can influence basic perceptual processes. In two experiments that demonstrated this, Payne (2001) showed pictures of various objects to white participants and asked them to classify the objects as guns or tools as quickly as possible. Immediately before seeing a picture, the participants briefly were shown a picture of a white face or a black one. Priming by a black face led participants to identify guns more quickly and to mistake

**ingroup favouritism** The tendency for people to evaluate favourably and privilege members of the ingroup more than members of the outgroup.

tools for guns (FIGURE 12.13). A more recent study, in which over 90 percent of the participants were white, found that the reverse is also true: Priming people with pictures of weapons (e.g., guns and knives) leads them to pay greater attention to black faces than to white faces (Eberhardt, Goff, Purdie, & Davies, 2004). Such findings suggest that implicit bias may result in white police officers' mistakenly concluding that suspicious-looking black men are armed. When forced to make a split-second decision, they might mistake someone's wallet for a weapon.

In a virtual reality simulation of the above scenario, Greenwald, Oakes, and Hoffman (2003) required each participant, in the role of a police officer, to respond to a criminal holding a gun (by clicking a computer mouse to shoot him), to a fellow police officer holding a gun (by pressing the space bar), or to a civilian holding a neutral object (by doing nothing). In some trials, the criminal holding a gun was a white male and the police officer holding a gun was a black male. In the other trials, these racial matches were reversed. Whatever their roles in the study, blacks were more likely to be incorrectly shot, in part because the objects they held were more likely to be identified as weapons. Fortunately, recent evidence suggests that computerized training, in which race is unrelated to the presence of a weapon, can eliminate this race bias in shooting behaviour among police officers (Plant & Peruche, 2005). Indeed, research comparing police officers and community members on simulated decisions to shoot or not shoot blacks and whites found that police officers were much less likely to shoot unarmed people and were equally likely to shoot blacks and whites (Correll et al., 2007). Community members were more likely to shoot unarmed black targets, suggesting that the extensive training received by police officers helps them avoid race bias in deciding whether to shoot.

### FIGURE 12.13 Scientific Method: Payne's Experiments on Stereotypes and Perception

**Hypothesis:** Social attitudes can influence basic perceptual processes.

**Research Method:**

- 1 White participants were shown a white or black face.
- 2 Immediately after viewing a face, participants were shown an object and asked to classify it as a gun or a tool as quickly as possible.



**Results:** Participants primed by seeing black faces identified guns more quickly and mistook tools for guns.

**Conclusion:** Implicit stereotypes affect perception.

**K**nowing if a person has racist views or how well a person can control his or her responses in situations where negative stereotypes may come into play would seem to be helpful in many situations, from hiring police officers and teachers to selecting jury panels. But if racist views could be determined by psychological testing and fMRI brain scanning (on such techniques, see Chapter 2, “Research Methodology”), would it be ethical to do so? If a couple of tests and a brain scan could eliminate all racial problems within the police force, would such testing be justified (**FIGURE 12.14**)? Similarly, is it ethical to require potential jurors to have their thoughts “read” by a machine and put on public record? What if it meant that every defendant would more likely have a fair trial? In other words, do we have a right to keep our thoughts private, or does the right to a fair trial supercede the individual juror’s rights?

Quickly categorizing all sensory input is what our brains do, and luckily for us they are pretty good at it. We instantly know if an object is animate or inanimate, a plant or an animal, a cat or a lion. We are also good at distinguishing males from females and children from adults. We might be able to tell a gang member from a police officer patrolling the streets, but if the police officer and the gang member traded clothing, we might no longer be able to put each in his or her group.

It appears that a process in the brain also makes it likely that people will categorize others on the basis of race. As noted in Chapter 1, fMRI studies done by Elizabeth Phelps and Mahzarin Banaji revealed that the amygdalas of some white men are activated by the sight of an unknown black man’s face. This response is triggered by an automatic, unconscious assessment of potential threat signified by sensory, social, and emotional stimuli. Yet responding this way is not the same thing as being racist, nor does it always happen. The ability to categorize is probably necessary for racism but does not necessarily lead to it; many people override this automatic activation and act in a nondiscriminatory fashion.

The American evolutionary psychologist Robert Kurzban and his colleagues (2001) examined claims that people encode the race of each individual they encounter. From an evolutionary psychologist’s perspective, these claims make no sense. Our hunter-gatherer ancestors rarely, if ever, travelled far enough to come in contact with people of a different race, so there would have been no selection pressure for an adaptation that automatically encoded race. Race must therefore be encoded as a side effect of some other function, perhaps as a by-product of computational mechanisms that evolved for



**FIGURE 12.14**  
**Testing for Prejudice** Critics charge that prejudice often influences random searches. Might testing eliminate potentially prejudiced officers from the force?

tracking coalitions and alliances (Cosmides, Tooby, & Kurzban, 2003). In a four-minute experiment, Kurzban found that when categorization cues stronger than race were present (he used shirt colour to indicate coalitional alliances), the categorization based on race was diminished or eliminated. For example, when you watch a football game between the Roughriders and the Argonauts, you see Roughriders and Argonauts, not white players and black ones. You are categorizing by coalitional alliance, not by race.

The American researchers Mary Wheeler and Susan Fiske (2005) investigated whether social goals such as social categorization (e.g., guessing the age of the black or white person in a photo), social individuation (e.g., guessing a person’s vegetable preference), and simple visual inspection (e.g., detecting a dot on the face) would affect the amygdala response and cognitive responses to racial outgroups. One study recorded brain activity in the amygdala using fMRI, and another measured cognitive activation of stereotypes by word priming. They found that neither response to racial outgroups was inevitable; instead, both responses depended on perceivers’ current social-cognitive goals. Changing the social context in which a target person is viewed affects the outgroup perception, measurable in both the brain and reaction time behaviour.

Even if someday we are able to link specific brain activity to racist thoughts, it will not mean that racist thoughts necessarily lead to racist acts. Since categorizing people need not entail mistreating them, should the products of automatic processing be revealed and used to judge people? Is the use of psychological testing and of brain scans for racist thoughts justified if it prevents even one race-based death, or prevents a jury from unjustly convicting even one innocent person because of race bias? Might it be worthwhile to use such tests to identify which police officers may need special sensitivity training or which jurors should not be chosen for a case in which race might be a factor?

**INHIBITING STEREOTYPES** Most people do not consider themselves prejudiced, and many are motivated to avoid stereotyping others. Yet according to many social cognition researchers, categorization and stereotyping occur automatically, without people's awareness or intent (Bargh & Ferguson, 2000). The American researcher Patricia Devine (1989) has made the important point that people can override the stereotypes they hold and act in nondiscriminatory ways. For instance, most people in North America know the negative stereotypes associated with blacks, and when a nonblack person encounters a black person, the information in the stereotypes becomes cognitively available. According to Devine, people low in prejudice override this automatic activation and act in a nondiscriminatory fashion. While some automatic stereotypes alter how we perceive and understand the behaviour of those we stereotype, simply categorizing people need not lead to mistreating them.

Indeed, numerous studies have shown that we can consciously alter our automatic stereotyping (Blair, 2002). For instance, the American researchers Nilanjana Dasgupta and Anthony Greenwald (2001) found that presenting positive examples of admired black individuals (e.g., Denzel Washington) produced more favorable attitudes toward blacks on the IAT. In another study, training people to respond counterstereotypically, as in having them press a "no" key when they saw an elderly person paired with a stereotype of the elderly, led to reduced automatic stereotyping in subsequent tasks (Kawakami, Dovidio, Moll, Hermsen, & Russin, 2000). Telling people their tests scores indicate that they hold negative stereotypes can motivate people to correct their attitudes, and the worse they feel about holding those attitudes, the harder they try not to be biased (Monteith, 1993).

Inhibiting stereotyped thinking in everyday life is difficult and requires self-regulation (Monteith, Ashburn-Nardo, Voils, & Czopp, 2002), in part because of the brain activity involved. As discussed throughout this book, the frontal lobes are important for controlling both thoughts and behaviour. In one brain imaging study, briefly showing white participants pictures of black faces produced amygdala activity. The amygdala is involved in detecting threat; in this context, the amygdala activity may indicate that the participants' immediate responses to black faces were negative. However, if the faces were presented longer, the frontal lobes became active and the amygdala response decreased; thus the frontal lobes appear to have overridden this immediate reaction. This reaction happened more for those whose IAT scores indicated negative stereotypes about blacks (Cunningham et al., 2004).

### Co-operation Can Reduce Prejudice

Can social psychologists use what they have learned in the laboratory to help reduce prejudice and to encourage peace? Since the 1950s, numerous such attempts have been made to alleviate the hostility and violence between factions, but it is extraordinarily difficult to change cultural and religious beliefs, and attitudes toward ethnic groups are embedded deeply in both. Around the world, groups clash over disputes that predate the births of most of the combatants, and sometimes people cannot even remember the original sources of particular conflicts. Yet as the global response to the Haiti earthquake in 2010 indicates (**FIGURE 12.15**), people can work together and, in doing so, overcome intergroup hostilities if they have a greater purpose, such as dealing with a natural catastrophe that killed hundreds of thousands and left a million homeless.

Social psychology may be able to suggest strategies for promoting intergroup harmony and producing greater tolerance for outgroups. The first study to suggest so was conducted by the Turkish psychologist Muzafer Sherif and his colleagues in the late 1950s. Sherif arranged for 22 well-adjusted and intelligent white fifth-grade boys from Oklahoma City to attend a summer camp. None of the boys knew each other before that summer. Before arriving at camp, the boys were divided into two



**FIGURE 12.15 Global Co-operation**  
After the devastating earthquake in Haiti in 2010, workers from around the world assisted efforts to rebuild the country.

groups that were essentially the same. During the first week, the boys lived in separate camps, each unaware that a similar group of boys was across the lake.

The next week, over a four-day period, the groups competed in a number of athletic competitions, such as tug-of-war, football, and softball. The stakes were high: The winning team would get a trophy, individual medals, and appealing prizes; the losers would receive nothing. The groups named themselves the Rattlers and the Eagles. Group pride was extremely strong, and animosity between the groups quickly escalated. The Eagles burned the Rattlers' flag, and the Rattlers retaliated by trashing the Eagles' cabin. Eventually, confrontations and physical fights had to be broken up by the experimenters. All the typical signs of prejudice emerged, including the outgroup homogeneity effect and ingroup favouritism.

Phase 1 of the study was complete. Sherif had shown how easy it was to get people to hate each other—simply divide them into groups and have the groups compete, and prejudice and mistreatment would result. Phase 2 of the study then explored whether the hostility could be undone.

Sherif first tried what made sense at the time, simply having the groups come into contact with one another. This approach failed miserably. The hostilities were too strong, and skirmishes continued. Sherif reasoned that if competition led to hostility, then co-operation should reduce hostility. The experimenters created situations in which members of both groups had to co-operate to achieve necessary goals. For instance, the experimenters rigged a truck to break down. Getting the truck moving required all the boys to pull together—in an ironic twist—on the same rope used earlier in the tug-of-war. When they succeeded, a great cheer arose from the boys, with plenty of backslapping all around. After a series of tasks that required co-operation, the walls between the two sides broke down, and the boys became friends across the groups. Among strangers, competition and isolation created enemies. Among enemies, co-operation created friends (FIGURE 12.16).

Research over the past four decades has indicated that only certain types of contact between hostile groups will likely reduce prejudice and discrimination. Shared *superordinate* goals—those that require people to co-operate—reduce hostility between groups. People who work together to achieve a common goal often break down subgroup distinctions as they become one larger group (Dovidio et al., 2004). For example, athletes on multi-ethnic teams often develop positive attitudes toward other

### FIGURE 12.16 Scientific Method: Sherif's Study of Competition and Co-operation

**Hypothesis:** Just as competition between groups promotes prejudice and hostility, so co-operation between groups can promote harmony.

**Research Method:**

**1** In Phase 1 of the experiment, boys from two summer camps were pitted against each other in athletic competitions:



**2** In Phase 2, the boys from the two camps were required to work together as one group to achieve common goals.

**Results:** Competition created tension and hostility, but after a series of co-operative efforts, the boys began to make friends across groups.

**Conclusion:** Shared goals requiring co-operation across group lines can reduce hostility between groups.

ethnicities. In addition, other strategies have been shown to reduce prejudice. For example, bilingual instruction in schools leads to less ingroup favouritism among elementary school children (Wright & Troop, 2005). Prejudice can also be reduced through explicit efforts to train people about their stereotypic association. For example, participants who practice associating women and counter-stereotypic qualities (e.g., strength, dominance) are more likely than a control group to choose to hire women in a subsequent task following a delay (Kawakami, Dovidio, & van Kamp, 2005).

**JIGSAW CLASSROOM** The programs that most successfully bring groups together involve person-to-person interaction. A good example is Eliot Aronson's jigsaw classroom, which he developed with his students in the 1970s. In this program, students work together in mixed-race or mixed-sex groups in which each member of the group is an expert on one aspect of the assignment. For instance, when studying Mexico, one group member might study its geography, another its history, and so on. The various geography experts from each group get together and master the material. They then return to their own groups and teach the material to their team members. Thus co-operation is twofold: Each group member co-operates not only with members of other groups but also within the group. More than 800 studies of the jigsaw classroom have demonstrated that it leads to more-positive attitudes toward other ethnicities and that students learn the material better and perform at higher levels. According to Aronson, children in jigsaw classrooms grow to like each other more and develop higher self-esteem than do children in traditional classrooms. The lesson is clear: Communal work toward superordinate goals can reduce prejudice.

## **SUMMING UP**

### **How Do We Form Our Impressions of Others?**

Human social interaction requires people to form impressions of others. People are highly sensitive to nonverbal information and can develop accurate impressions of others on the basis of very thin slices of behaviour. People also are motivated to figure out what causes other people to behave the way they do. People often make biased attributions about others. They tend to attribute other people's behaviour to dispositions rather than to situations, and they use heuristic processing, which biases social judgment. Stereotypes result from the normal cognitive process of categorization. However, negative stereotypes and prejudice lead to discrimination. Humans tend to discriminate against those who are threatening, such as outgroup members.

## **MEASURING UP**

1. Label each of the following statements as an example of stereotyping, prejudice, or discrimination.
  - a. "People from Toronto are arrogant and obnoxious."
  - b. "What can I say, I just don't like people from Toronto."
  - c. Walter tells a joke that makes fun of people from Toronto.
2. Max was arrested for driving while under the influence of alcohol. Label each of the following statements as an example of personal attribution, situational attribution, or fundamental attribution error.
  - a. Max says, "Nobody would give me a ride home. I couldn't sleep at the bar, so I had to get home. I had no other option."
  - b. Max's friend says, "Max should know better, but he is a selfish and irresponsible jerk."
  - c. Max says, "That was really stupid of me. Maybe I have a drinking problem."

## How Do Others Influence Us?

We humans have an overriding motivation to fit in with the group. One way we try to fit in is by presenting ourselves positively, as in being on our best behaviour and in trying not to offend others. But we also conform to group norms, obey authorities' commands, and are easily influenced by others in our social groups. The desire to fit in with the group and avoid being ostracized is so great that under some circumstances we willingly engage in behaviours we otherwise would condemn. As noted throughout this chapter, the power of the social situation is much greater than most people believe—and this truth is perhaps the single most important lesson from social psychology. The importance of social influences was summed up by Philip Zimbardo, who commented that it is difficult to remain a cucumber while those around you become pickles.

### Groups Influence Individual Behaviour

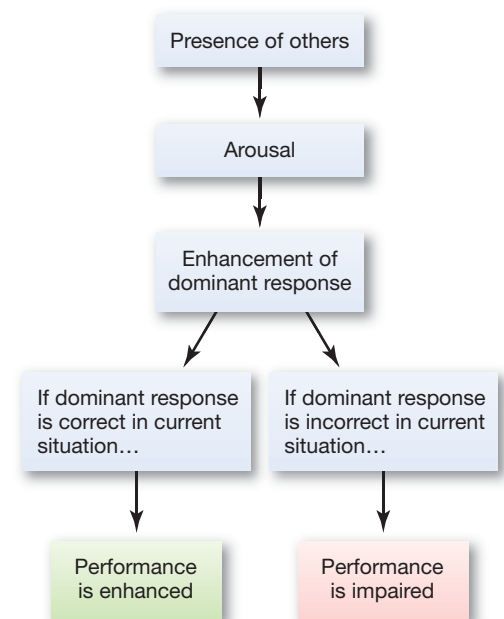
The first social psychology experiment was conducted at Indiana University in 1897: Norman Triplett showed that bicyclists pedal faster when riding with other people than when riding alone. They do so because of **social facilitation**, in which the presence of others enhances performance. Social facilitation also occurs in other animals, including horses, dogs, rats, birds, fish, and even cockroaches. Robert Zajonc (1965) proposed a model of social facilitation that involves three basic steps (FIGURE 12.17). According to Zajonc, all animals are genetically predisposed to become aroused by the presence of others of their own species, since others are associated with most of life's rewards and punishments. Zajonc then invoked Clark Hull's well-known learning principle that arousal leads animals to emit a dominant response, that is, the response most likely to be performed. In front of food, for example, the dominant response is to eat. Zajonc's model expands on Triplett's, predicting that social facilitation can enhance or impair performance. The presence of others improves the performance of a simple task for which the dominant response is well learned, such as the adding of single digits, but it interferes with the performance of a complex task that requires greater thought, such as differential calculus. If employees are performing simple tasks such as database entry, they might work best in a fairly open environment, either around a common table or in cubicles, where each person is aware of the rate at which others are performing. If employees are performing more complicated tasks, such as editing manuscripts, they might work best in private offices, since concentration is paramount and an awareness of how others are performing is irrelevant to the complex work at hand.

**SOCIAL LOAFING** In some cases, people work less hard when in a group than when working alone. This **social loafing** occurs when people's efforts are pooled so that no one individual feels personally responsible for the group's output. In a classic study, six blindfolded people wearing headphones were told to shout as loudly as they could. Some were told they were shouting alone; others were told that they were shouting with other people. Participants did not shout as loudly when they believed that others were shouting as well (Latané, Williams, & Harkins, 1979). However, making it clear that individual efforts can be monitored eliminates social loafing. Thus if a group is working on a project, each person must feel personally responsible for some component of the project for everyone to exert maximum effort.

**DEINDIVIDUATION** People sometimes lose their individuality when they become part of a group. **Deindividuation** occurs when people are not self-aware and therefore are not paying attention to their personal standards. Recall that self-awareness typically causes people to act in accordance with the values and beliefs they hold.

**LEARNING OBJECTIVES**

- Differentiate among conformity, compliance, and obedience.
- Apply principles of social influence to common educational situations.



**FIGURE 12.17 Social Facilitation** The mere presence of other people leads to increased arousal, which in turn favors the dominant response. If this is the correct response, performance is enhanced, but if it is the incorrect response, performance suffers.

**social loafing** The tendency for people to work less hard in a group than when working alone.

**deindividuation** A phenomenon of low self-awareness, in which people lose their individuality and fail to attend to personal standards.



**FIGURE 12.18 Deindividuation** When people are swept up as part of a group, such as these fans doing the “wave” during the 2010 Olympic Gold Medal Hockey game between Canada and the United States, deindividuation can happen if they stop paying attention to their personal standards.

When self-awareness disappears, so do restraints. Deindividuated people often do things they would not do if they were alone or self-aware. A good example is crowd behaviour. Most of us like to think we would try to help a person who was threatening suicide. But people in crowds often not only fail to intercede but also sometimes egg the person on, yelling “Jump! Jump!” to someone teetering on a ledge.

People are especially likely to become deindividuated when they are aroused and anonymous and when responsibility is diffused. Rioting by fans, looting following disasters, and other mob behaviours are the products of deindividuation. Recall the Stanford prison study, mentioned at the beginning of this chapter. The study had to be stopped after just six days because the students became so immersed in their roles that many guards acted brutally and many prisoners became listless and apathetic. The situation was powerful enough to radically alter people’s behaviour through a process of deindividuation. Most militaries around the world require each of their members to have a standard haircut and an identical uniform because people who look similar are more likely to conform and respond to orders—including orders to commit acts of violence against an enemy. Not all deindividuated behaviour is so serious, of course. Gamblers in crowded casinos, fans doing the wave, and people dancing the funky chicken while inebriated at weddings are most likely in deindividuated states, and accordingly they act in ways they would not if they were self-aware (**FIGURE 12.18**).

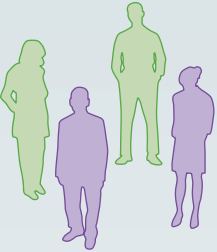
**GROUP DECISION MAKING** It has been said that a group’s intelligence can be determined by averaging its members’ IQs and then dividing that average by the number of people in the group. In other words, groups are known for making bad decisions. Social psychologists have shown that being in a group influences decision making in curious ways. For instance, in the 1960s the American psychologist James Stoner found that groups often made riskier decisions than individuals did. This phenomenon, the *risky-shift effect*, accounts for why children in a group may try something dangerous that none of them would have tried alone. Subsequent research has demonstrated that groups are sometimes riskier than individuals and sometimes more cautious, as groups tend to enhance the initial attitudes of members who already agree. This process is known as *group polarization*. For example, discussion tends to make people on juries believe more strongly in their initial opinions about defendants’ guilt or innocence. When groups make risky decisions, they usually do so because the individuals initially favour a risky course of action and, through mutual persuasion, come to agreement.

Sometimes group members are particularly concerned with maintaining the group’s cohesiveness, so for the sake of cordiality the group will make a bad decision. In 1972, the American social psychologist Irving Janis coined the term *groupthink* to describe this extreme form of group polarization. Contemporary examples of groupthink include, in 1986, the decision to launch the space shuttle *Challenger* despite the clear evidence of a problem with a part and, in 2003, the second Bush administration’s decision to go to war with Iraq over weapons of mass destruction that did not exist, as later investigations showed (see “Critical Thinking Skill: Recognizing and Correcting for Belief Persistence ...,” in Chapter 9). Groupthink typically occurs when a group is under intense pressure, is facing external threats, and is biased in a particular direction. The group does not carefully process all the information available to it, dissension is discouraged, and group members assure each other they are doing the right thing. To prevent groupthink, leaders must refrain from expressing their opinions too strongly at the beginning of discussions. The group should be encouraged to consider alternative ideas, either by having someone play devil’s



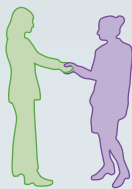
FIGURE 12.19 Try for Yourself: Working Effectively in Groups

**If possible, keep the group small.**



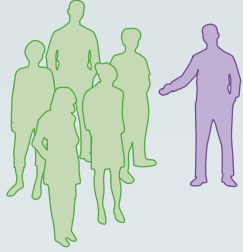
Members will more likely speak their minds in a smaller group.

**Be open to alternative ideas.**



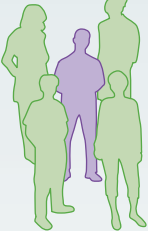
Sometimes the best idea is one you have not considered yet.

**Express your ideas.**



Even one dissenting opinion can decrease group conformity.

**Treat dissenters respectfully.**



Ostracizing them may make others afraid to speak up.

**Consider the pros and cons of all options.**

PRO	CON
1.	1.
2.	2.
3.	3.

Doing so will help you choose the best one.

**Result:** Being open to new ideas and carefully weighing options can help you avoid groupthink.

advocate or by purposefully examining outside opinions. Carefully going through alternatives and weighing the pros and cons of each can help people avoid groupthink (FIGURE 12.19).

## We Conform to Social Norms

Society needs rules. Imagine, for example, the problems you would cause if you woke up one morning and decided that from then on you would drive on the wrong side of the road. **Social norms**—expected standards of conduct—influence behaviour in multiple ways, such as indicating which behaviour is appropriate in a given situation. Standing in line is a social norm, and people who violate that norm by cutting in line are often reprimanded and directed to the back of the line. **Conformity**, the altering of one’s behaviours or opinions to match those of others or to match social norms, is also a powerful form of social influence.

How much do people conform? Muzafer Sherif was one of the first researchers to demonstrate the power of norms and conformity in social judgment. His studies, conducted in the 1930s, relied on a perceptual phenomenon known as the *autokinetic effect*, in which a stationary point of light appears to move when viewed in a totally dark environment. This effect occurs because people have no frame of reference and therefore cannot correct for small eye movements. Sherif asked participants who were alone in a room to estimate how far the light moved. Individual differences were considerable; some saw the light move only an inch or two, whereas others saw it move

**social norms** Expected standards of conduct, which influence behaviour.

**conformity** The altering of one’s opinions or behaviours to match those of others or to match social norms.

eight inches or more. In the second part of the study, Sherif put two or more participants in the room and had them call out their estimates. Although there were initial differences, participants very quickly revised their estimates until they agreed. In ambiguous situations, people often compare their reactions with the reactions of others to judge what is appropriate.

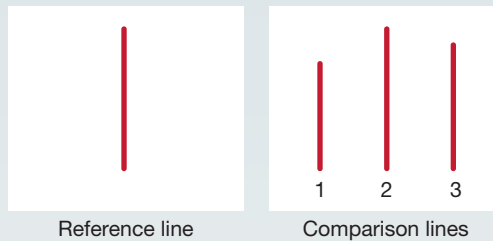
The American psychologist Solomon Asch (1955) speculated that Sherif's effect probably occurred because the autokinetic effect is a subjective visual illusion. If there were objective perceptions, Asch thought, participants would not conform. To test his hypothesis, Asch assembled male participants for a study of visual acuity. In the 18 trials, the participants looked at a reference line, decided which of three other lines matched it, and said their answers aloud. Normally, people are able to perform this easy task with a high level of accuracy. But in these studies, Asch included a naive participant with a group of five confederates pretending to be participants but actually working for the experimenter. The real participant always went sixth, giving his answer after the five confederates gave theirs. On 12 of the 18 trials, the confederates deliberately gave the same wrong answer. After hearing five wrong answers, the participant then had to state his answer. Because the answer was obvious, Asch speculated that the participant would give the correct answer, but about one-third of the time, the participant went along with the confederates. More surprisingly, in repeated trials, three out of four people conformed to the incorrect response at least once (FIGURE 12.20).

### FIGURE 12.20 Scientific Method: Asch's Study on Conformity to Social Norms

**Hypothesis:** Conformity would not take place if there were objective perceptions.

**Research Method:**

- 1 A participant joined a group of five other participants—who were confederates, secretly in league with the researcher. Each participant was asked to look at a reference line (left) and then say out loud which of three comparison lines matched it (right).



- 2 The five confederates deliberately gave the wrong answer in 12 out of 18 trials (the real participant is in the middle of the photos below, with glasses).



The real participant hears the answer given by the confederates.



He has a hard time believing their wrong answers.



But he starts to doubt his own eyes.

**Results:** When confederates gave false answers first, three-quarters of the real participants conformed by giving the wrong answer at least once.

**Conclusion:** People tend to conform to social norms, even when those norms are obviously wrong.

Research consistently has demonstrated that people tend to conform to social norms. This effect can be seen outside the laboratory as well: Adolescents conform to peer pressure to smoke; jury members go along with the group rather than state their own opinions; people stand in line to buy tickets. But when do people reject social norms? In a series of follow-up studies, Asch and others identified factors that decrease the chances of conformity. One factor is group size. If there are only one or two confederates, a naive participant usually does not conform; as soon as the confederates number three or more, the participant conforms. However, conformity seems to level off at a certain point. Subsequent research has found that even groups as large as 16 do not lead to greater conformity than groups of 7.

Asch found that lack of unanimity is another factor that diminishes conformity. If even one confederate gives the correct answer, conformity to the group norm decreases a great deal. Any dissent from majority opinion can diminish the influence of social norms. But dissenters are typically not treated well by groups. In 1951, Stanley Schachter conducted a study in which a group of students debated the fate of a juvenile delinquent, Johnny Rocco. A confederate deviated from the group judgment of how Johnny should be treated. When it became clear that the confederate would not be persuaded by group sentiment, the group began to ostracize him. When group members subsequently were given the opportunity to reduce group size, they consistently rejected the “deviant” confederate. The bottom line is that groups enforce conformity, and those who fail to go along are rejected. The need to belong, and the anxiety associated with the fear of social exclusion, gives a group powerful influence over its members. Indeed, a brain imaging study that used a conformity test similar to Asch’s found activation of the amygdala, perhaps a fear response, in participants whose answers did not conform to the group’s incorrect answer (Berns et al., 2005).

Universities across North America have tried to harness the power of social norms to reduce binge drinking on campus. They have used social norms marketing in attempts to correct faulty misperceptions regarding peer drinking; proponents might put up posters saying, for example, “Most students have fewer than four drinks when they party.” Unfortunately, social norms marketing may inadvertently increase drinking among light drinkers, whose behaviour is also susceptible to social norms (Russell, Clapp, & Dejong, 2005); students who usually have only one drink at a time might interpret the posters as suggesting that the norm is to have two or three drinks, and they might adjust their behaviour accordingly. One team of researchers demonstrated that simply providing descriptive norms (i.e., the frequency of behaviour) can cause this sort of backfire effect. They found that adding a message that the behaviour is undesirable might help prevent social norms marketing from increasing the behaviour it is meant to reduce (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007).

## We Are Compliant

Often people influence the behaviour of others simply by asking them to do things. If the others do the requested things, they are exhibiting **compliance**. A number of factors increase compliance. For instance, the Australian researcher Joseph Forgas (1998) has demonstrated that people in good moods are especially likely to comply. This tendency may be the basis for “battering up” others when we want things from them. According to the American psychologist Robert Cialdini (2008), people often comply with requests because, failing to pay attention, they respond without fully considering their options; they are following a standard mental shortcut to avoid conflict. For instance, if you give people a reason for a request, they will much more likely comply, even if the reason makes little sense.

**compliance** The tendency to agree to do things requested by others.

People can use a number of powerful strategies to influence others to comply. For instance, because of the *foot-in-the-door effect*, people will more likely comply with a large and undesirable request if earlier they have agreed to a small request. Jonathan Freedman and Scott Fraser (1966) asked homeowners to allow a large, unattractive “DRIVE CAREFULLY” sign to be placed on their front lawns. As you might imagine, fewer than one in five people agreed to do so. However, another group of homeowners first was asked to sign a petition supporting legislation that would reduce traffic accidents. A few weeks later, these same people were approached about having the large sign placed on their lawns, and more than half agreed. Once people commit to a course of action, they behave in ways consistent with that course.

The opposite influence technique is the *door in the face*, thanks to which people will more likely agree to a small request after they have refused a large request, because the second request seems modest in comparison and they want to seem reasonable. Salespeople often use this technique. Another favourite among salespeople is the *low-balling strategy*, which begins when a salesperson offers a product—for example, a car—for a very low price. Once the customer agrees, the salesperson may claim that the manager did not approve the price or that there will be additional charges. Whatever the reason, a person who has agreed to buy a product will often agree to pay the increased cost.

## We Are Obedient to Authority

One of the most famous and most disturbing psychology experiments was conducted in the early 1960s by the American psychologist Stanley Milgram, who wanted to understand why apparently normal German citizens willingly obeyed orders to injure or kill innocent people during World War II (FIGURE 12.21). Milgram was interested in the determinants of *obedience*—that is, the factors that influence people to follow orders given by an authority. Try to imagine yourself as a participant in Milgram’s experiment. You have agreed to take part in a study of learning. On arriving at the laboratory, you meet your fellow participant, a 60-year-old grandfatherly type. The experimenter describes the study as consisting of a teacher administering electric shocks to a learner engaged in a simple memory task involving word pairs. Your role as the teacher is determined by an apparently random drawing of your name from a hat. On hearing that he may receive electric shocks, the learner reveals that he has a heart condition and expresses minor reservations.

The experimenter says that although the shocks will be painful, they will not cause permanent tissue damage. You help the experimenter take the learner to a small room and hook him up to the electric shock machine. You then proceed to a nearby room and sit at a table in front of a large shock generator with switches from 15 to 450 volts. Each voltage level carries a label, ranging from “slight” to “danger—severe shock” to, finally, an ominous “XXX.”

You perform your task, giving the learner a shock each time he makes a mistake and increasing the voltage with each subsequent error. When you reach 75 volts, over the intercom you hear the man yelp in pain. At 150 volts, he screams, bangs on the wall, and demands that the experiment be stopped. The man is clearly in agony as—at the experimenter’s

**FIGURE 12.21 Stanley Milgram** Milgram, pictured here with his infamous shock generator, demonstrated that average people will obey even hideous orders given by an authority figure.



command—you apply additional, stronger shocks. Each time you say you are quitting and try to stop the experiment, the experimenter replies, “The experiment requires that you continue,” “It is essential that you go on,” “There is no other choice; you must go on!” So you do. At 300 volts, the learner refuses to answer any more questions. After 330 volts, the learner is silent. All along you have wanted to leave, and you severely regret participating in the study. You might have killed the man, for all you know.

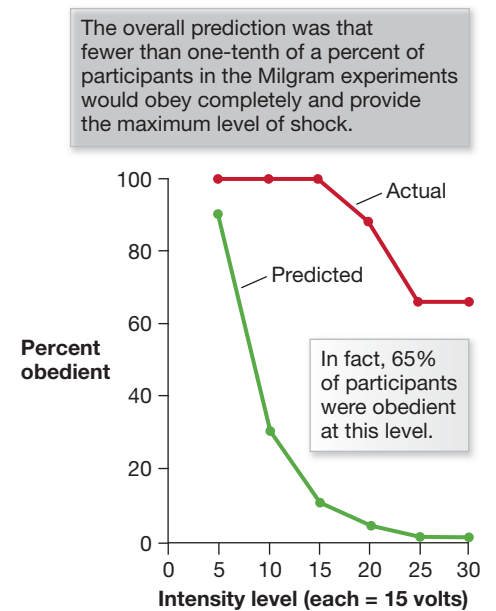
Does this scenario sound crazy to you? If you really were the teacher, at what level would you stop administering the shocks? Would you quit as soon as the learner started to complain? Would you go up to 450 volts? The various people Milgram asked predicted that most participants would go no higher than 135 volts and that fewer than one in a thousand people would administer the highest level of shock. But that is not what happened. What did happen changed how people viewed the power of authority.

Milgram found that although almost all the participants tried to quit, nearly two-thirds completely obeyed all the experimenter’s directives (FIGURE 12.22), despite believing they were administering 450 volts to an older man with a heart condition (actually a confederate). These findings have been replicated by Milgram and others around the world. The conclusion of these studies is that ordinary people can be coerced into obedience by insistent authorities, even when what they are coerced into goes against the way they usually would behave. At the same time, these results do not mean all people are equally obedient. Indeed, some aspects of personality seem related to being obedient, such as the extent to which people are concerned about how others view them (Blass, 1991). As discussed in the next chapter, both situation and personality influence behaviour.

Surprised by the results of his study, Milgram next set out to study how to reduce obedience. He found that some situations produced less compliance. For instance, if the teacher could see or had to touch the learner, obedience decreased. When the experimenter gave the orders over the telephone and thus was more removed from the situation, obedience dropped dramatically.

Throughout these studies, Milgram was highly concerned with his participants’ mental states. In systematic debriefings, he carefully revealed the true nature of the experiments to the participants, and he made sure that the teachers met the confederate learners and that the teachers could see that the learners were not hurt in any way. Milgram also followed his participants over time to ensure that they experienced no long-term negative effects. Actually, many people were glad they had participated, feeling that they had learned something about themselves and about human nature. Most of us assume that only sadistic miscreants would willingly inflict injury on others when ordered to do so. Milgram’s research, and studies that followed up on it, demonstrated that ordinary people may do horrible things when ordered to do so by an authority (FIGURE 12.23). Although some people speculate that these results would not be true today, a recent replication found that 70 percent of the participants were obedient up to the maximum voltage in the experiment (Burger, 2009).

All the background data available on the prison guards at Abu Ghraib (see the discussion at the opening of this chapter), for example, suggest they were ordinary people. Investigators do not know exactly what the guards were ordered to do, but a number of social factors, from deindividuation to social facilitation to inappropriate norms and conformity, contributed to the situation and likely played prominent roles in the mistreatment of Abu Ghraib prisoners. As noted earlier, all of us need to be aware of situational influences when we evaluate our own behaviour and that of others, particularly when our core beliefs and values are at risk.



**FIGURE 12.22 Predicting the Results** Psychiatrists, university students, middle-class adults, and both graduate students and professors in the behavioural sciences offered predictions about the results of Milgram’s experiments. Their predictions were incorrect.

## FIGURE 12.23 Scientific Method: Milgram's Shock Experiments on Obedience

**Hypothesis:** People are obedient to authority figures.

### Research Method:

- 1** In one condition, each participant was instructed to “shock,” from another room, a participant (learner) who was secretly in league with the experimenter.
- 2** In another condition, each participant was instructed to touch and “shock” a learner sitting next to the participant. In both conditions, the experimenter would instruct the participant to give the learner increasingly severe shocks.
- 3** After the experiment, each participant was introduced to the confederate learner and could see that the learner had not been harmed.



**Results:** In the first condition, almost all the participants tried to quit, but nearly two-thirds obeyed the experimenter's directives. In the “touch” condition, fewer than one-third of the participants obeyed the experimenter's orders.

**Conclusion:** Most people will obey even hideous orders given by insistent authority figures, but this willingness is lessened when people are made more personally responsible.

## SUMMING UP

### How Do Others Influence Us?

For the most part, people follow group norms, are influenced by others' opinions, and are obedient to authority. Most people underestimate the power of these effects or do not believe that they themselves are affected by social influence. Yet the evidence is overwhelming that in many situations people will engage in behaviours quite inconsistent with their own standards. Sometimes, for example, people in a state of deindividuation lose awareness of the values and beliefs they hold. Those who are aware of the power of social influence often use specific strategies to manipulate others' behaviour, such as by using foot-in-the-door, door-in-the-face, and low-balling techniques. The more each of us is aware of our own values and beliefs, the more capable we are of upholding our own standards.

## MEASURING UP

1. Label each of the following scenarios as an example of conformity, compliance, or obedience.
  - a. Bettina decides to join Facebook because all her friends have already created profiles.
  - b. Elisa says to her son, “Wash the dishes before you go outside to play.” He does so.
  - c. Randall goes into an office supply store to make photocopies. There are long lines at each copier. As a woman steps up to one of the machines to take her turn, he approaches her and asks, “Do you mind if I go next? I need to make a copy.” She says yes.

2. Match each of the following social influence constructs with the correct definition: deindividuation, group polarization, social facilitation, and social loafing.
  - a. A lack of self-awareness has a disinhibiting effect, allowing people to act in ways that are inconsistent with the beliefs and values they hold.
  - b. People make less individual effort when their efforts are pooled than when they work alone.
  - c. Over the course of group discussion, individuals become increasingly committed to attitudes they held before the group discussion.
  - d. The presence of others enhances performance of simple tasks that are well learned.

## When Do We Harm or Help Others?

Although obedience can lead people to commit horrible acts, the need to belong to a group also can lead us to acts of altruism and of generosity. Events of the last few years have revealed the human capacities for harming and helping others. We have seen terrorists killing civilians in Mumbai, guards abusing prisoners at Abu Ghraib, and tribal warfare in the Darfur region of Sudan. Yet people also can be kind, compassionate, and giving, as evidenced by the outpouring of support to the victims of the 2010 earthquake in Haiti (noted earlier in this chapter). Similarly, members of the group Doctors Without Borders travel to dangerous regions around the globe to care for those in need. This tension between our aggressive and altruistic sides is at the core of who we are as a species. Psychological scientists working at all levels of analysis have provided much insight into the roles that nature and nurture play in these fundamental human behaviours.

### Aggression Can Be Adaptive

**Aggression** can be expressed through countless behaviours, all involving the intention to harm someone else. Among nonhuman animals, it often occurs in the context of fighting over a mate or defending territory from intruders, though in the latter case just the threat of aggressive action may be sufficient to dissuade. Among humans, physical aggression is common among young children but relatively rare in adults; adults' aggressive acts more often involve words, or other symbols, meant to threaten, intimidate, or emotionally harm others. Aggression can be considered across the levels of analysis, from basic biology to cultural context.

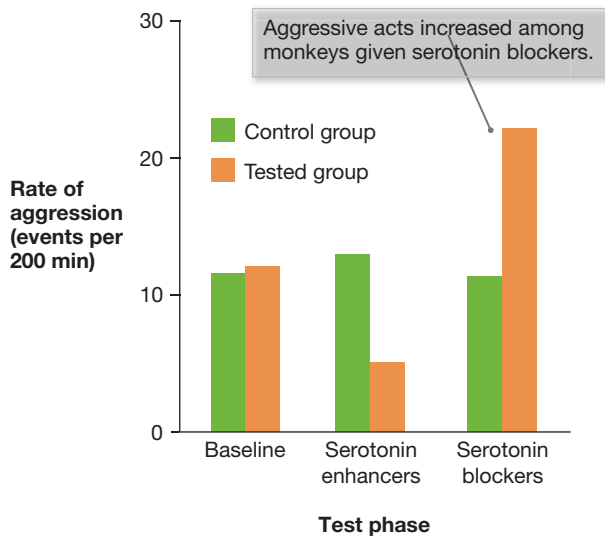
**BIOLOGICAL FACTORS** At the biological level of analysis—largely involving research with nonhuman animals—we see that stimulating certain brain regions or altering neurochemicals can lead to substantial changes in behaviour. Stimulating or damaging the septum, amygdala, or hypothalamus regions in the brain (see Figure 3.24) leads to corresponding changes in the level of aggression displayed. For example, stimulating a cat's amygdala with an electric probe causes the animal to attack, whereas damaging the amygdala leads to passive behaviour. In 1937, the American researchers Heinrich Klüver (a native of Germany) and Paul Bucy produced a striking behavioural change by removing the amygdalas of normally very aggressive rhesus monkeys. Following the surgery, the monkeys were tame, friendly, and easy to handle. They began to approach and explore normally feared objects, such as snakes. They also showed unusual oral behaviour, putting anything within reach into their mouths, including snakes, matches, nails, dirt, and feces. The behaviour associated with damage to this region is now referred to as *Klüver-Bucy syndrome*.

### LEARNING OBJECTIVES

Classify the evidence as supporting biological, individual-differences, or socio-cultural explanations for aggression.

Recognize situations in which people are most likely to evidence bystander apathy.

**aggression** Any behaviour or action that involves the intention to harm someone else.



**FIGURE 12.24 Serotonin and Aggression** Male vervet monkeys were given either serotonin enhancers or serotonin blockers. The results suggest serotonin is important in the control of aggressive behavior.

**frustration-aggression hypothesis** The extent to which people feel frustrated predicts the likelihood that they will act aggressively.

In terms of neurochemistry, several lines of evidence suggest that serotonin is especially important in the control of aggressive behaviour (Caramaschi, de Boer, & Koolhaus, 2007). In a study using monkeys, drugs that enhance the activity of serotonin lowered aggression, whereas those that interfere with serotonin increased aggression (Raleigh, McGuire, Brammer, Pollack, & Yuwiler, 1991; **FIGURE 12.24**). In humans, low levels of serotonin have been associated with aggression in adults and hostility and disruptive behaviour in children (Kruesi et al., 1992). In a large sample of men from New Zealand, low serotonin levels were associated with violence but not with criminal acts in general (Moffitt et al., 1998). Additionally, post-mortem examinations of suicide victims have revealed extremely low serotonin levels. Although suicide may seem very different from aggression, many psychologists believe suicide and violence toward others are manifestations of the same aggressive tendencies. Indeed, low serotonin levels were found among those who had killed themselves violently (such as by shooting themselves) but not among those who had done so nonviolently (such as by taking drug overdoses; Asberg, Shalling, Traskman-Bendz, & Wagner, 1987).

Decreased serotonin levels may interfere with good decision making in the face of danger or of social threat. For instance, monkeys with the lowest serotonin levels are the least socially skilled (Higley et al., 1996). This lack of social competence often leads the other monkeys to attack and kill them. Monkeys with low serotonin also likely will pick fights with much larger monkeys. Do these findings have implications for humans? Possibly. In one study, participants given a drug that enhances serotonin activity were found to be less hostile and more co-operative over time, compared with the control group (Knutson et al., 1998).

**INDIVIDUAL FACTORS** In the 1930s, American psychologist John Dollard and his colleagues proposed the first major psychological model of aggression. According to their **frustration-aggression hypothesis**, the extent to which people feel frustrated predicts the likelihood that they will be aggressive. The more people's goals are blocked, the greater their frustration and therefore the greater their aggression. Slow traffic is frustrating, for example, and if it impedes you from getting somewhere you really want or need to go, you may feel especially frustrated. If another driver then cuts in front of you, you may feel especially angry and perhaps make an aggressive hand gesture, shout, or otherwise express yourself.

According to Leonard Berkowitz's *cognitive-neoassociationistic model* (1990), frustration leads to aggression by eliciting negative emotions. Similarly, any situation that induces negative emotions, such as being insulted, afraid, overly hot, or in pain, can trigger physical aggression even if it does not induce frustration. Berkowitz proposed that negative emotion leads to aggression because it primes cognitive knowledge associated with aggression; in other words, negative events activate thoughts related to escaping or fighting, and those thoughts prepare a person to act aggressively. Whether someone behaves aggressively depends on the situational context. If the situation also cues violence—for example, if the person has recently watched a violent movie or been in the presence of weapons—the person more likely will act aggressively.

## Aggression Has Social and Cultural Aspects

An evolutionary approach to aggression would call for similar patterns of aggressive behaviour to exist in all human societies. After all, if aggression provided a selective advantage for human ancestors, it should have done so for all humans. But the



data show that violence varies dramatically across cultures and even within cultures at different times. For example, over the course of 300 years, Sweden went from being one of the most violent nations on earth to being one of the most peaceable, a change that did not correspond with a change in the gene pool. Moreover, murder rates are far higher in some countries than in others (FIGURE 12.25). Analysis of crime statistics in the United States reveals that physical violence is much more prevalent in the South than in the North. Aggression may be part of human nature, but culture influences people's tendencies to commit acts of physical violence.

Some cultures may be violent because they subscribe to a *culture of honour*, a belief system in which men are primed to protect their reputations through physical aggression. Men in the southern United States, for example, traditionally were (and perhaps still are) raised to be ready to fight for their honour and to respond aggressively to personal threats. To determine whether southern males are more likely to be aggressive than northern males, researchers conducted a series of studies at the University of Michigan (Cohen, Nisbett, Bowdle, & Schwarz, 1996). In each study, a male participant walking down a narrow hallway had to pass a male confederate who was blocking the hallway at a filing cabinet. As the participant tried to edge past the confederate, the confederate responded angrily and insulted the participant. Compared with participants raised in the North, those raised in the South became more upset and were more likely to feel personally challenged, more physiologically aroused (measured by cortisol and testosterone increases), more

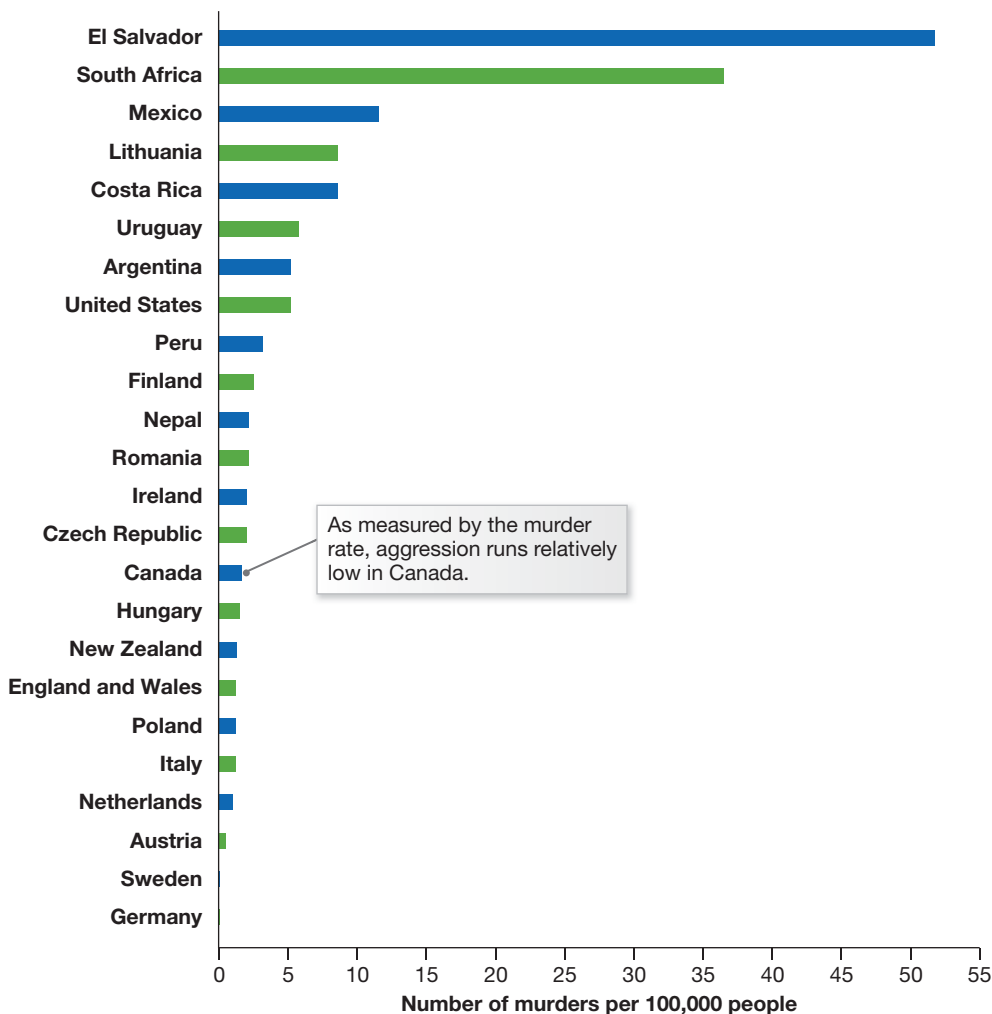
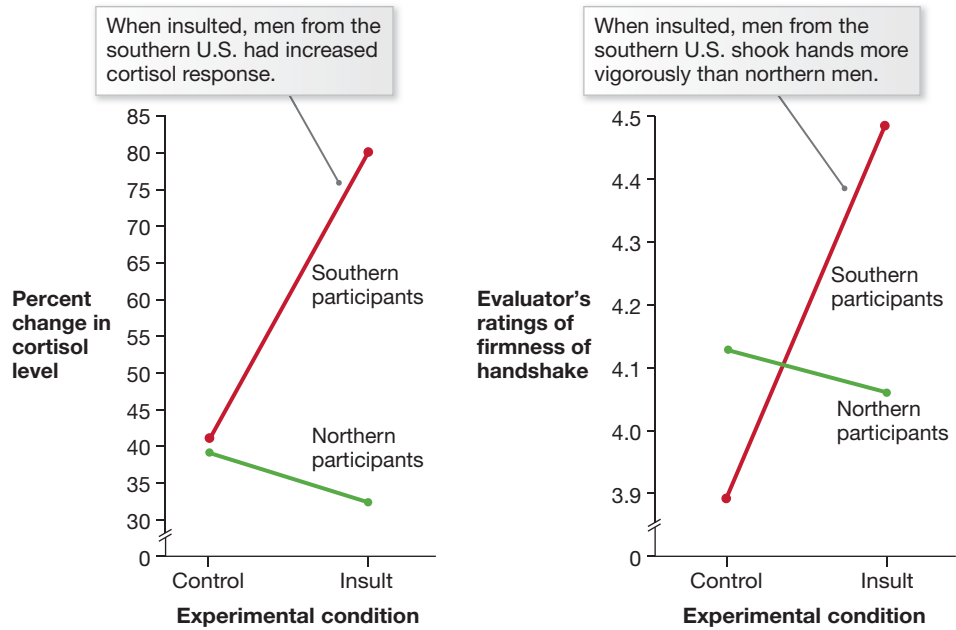


FIGURE 12.25 Aggression Varies across Cultures

As measured by the murder rate, aggression runs relatively low in Canada.

SOURCE: United Nations Office on Drugs and Crime, 2008.



**FIGURE 12.26** Aggressive Responses to Insults

cognitively primed for aggression, and more likely to act in an aggressive and dominant manner for the rest of the experiment—for instance, by vigorously shaking the experimenter’s hand (FIGURE 12.26). The culture-of-honour theory of violence supports Bandura’s social learning theory (discussed in Chapter 6, “Learning”), according to which much aggressive behaviour is learned through vicarious social observation of both reward and punishment. The theory also suggests that our attitudes toward violence are determined by our societies’ cultural norms.

### Many Factors May Influence Helping Behaviour

**prosocial** Tending to benefit others.

People inflict harm on one another in many situations, but they often behave in **prosocial** ways, meaning they act for the benefit of others. Prosocial behaviours include doing favours, offering assistance, paying compliments, subjugating egocentric desires or needs, resisting the temptation to insult or throttle another person, or simply being pleasant and co-operative. By providing benefits to others, prosocial behaviours promote positive interpersonal relationships. Group living, in which people necessarily engage in prosocial behaviours such as sharing and co-operating, may be a central human survival strategy. After all, a group that works well together is a strong group, and belonging to a strong group benefits the individual members.

Why are humans prosocial? Theoretical explanations range from selflessness to selfishness, and from the biological to the philosophical. For instance, Daniel Batson and his colleagues (Batson et al., 1988; Batson, Turk, Shaw, & Klein, 1995) argue that prosocial behaviours are motivated by empathy, in which people share others’ emotions. Conversely, Robert Cialdini and his colleagues (1987; also Maner et al., 2002) argue that most prosocial behaviours have selfish motives, such as wanting to manage one’s public image or relieve one’s negative mood. Others have proposed that people have an inborn disposition to help others. Young infants become distressed when they see other infants crying (Zahn-Waxler & Radke-Yarrow, 1990), and although children’s early attempts to soothe other children generally are ineffective (for instance, they tend initially to comfort themselves rather than the other children), this empathic response to others’ suffering suggests that prosocial behaviour is hard-wired.

**Altruism** is the providing of help when it is needed, without any apparent reward for doing so. The fact that people help others, and even risk personal safety to do so, may seem contrary to evolutionary principles; after all, those who protect themselves first would appear to have an advantage over those who risk their lives to help others. During the 1960s, the British geneticist William Hamilton offered an answer to this riddle; he proposed that natural selection occurs at the genetic level rather than at the individual level. As discussed in Chapter 1, the “fittest” animals pass along the most genes to future generations, through the survival of their offspring. Hamilton’s concept of *inclusive fitness* describes the adaptive benefits of transmitting genes rather than focusing on individual survival. According to this model, people are altruistic toward those with whom they share genes, a phenomenon known as *kin selection*. A good example of kin selection occurs among insects, such as ants and bees, whose workers feed and protect the egg-laying queen but never reproduce. By protecting the group’s eggs, they maximize the number of their common genes that will survive into future generations (Dugatkin, 2004).

Of course, sometimes animals help nonrelatives: For example, dolphins and lions will look after orphans within their own species. Similarly, a person who jumps into a lake to save a drowning stranger is probably not acting for the sake of genetic transmission. The American evolutionary biologist Robert Trivers (1971) proposed the idea of *reciprocal helping* to explain altruism toward nonrelatives. According to Trivers, one animal helps another because the other may return the favour in the future. Consider grooming, in which primates take turns cleaning each other’s fur: “You scratch my back, and I’ll scratch yours.” For reciprocal helping to be adaptive, benefits must outweigh costs, and indeed people will less likely help when the costs of doing so are high. Reciprocal helping will also much more likely occur among animals, such as humans, that live in social groups because their species’ survival depends on co-operation. Thus, as discussed above, people will more likely help members of their ingroups than those of outgroups. From an evolutionary perspective, then, altruism confers benefits, either by increasing the transmission of genes or by increasing the likelihood that others in the social group will reciprocate when needed.

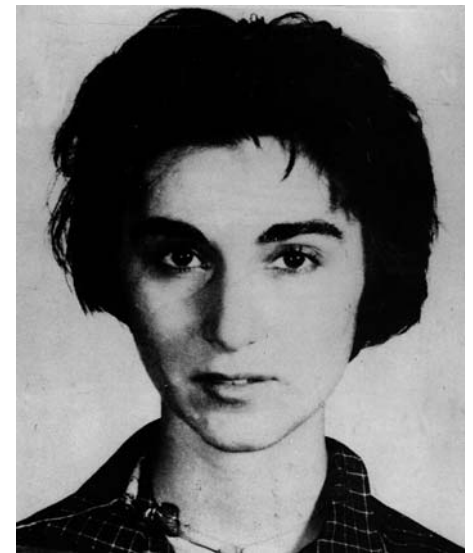
### Some Situations Lead to Bystander Apathy

In 1964, a young woman named Kitty Genovese was walking home from work in a relatively safe area of New York City. An assailant savagely attacked her for half an hour, eventually killing her. At the time, a newspaper reported that none of the 38 witnesses to the crime tried to help or called the police (FIGURE 12.27). As you might imagine, most people who followed the story were outraged that 38 people could sit by and watch a brutal murder. That story appears to have been wrong, however, as none of the few witnesses was in a position to observe what was happening to Genovese (Manning, Levine, & Collins, 2007).

Yet the idea of 38 silent witnesses prompted researchers to undertake important research on how people react in emergencies. Shortly after the Genovese murder, the American social psychologists Bibb Latané and John Darley examined situations that produce the **bystander intervention effect**, or the failure to offer help to someone observed to be in need. Although common sense might suggest that the more people there are available to help, the more likely it is that a victim will be helped, Latané and Darley made the paradoxical claim that a person will less likely help if other bystanders are around.

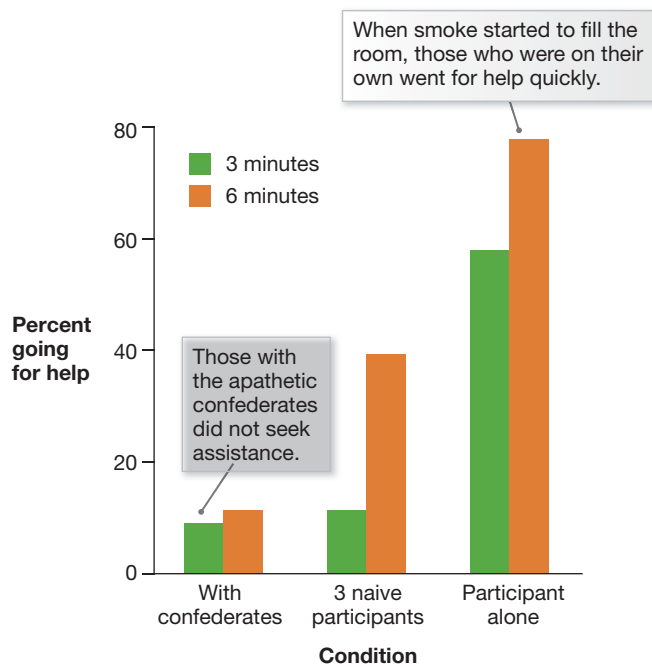
To test their theory, Latané and Darley conducted studies in which people were placed in situations that indicated they should seek help. In one of the first situations

**altruism** The providing of help when it is needed, without any apparent reward for doing so.



**FIGURE 12.27** Kitty Genovese When Genovese was murdered, was she also the victim of bystander apathy?

**bystander intervention effect** The failure to offer help by those who observe someone in need.



**FIGURE 12.28 The Bystander Intervention Effect** Participants waited with two apathetic confederates, with two other naive participants, or alone. This chart records their reactions to smoke filling the room.

(Latané & Darley, 1968), male college students filling out questionnaires in a room were exposed to pungent smoke puffing in through the heating vents. Some participants were alone, some were with two other naive participants, and some were with two confederates, who noticed the smoke, shrugged, and continued filling out their questionnaires. When participants were on their own, most went for help. However, when three naive participants were together, few initially went for help. With the two calm confederates, only 10 percent of participants went for help in the first six minutes (FIGURE 12.28). The other 90 percent “coughed, rubbed their eyes, and opened the window—but they did not report the smoke” (p. 218). Similar results were obtained in subsequent studies, in which people were confronted with mock crimes, apparent heart attack victims in subway cars, and people passed out in public places. The bystander intervention effect, also called *bystander apathy*, has been shown to occur in a wide variety of contexts. Even divinity students, while rushing to give a lecture on the Good Samaritan, failed to help a person in apparent need of medical attention (Darley & Batson, 1973).

Years of research have indicated four major reasons for the bystander intervention effect. First, a diffusion of responsibility occurs, such that people expect other bystanders to help. Thus the greater the number of people who witness someone in need of help, the less likely it is that any of them will step forward. Second, people fear making social blunders in ambiguous situations. All the laboratory situations had some degree of ambiguity, and people may have worried that they would look foolish if they sought help that was not needed. Evidence indicates that people feel less constrained from seeking help as the need for help becomes clearer. In the Genovese murder case, the few witnesses found the situation unclear and therefore might have been reluctant to call the police. Third, people will less likely help when they are anonymous and can remain so. Therefore, if you need help, it is often wise to point to a specific person and request his or her help by saying something like, “You, in the red shirt, call an ambulance!” Fourth, people weigh how much harm to themselves they risk by helping against what benefits they may have to forgo if they help. Imagine you are walking to a potentially dull class on a beautiful day, and in front of you someone falls down, twists an ankle, and needs transportation to the nearest clinic. You probably would be willing to help. Now imagine you are running to a final exam that counts for 90 percent of your grade. In this case, you probably would be much less likely to offer assistance.



## SUMMING UP

### When Do We Harm or Help Others?

Humans in all cultures engage in aggressive acts. Frustration can lead to aggression, as can other factors that induce negative affect. This effect may occur because negative emotion primes aggressive thoughts. Beliefs and cultural norms can alter the expression of aggressive behaviour. People often are willing to offer help to others, especially if the person needing help is a relative. However, people will less likely offer help when there are personal risks involved and when responsibility is diffused.

## MEASURING UP

1. Indicate whether each of the following statements supports a biological, individual-differences, or socio-cultural explanation for aggression.
  - a. Drugs that enhance serotonin activity decrease aggressive behaviours.
  - b. If some people recently watched a violent movie, they will more likely act aggressively.
  - c. Levels and types of violence vary across cultures.
  - d. Levels and types of violence vary within cultures across time.
  - e. Physical violence is more prevalent in the southern United States than in the northern United States.
  - f. Post-mortem examinations of people who committed suicide reveal extremely low serotonin levels.
  - g. Removing the amygdala in a rhesus monkey tames this normally aggressive creature.
  - h. Stimulating a cat's amygdala with an electric shock causes the animal to attack.
  - i. The more an individual's goals are blocked, the greater his or her frustration and aggression.
2. For each of the following scenarios, indicate whether the individuals are likely to evidence bystander apathy. Briefly explain why or why not.
  - a. A university student is in an academic building late one Friday afternoon, when almost everyone has gone home for the weekend. She sees one of her professors lying in the hallway; his breathing is shallow, and he is grasping his chest.
  - b. A driver hurrying to a meeting sees a man hovering over a woman sitting on a park bench. The man is shaking his fist violently, and the woman is looking up at him with terror in her eyes.
  - c. University students are walking across campus after a night on the town. They come across a person who appears to be homeless, curled up on the sidewalk. His eyes and mouth are open, but he does not seem alert.

## What Determines the Quality of Relationships?

You might expect that studying relationships—how people select their friends and romantic partners—would be a high priority for psychological scientists. But until the last decade or so, the topic was given little attention, perhaps because of the difficulty of developing rigorous experiments to test complex and fuzzy concepts such as love, a mysterious state that some think is more appropriate for consideration by poets than by scientists. However, researchers have made considerable progress in identifying the factors that lead us to form friendships and other close relationships (Berscheid & Regan, 2005). Many of these findings consider the adaptiveness of forming lasting affiliative bonds with others. As discussed in Chapter 9, humans have a strong need for social contact, and various factors influence how people select mates. The following section considers the factors that determine the quality of human relationships: how friendships develop, why people fall in love, and why love relationships sometimes fail. As you will see, many of the same principles are involved in choosing our friends and choosing our lovers.

### LEARNING OBJECTIVES

Describe passionate and companionate love.

Distinguish between relationships that are likely to last and relationships that are not.

## Situational and Personal Factors Influence Friendships

Psychological scientists have discovered a number of factors that promote friendships. In 1950, Leon Festinger, Stanley Schachter, and Kurt Back examined friends in a university dorm. Because room assignments were random, the researchers were able to examine the effects of proximity, or how often people come into contact, on friendship. They found that the more often students came into contact, the more likely they would become friends. Indeed, friendships often form among people who belong to the same groups, clubs, and so on.

Proximity might have its effects because of familiarity: People like familiar things more than unfamiliar ones. In fact, humans generally fear anything novel, a phenomenon known as *neophobia*. As discussed earlier, repeatedly being exposed to something leads to increased liking—the mere exposure effect. This effect has been demonstrated in hundreds of studies using various objects, including faces, geometric shapes, Chinese characters, and nonsense words (Zajonc, 2001). However, familiarity can breed contempt rather than liking, as when the more we get to know someone, the more aware we become of how different that person is from us (Norton, Frost, & Ariely, 2007).

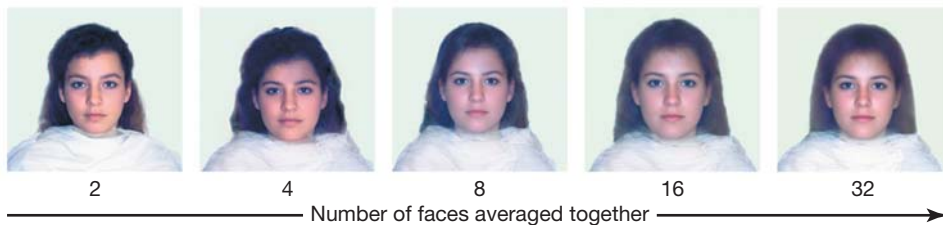
**BIRDS OF A FEATHER** Another factor that increases liking is similarity. Birds of a feather really do flock together. People similar in attitudes, values, interests, backgrounds, and personalities tend to like each other. In high school, people tend to be friends with those of the same sex, race, age, and year in school. University roommates who are most similar at the beginning of the school year are most likely to become good friends. The most successful romantic couples also tend to be the most physically similar, a phenomenon called the *matching principle* (Bentler & Newcomb, 1978; Caspi & Herbener, 1990). Of course, people can and do become friends with, become romantic partners with, and marry people of other races, people who are much older or younger, and so on, but such friendships and relationships tend to be based on other important similarities—values, education, socio-economic status, and so on.

**PERSONAL CHARACTERISTICS** People tend especially to like those who have admirable personality characteristics and who are physically attractive, both as friends and as lovers. In a now-classic study conducted in the 1960s, the American psychologist Norman Anderson asked university students to rate 555 trait descriptions by how much they would like others who possessed those traits. As you might guess from the earlier discussion of who is rejected from social groups, people dislike cheaters and others who drain group resources. Indeed, as shown in **TABLE 12.1**, the least likable characteristics are dishonesty, insincerity, and lack of personal warmth. Conversely, people especially like those who are kind, dependable, and trustworthy. Generally, people like those who have personal characteristics valuable to the group. For example, people like those whom they perceive to be competent much more than those they perceive to be incompetent or unreliable, perhaps because competent people make valuable group members. However, people who seem overly competent or too perfect make others feel uncomfortable or inadequate, and small mistakes can make a person seem more human and therefore more likable. In one study, a highly competent person who spilled a cup of coffee on himself was rated more highly than an equally competent person who did not perform this clumsy act (Helmreich, Aronson, & LeFan, 1970).

**PHYSICAL ATTRACTIVENESS** What determines physical attractiveness? Although some standards of beauty, such as preferences for particular body types, appear to change over time and across cultures, how people rate attractiveness is generally consistent across all cultures (Cunningham, Roberts, Barbee,

**Table 12.1** The Ten Most Positive and Most Negative Personal Characteristics

MOST POSITIVE	MOST NEGATIVE
Sincere	Unkind
Honest	Untrustworthy
Understanding	Malicious
Loyal	Obnoxious
Truthful	Untruthful
Trustworthy	Dishonest
Intelligent	Cruel
Dependable	Mean
Thoughtful	Phony
Considerate	Liar



**FIGURE 12.29 “Average” Is Attractive**  
The more faces that are averaged together, the more attractive the outcome. The face on the right, a combination of 32 faces, typically is rated most attractive.

Druen, & Wu, 1995). In a cleverly designed study of what people find attractive, Langlois and Roggman (1990) used a computer program to combine (or “average”) various faces without regard to individual attractiveness. They found that as more faces were combined, participants rated the “averaged” faces as more attractive (FIGURE 12.29). People may view averaged faces as attractive because of the mere exposure effect, in that such faces may be more familiar than unusual faces (FIGURE 12.30). However, other researchers contend that although averaged faces might be attractive, averaged attractive faces are rated more favourably than averaged unattractive faces (Perrett, May, & Yoshikawa, 1994).

Most people find symmetrical faces more attractive than asymmetrical ones. This preference may be adaptive, in that a lack of symmetry could indicate poor health or a genetic defect. There are no racial differences in the extent to which faces are symmetrical, but biracial people tend to have more symmetrical facial features and correspondingly are rated as more attractive than those who are uniraical (Phelan, 2002). It does not seem to matter which two races comprise the genetic makeup. (We do not yet have data on the attractiveness of multiracial people.)

Attractiveness can bring important social benefits: Most people are drawn to those they find physically attractive. Attractive people are typically judged to be happier, more intelligent, more sociable, more successful, and less socially deviant. Taken together, these findings point to what the Canadian researcher Karen Dion and her colleagues (1972) dubbed the “*what is beautiful is good*” stereotype. A meta-analysis of many hundreds of research studies of the effects of attractiveness on interpersonal

**FIGURE 12.30 Try for Yourself: Which Average Is More Attractive?**

Which face do you find most attractive?



Image (a) represents the averaging of 60 women. Image (b) is the composite of the 15 most attractive faces out of that 60. Given a choice between (a) and (b), most people prefer (b). Image (c) exaggerates the subtle differences between (a) and (b). Given a choice between (b) and (c), 7 out of 10 people prefer (c).

**Explanation:** Female faces that have stereotypically feminine features, such as larger eyes, a smaller nose, plumper lips, and a smaller chin, tend to be rated most attractive.

evaluation and behavioural outcomes found that being attractive confers numerous benefits (Langlois et al., 2000). Physically attractive people are less likely to be perceived as criminals, are given lighter sentences when convicted of crimes, are rated as more intelligent and capable and gifted, are paid more for doing the same work, and have greater career opportunities. The preference for physical attractiveness begins early. Children as young as six months prefer to look at attractive faces, and young children prefer attractive over unattractive playmates (Rubenstein, Kalakanis, & Langlois, 1999). Even mothers treat attractive children differently from unattractive children. In one study, researchers observed more than 100 mothers feeding and playing with their just-born babies (while still in the hospital) and then again three months later (Langlois, Ritter, Casey, & Sawin, 1995). Mothers of attractive infants were much more affectionate and playful than mothers of unattractive children, who attended to other people more than to their infants. Mothers of attractive infants also expressed slightly more positive attitudes about those infants.

Given such preferential treatment, do physically attractive people actually possess characteristics consistent with the “what is beautiful is good” stereotype? The evidence on this issue is mixed. Attractive people tend to be more popular, more socially skilled, and healthier, but they are not necessarily smarter or happier. Among studies of university students, the correlation between objective ratings of attractiveness and other characteristics appears small. In one study that examined physical attractiveness, objectively rated by multiple judges, the researchers did not find any relation between appearance and grades, number of personal relationships, financial resources, or just about anything (Diener, Wolsic, & Fujita, 1995). In addition, attractive people are similar to less attractive people in intelligence, life satisfaction, and self-esteem. Why does having all the benefits of attractiveness not lead to greater happiness? Possibly, attractive people learn to distrust attention from others, and especially from the opposite sex, because they assume people like them simply for their looks. Believing that good things happen to them primarily because they are good looking may leave people feeling insecure, given that looks can fade or change with age.

## Love Is an Important Component of Romantic Relationships

As noted above, psychological scientists have long neglected the study of love, in part because love seems to be a mysterious state that defies sensible comprehension. Thanks to the pioneering work of the American researchers Elaine Hatfield and Ellen Berscheid, researchers now can use scientific methods to examine this important interpersonal bond. Hatfield and Berscheid have drawn an important distinction between *passionate love* and *companionate love*. Passionate love is a state of intense longing and sexual desire, the kind of love often portrayed stereotypically in the movies. In passionate love, people fall head over heels for each other, feel an overwhelming urge to be together, and are continually sexually aroused in each other’s presence (**FIGURE 12.31A**). Brain imaging studies show that passionate love is associated with activity in dopamine reward systems, the same ones involved in drug addiction (Fisher, Aron, & Brown, 2006; Ortigue, Bianchi-Demicheli, Hamilton, & Grafton, 2007; on brain imaging, see Chapter 2, “Research Methodology”; on brain chemistry, see Chapter 3, “Biological Foundations”). Companionate love is a strong commitment to care for and support a partner that develops slowly over time. It is based on friendship, trust, respect, and intimacy (**FIGURE 12.31B**). Although people experience passionate love early in relationships, in most enduring relationships it evolves into a more companionate love, in which intimacy and commitment dominate (Sternberg, 1986).

One theory of love is based on attachment theory. As discussed in Chapter 11, infants can form different levels of attachment with their parents. According to the





(a)



(b)

**FIGURE 12.31 Passionate versus Companionate Love** (a) The arts tend to focus on passionate love, as in this scene from the 1996 movie version of William Shakespeare's *Romeo and Juliet*, starring Claire Danes and Leonardo DiCaprio. (b) Romances such as *New York, I Love You*, however, focus on older, more mature partners that emphasize intimacy, trust, and respect.

American researchers Cindy Hazan and Phillip Shaver (1987), adult relationships, especially romantic relationships, also vary in their attachment styles. The types of attachment styles people have as adults are assumed to relate to how their parents treated them as children (Fraley & Shaver, 2000). Those who believe their parents were warm, supportive, and responsive report having secure attachments in their relationships. They find it easy to get close to others and do not fear being abandoned. Just under 60 percent of adults report having this attachment style (Mickelson, Kessler, & Shaver, 1997). Those who believe their parents were cold and distant, about 25 percent of the population, report having avoidant attachments. They find it hard to trust or depend on others, and they are wary of those who try to become close to them. Relationship partners make them uncomfortable. Those whose parents treated them inconsistently—sometimes warm and sometimes not—have anxious-ambivalent attachments. This 11 percent of the population is best described as clingy. They worry that people do not really love them and are bound to leave them. However, these findings are based partly on people's recollections of how their parents treated them, and it is possible that their memories are distorted.

### Love Is Fostered by Idealization

The Irish playwright George Bernard Shaw once commented that “Love is a gross exaggeration of the difference between one person and everybody else.” Is there any truth in Shaw's cynical remark?

Researchers at the University of Waterloo have argued that there is. Sandra Murray, John Holmes, and Dale Griffin reasoned that people who fall in love and maintain that love tend to be biased toward positive views of their partners. This bias enables the lovers to reconcile the conflicting thoughts “I love my partner” and “My partner sometimes does things that drive me crazy!” After all, people in love relationships often have to make accommodations for one another's failures. Suppose, for example, that your romantic partner has annoying habits, such as frequently arriving late or always leaving dirty dishes around your home. Or suppose your partner behaves in an unlovable way, such as becoming angry and kicking the wall, growing very overweight, or losing money in a get-rich-quick scheme. Paying attention to your partner's flaws or placing too much importance on your partner's occasional failure should make it very difficult to remain in love. If, however, you hold positive illusions about your partner, you should encounter fewer conflicting thoughts. So you might think of your partner's anger as reflecting how “he is in touch with his feelings,” his increasing girth as a sign that “he knows how to enjoy life,” and his botched investments as indications that “he's trying his best to provide his family with new opportunities.” You should thus have an easier time keeping the love going.

To investigate this hypothesis, Murray and colleagues (1996) investigated dating and married partners' perceptions of each other. The results were consistent with their predictions: Those people who idealized their partners the most (i.e., viewed their partners in the most unrealistically positive terms compared with how they viewed other people *and* compared with how their partners viewed themselves) also loved their partners the most. Those people with the most positively biased views of their partners were more likely to still be in the relationships with their partners several months later than were those with more “realistic” views of their partners. A little idealization appears to buffer a relationship against the ugly truths that might threaten it.

## Making Love Last Is Difficult

Many contemporary Western marriages fail. In North America, approximately half of marriages end in divorce or separation, often within the first few years. In addition, many couples who do not get divorced live together unhappily, in a constant state of tension or as strangers sharing a home. The social psychologist Rowland Miller notes that “married people are meaner to each other than they are to total strangers” (1997, p. 12). People often take their relationship partners for granted, openly criticize them, and take out their frustrations on them by being cruel or cold. Perhaps unsurprisingly, then, relatively few marriages meet the blissful ideals that newlyweds expect.

As noted above, passion typically fades over time. The long-term pattern of sexual activity within relationships shows a rise and then a decline. Typically, for a period of months or even years, the two people experience frequent, intense desire for one another and have sex as often as they can arrange it. Past that peak, however, their interest in sex with each other wanes. Frequency of sex declines by about half from the first year of marriage to the second, for example, and it continues to decline, although more gradually, thereafter. Not only does frequency of sex decline, but people typically experience less passion for their partners over time. Unless people develop other forms of satisfaction in their romantic relationships, such as friendship, social support, and intimacy, the loss of passion leads to dissatisfaction and often to the eventual dissolution of the relationship (Berscheid & Regan, 2005).

**DEALING WITH CONFLICT** Even in the best relationships, some conflict is inevitable, and couples continually need to resolve strife. Confronting and discussing important issues is clearly an important aspect of any relationship. The way a couple deals with conflict often determines whether the relationship will last. John Gottman (1994) describes four interpersonal styles that typically lead couples to discord and dissolution, and he calls these patterns of interacting the “Four Horsemen of the Apocalypse” to reflect their threats to relationships. These maladaptive strategies are *being overly critical*, *holding the partner in contempt*, *being defensive*, and *mentally withdrawing from the relationship*. For example, when one partner voices a complaint, the other responds with his or her own complaint(s) and often raises the stakes by recalling all of the other person’s failings. People use sarcasm and sometimes insult or demean their partners. Inevitably, any disagreement, no matter how small, escalates into a major fight over the core problems, which often centre around a lack of money or of sex or of both. More-satisfied couples tend to express concern for each other even while disagreeing, try to see each other’s point of view, and manage to stay relatively calm. Delivering criticism lightheartedly and playfully is also a strategy for relationship satisfaction (Keltner, Young, Heerey, Oemig, & Monarch, 1998). In addition, optimistic people are more likely to use co-operative problem solving; as a result, optimism is linked to having satisfying and happy romantic relationships (Assad, Donnellan, & Conger, 2007; Srivastava, McGonigal, Richards, Butler, & Gross, 2006).

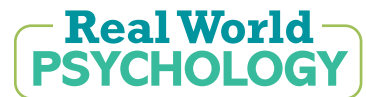
**ATTRIBUTIONAL STYLE AND ACCOMMODATION** Unhappy couples also differ from happy couples in *attributional style*, or how one partner explains the other's behaviour (Bradbury & Fincham, 1990). Essentially, happy couples attribute good outcomes to one another and bad outcomes to situations, whereas distressed couples do the opposite. Happy couples make partner-enhancing attributions in which they overlook bad behaviour or respond constructively, a process called *accommodation* (Rusbult & Van Lange, 1996). In contrast, unhappy couples make distress-maintaining attributions, in which they view one another in the most negative ways possible. In unhappy couples, if one partner comes home with flowers, for example, the other partner wonders what ill deed the first partner committed rather than reflecting on that partner's generosity and sweetness.

Over the past two decades, a number of psychological scientists have conducted research on healthy and unhealthy relationships. Among the foremost of these researchers is John Gottman, who has studied thousands of married couples to understand what predicts marital outcomes (Gottman, 1998). In his 1994 book, *Why Marriages Succeed or Fail and How You Can Make Yours Last*, Gottman outlines numerous differences between couples who are happy and those who are not. He also dispels some common myths about couples—for instance, that couples who have the most sex are the happiest. Actually, couples who *agree* on the frequency of sex are happiest. No matter the frequency, if one person thinks it is too often and the other thinks it is not often enough, that spells conflict. Furthermore, many people believe that conflict is a sign of a troubled relationship and that couples who never fight must be the happiest, but these ideas are not true either. According to research by Gottman and others, fighting, especially when it allows grievances to be aired, is one of the healthiest things a couple can do for their relationship. Conflict is inevitable in any serious relationship, but resolving conflict positively is the key to happiness as a couple.

Gottman asserts that the most successful type of couple is what he calls a *validating* couple, in which partners may disagree—may respond to particular situations by having different opinions and feeling different emotions—but each partner considers the other partner's opinions and emotions valid. People in such relationships make statements like “I know that it makes you angry when I hang the toilet paper the wrong way, but it was never a big deal to me which way it should hang.” Validating couples try to compromise and to demonstrate mutual respect. Quite simply, they do the hard work of working things out.

Based on his research, Gottman believes that as long as there are about five positive interactions for every negative one in a relationship, chances are good that the relationship will be stable. Couples headed for breakup fall below this level, and if there are as many negatives as positives in a relationship, the prognosis is pretty bleak. Therefore, the task for any couple is to seek opportunities for positive feelings within the relationship. According to Gottman and others, the same principles apply to all long-term, committed relationships, heterosexual or homosexual:

- Show interest in your partner. Listen to him or her describe the events of the day. Pay attention while he or she is speaking and maintain eye contact. Try to be empathetic; show that you really understand and can feel what your partner is feeling. Such empathy and understanding cannot be faked, but saying, for example, “That must have been really annoying” conveys that you understand your partner's feelings.
- Be affectionate. You can show love in very quiet ways, such as simply touching the person once in a while. Reminisce about happy times together. Appreciate the benefits of the relationship. A couple who talk about the joys of their relationship, including comparing their partnership favourably to those of other people, tend to be happier with their relationship.





(a)



(b)

**FIGURE 12.32 Principles for a Committed Relationship** Positive interactions help keep a relationship stable. **(a)** A thoughtful gesture is one way to show your partner you care. **(b)** Doing activities you both enjoy is one way to spend quality time together.

- Show you care. Many people take their partners for granted. Try to do spontaneous things such as buying flowers or calling your partner at an unexpected time just to see how he or she is doing (**FIGURE 12.32A**). Such actions let your partner know you think about him or her, even when you are not together. When we are dating people, we flirt with them, give them compliments, and display our best manners. Being in a committed relationship does not mean you do not have to do any of these things. Be nice to your partner and try to make him or her feel that you value your mutual companionship. Praise your partner whenever possible. In turn, he or she will feel free to act in kind, which will help you feel good about yourself.
- Spend quality time together. It is easy for a couple to drift apart and develop separate lives. Find time to explore joint interests, such as hobbies or other activities (**FIGURE 12.32B**). Partners should pursue independent interests, but having some activities and goals in common helps bring a couple closer. Having fun together is an important part of any relationship. Share private jokes, engage in playful teasing, be witty. Enjoy each other.
- Maintain loyalty and fidelity. Outside relationships can be threatening to an intimate partnership. Believing your partner is emotionally or physically involved with another person can pose harm to even the healthiest relationship, as can being distrustful or jealous for no reason. At their core, relationship partners have to trust one another. Anything that threatens that basic sense of trust will harm the relationship.
- Learn how to handle conflict. Do not avoid it and pretend you have no serious issues. Rather, calm down, try to control your anger, and avoid name-calling, sarcasm, or excessive criticism. Validate your partner's feelings and beliefs even as you express your own feelings and beliefs. Look for areas of compromise.

Although much of this advice seems like common sense, many couples lose sight of how to express their love and commitment. Partners can get so caught up in everything else in their lives, from work to raising children, that it becomes easier to focus on what is wrong in a relationship than on what is right. When that happens, the relationship has taken a wrong turn. To make a relationship stronger, partners must put considerable effort into recognizing and celebrating all that is good about the relationship. Those affirming experiences make relationships succeed.

## ▶ SUMMING UP

### What Determines the Quality of Relationships?

People form friendships based on proximity, familiarity, similarity, and personal characteristics, such as personality traits and attractiveness. Love is an important component of romantic relationships. Relationships based solely on sexual passion may fail when that passion starts to wane, as it often does over time. How a couple deals with conflict is an important determinant of whether the relationship will endure. Happy couples tend to make positive attributions for the partners' behaviours, whereas unhappy couples tend to make negative attributions.

## ▶ MEASURING UP

1. Label each of the following characteristics as an attribute of passionate love or companionate love.
  - a. a longing to be together
  - b. associated with dopamine reward systems

- c. based on friendship
  - d. develops slowly over time
  - e. emotionally volatile
  - f. strong commitment to care for and support partner
  - g. typified by sexual desire
  - h. typified by trust and respect
2. For each of the following situations, select the comment that, according to empirical findings, indicates a lasting relationship.
- Situation 1: Chris finds a receipt in Sam's pocket for a \$200 pair of pants. Because they are on a tight budget, this expense angers Chris. Chris confronts Sam about the expense.
- a. Sam replies, "It seems only fair that I get to treat myself when you have your \$70-a-month gym membership."
  - b. Sam replies, "I understand why you're upset. I really do need a new pair of pants, but I don't need a \$200 pair of pants, so I'll return these tomorrow and get a less expensive pair."
- Situation 2: Jordan and Jane receive a letter from the Canada Revenue Agency saying they owe \$3,000 in back taxes because of an error in the documents their accountant filed a few years ago.
- a. Jordan notes, "The accountant made this error, and now we have to come up with the money to pay for it! Well, good thing we've been saving."
  - b. Jordan notes, "Didn't you say you reviewed those documents? Next time, you have to be more careful."

## CONCLUSION

Even as we feel in control of our own behaviour and believe we can make sense of others' actions, we often fail to take into account how powerfully social situations can influence behaviour, attitudes, and beliefs. Moreover, much of how we think about ourselves and others occurs automatically and is based on minimal information. These judgments are often biased in ways that make us feel good about ourselves, frequently at others' expense. Research crossing levels of analysis has shown that stereotypes alter the way people perceive and process information about others. Brain activity often indicates that people do not report, or perhaps even know about, attitudes they hold, such as negative ones about ethnic minorities. Using only some of their mental resources, human minds automatically categorize others, with the outcome that people fail to treat others individually and with respect. People easily develop ingroups and outgroups; a group can consist of as few as three people. Yet social psychologists have discovered that co-operative learning systems can benefit the self and society. The challenge now is to adapt these systems to larger groups in society and to motivate these groups to use them.

Much of the strength of the social situation comes from the human need to belong. People favour their groups, go along with their leaders, and are motivated to avoid conflict to maintain group harmony. However, pressure to conform to the group leaves people susceptible to social influence and may cause them to act in ways that conflict with their personal standards. Understanding the power of social situations allows us to at least partially understand humans' inhumane acts and to more fully understand humans' everyday behaviour.

## CHAPTER SUMMARY

### How Do Attitudes Guide Behaviour?

- **We Form Attitudes through Experience and Socialization:** Attitudes are influenced by familiarity (the mere exposure effect) and can be shaped by conditioning and through socialization.
- **Behaviours Are Consistent with Strong Attitudes:** Implicit attitudes (those that are automatic and easily activated from memory) can influence behaviour and may differ from explicit attitudes (those we profess).
- **Discrepancies Lead to Dissonance:** A mismatch between attitudes or between an attitude and a behaviour causes cognitive dissonance, which is usually resolved by a change in attitude. A behavioural change is possible but more difficult to accomplish. To justify behaviour that does not reflect attitudes, people often inflate positive aspects of the experience.
- **Attitudes Can Be Changed through Persuasion:** Persuasion often works by focusing on either the message (the central route) or the feelings the message generates (the peripheral route).

### How Do We Form Our Impressions of Others?

- **Nonverbal Actions and Expressions Affect Our Impressions:** Nonverbal behaviour (body language) is interpreted quickly and provides valuable information.
- **We Make Attributions about Others:** We use personal dispositions and situational factors to explain others' behaviour. Fundamental attribution error occurs when personal attributions are favoured over situational attributions in explaining others' behaviour.
- **Stereotypes Are Based on Automatic Categorization:** Stereotypes are cognitive schemas that allow for fast, easy processing of social information; they can lead to bias and illusory correlations. Self-fulfilling prophecies occur when people behave in ways that confirm the biases of stereotypes.
- **Stereotypes Can Lead to Prejudice:** Prejudice occurs when the attitude associated with a stereotype is negative. Having a negative bias can lead to discriminatory action. We show a preference for members of our ingroup versus those in outgroups.
- **Co-operation Can Reduce Prejudice:** Sharing superordinate goals that require co-operation leads to reduced prejudice and discrimination.

### How Do Others Influence Us?

- **Groups Influence Individual Behaviour:** The presence of others can improve performance (social facilitation) or create laziness (social loafing). Loss of personal identity and of self-awareness (deindividuation) can occur in groups. Group decisions can be extreme.

- **We Conform to Social Norms:** Socially determined influences on behaviour occur through awareness of social norms. Lack of unanimity diminishes conformity.
- **We Are Compliant:** Various factors influence the likelihood of compliance, among them what mood we are in and whether we have previously agreed to a lesser request (foot-in-the-door effect).
- **We Are Obedient to Authority:** People readily behave in ways directed by authorities, even to the extent of harming others.

### When Do We Harm or Help Others?

- **Aggression Can Be Adaptive:** Brain structures, neurochemistry, and hormones influence aggression. Biologically based responses can be adaptive. Frustration can lead to aggression.
- **Aggression Has Social and Cultural Aspects:** Aggression is not entirely adaptive and is influenced by our social and cultural experiences.
- **Many Factors May Influence Helping Behaviour:** Prosocial behaviours maintain social relations. Altruism toward kin may favour inclusive fitness. Reciprocal helping is more likely in social groups in which survival depends on co-operation.
- **Some Situations Lead to Bystander Apathy:** The presence of others in an emergency may diffuse responsibility and lead to individual inaction.

### What Determines the Quality of Relationships?

- **Situational and Personal Factors Influence Friendships:** People affiliate with others who are similar to themselves and who possess valued characteristics, such as attractiveness.
- **Love Is an Important Component of Romantic Relationships:** In successful romantic relationships, passionate love tends to evolve into companionate love.
- **Love Is Fostered by Idealization:** Romantic relationships may be more resilient when partners view each other in unrealistically positive terms.
- **Making Love Last Is Difficult:** As passion fades, couples must develop other areas of satisfaction. How a couple deals with conflict influences the stability of the relationship. Generally, in a happy couple the partners have positive views of each other and their relationship.

## KEY TERMS

aggression, p. 565	compliance, p. 561	frustration-aggression hypothesis, p. 566	nonverbal behaviour, p. 545	self-fulfilling prophecy, p. 549
altruism, p. 569	conformity, p. 559	fundamental attribution error, p. 546	personal attributions, p. 546	situational attributions, p. 546
attitudes, p. 537	deindividuation, p. 557	implicit attitudes, p. 538	persuasion, p. 540	social facilitation, p. 557
attributions, p. 545	discrimination, p. 550	ingroup favouritism, p. 551	prejudice, p. 550	social loafing, p. 557
bystander intervention effect, p. 569	elaboration likelihood model, p. 541		prosocial, p. 568	social norms, p. 559
cognitive dissonance, p. 539	explicit attitudes, p. 538			stereotypes, p. 548

## PRACTICE TEST

1. Which of the following scenarios illustrates postdecisional dissonance?
  - a. Josh has always wanted to attend University A. During his senior year of high school, he applies to University A and University B. Although he receives acceptance letters from both institutions, he

decides to attend University A. When asked to explain why he wants to attend University A, he says, "I like that I can live on campus. There's a great community vibe here. Plus I can major in international business. None of these things are true of the other school."

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.

- b. Adrianna wants to go on a community service trip during her spring break. After struggling for weeks to decide between two options, she opts to build houses in rural Mexico instead of helping the homeless in Montreal. When asked to explain why she made this decision, she says, "The Mexico trip will give me a chance to travel outside Canada, which I've always wanted to do. Plus, the Montreal trip sounded pretty stale."
2. Which of the following scenarios illustrates justification of effort?
- David's boss regularly asks him to do a lot of extra tasks around the office, but David's pay does not reflect the extra effort he puts into emptying the recycling bin, washing out coffee mugs, or refilling the printer paper. When asked why he does all these extra tasks, David replies, "I'm happy to do whatever it takes to make our office as welcoming and efficient as possible."
  - Sasha elects to attend an intensive, summer-long math program. When asked why she gave up her summer vacation for this program, Sasha says, "I'll be able to get university credit for the courses I took there, plus I got a scholarship that paid for my tuition, room, and board. It was a deal I couldn't refuse."
3. Some of the following statements illustrate cognitive or behavioural outcomes of stereotyping. As appropriate, label those statements as examples of illusory correlation, ingroup favouritism, outgroup homogeneity, and self-fulfilling prophecy. Not all response options will be used.
- A first-year university student states, "Students at our university are so unique! Each person has his or her own passions and aptitudes."
  - A professor mistakenly comments to a colleague, "The athletes in my class always seem to ask for extensions on their homework; none of my other students ever ask for extensions."
  - A fourth-year student from University A tells her friend, "Whatever you do, don't go to parties at University B. They all drink way too much, and the guys can't keep their hands off the women at their parties."
4. Dorm A and Dorm B have a long-standing rivalry. Recently, the rivalry has intensified, resulting in destructive acts to property and harassment of outgroup members. A couple students from each dorm encourage the students to get together to brainstorm possible strategies for easing the tension. According to the ideas presented in this chapter, which suggestion would be most effective?
- "Let's hold a series of dorm dinners. Dorm A can invite people from Dorm B over one week, and Dorm B can invite people from Dorm A over the following week."
  - "Since people in Dorm A are such strong math students, we could have Dorm A offer math tutoring to students from Dorm B."
  - "The administration should hold a meeting with the dorm presidents to let them know that funding for dorm activities will be cut unless the interdorm tension subsides."
  - "We can hold an all-campus competition, where teams of dorms would compete for prizes. Dorm A and Dorm B could be on one team; Dorm C and Dorm D could be on the other team."
5. Which of the following examples of social norms marketing would most likely be most effective?
- 80 percent of the residents in your neighbourhood recycle.
  - 80 percent of the residents in your neighbourhood recycle. Keep up the great work!
  - Recycle!
  - Recycle! It's the right thing to do!
6. Some of the following scenarios illustrate compliance strategies discussed in this chapter. As appropriate, label each scenario as an example of door in the face, foot in the door, or low-balling. Not all response options will be used, and not every example will have an appropriate label.
- After a gruelling series of abdominal crunches, a fitness instructor tells her class, "C'mon, just eight more!" Then, after the eight crunches, she says, "OK, now crunch up and hold for eight counts!"
  - A professor tells her students, "As you know, we're going on a class field trip this Saturday. I'd like us to all meet up at 8:00 AM. Will that time work for everyone?" Then, upon encountering much resistance from the class, she says, "Okay, okay. Instead of 8:00, let's meet at 9:00."
  - You see an infomercial for a collection of fancy knives. A countdown timer appears in the corner of the screen, reminding you the deal will be available for only three more minutes.
7. Which of the following examples most accurately describes the relationship between relationship length and frequency of sex?
- After an initial period of frequent sex, there is a negative correlation between relationship length and frequency of sex.
  - There is a near-zero correlation between relationship length and frequency of sex.
  - There is a negative correlation between relationship length and frequency of sex.
  - There is a positive correlation between relationship length and frequency of sex.
8. Match each definition below with the appropriate term: altruism, inclusive fitness, kin selection, reciprocal helping.
- a process in which individuals behave helpfully toward those with whom they share genes
  - providing help without any apparent reward for doing so
  - the tendency for one animal to help another because the other can return the favour in the future
  - the adaptive benefits of transmitting genes rather than focusing on individual survival
9. Which statement below about Shelly, who is very attractive, is most consistent with the "what is beautiful is good" stereotype?
- "Shelly is a total ditz!"
  - "Shelly is easily the happiest person I know!"
  - "Shelly sure knows how to manipulate other people with her looks!"
  - "Shelly's parents are really attractive, too."

## ■ PSYCHOLOGY AND SOCIETY

- Seek out examples of public service announcements. You can find them on television, in print, or on the Internet (for example, check out [www.adcouncil.org](http://www.adcouncil.org)). Analyze the ads using ideas from the elaboration likelihood model. Make clear whether the ads use the central or peripheral routes to persuasion, identify cues (source, content, receiver) likely to influence the persuasiveness of the message, and note whether the ads use a social norms marketing approach.
- Our social worlds are full of norms: how to act, how to dress, when to eat, what to say, how to say it, and so on. For one 24-hour period, write down as many social norms as you can identify. You might find it helpful to ask, "How would others react if I \_\_\_\_\_?" In the blank, fill in any nonstandard behaviour. Would people laugh at you or give you a dirty look? If so, you probably would be violating a norm. After logging the observed norms, write a brief essay reflecting on what you learned as a result of engaging in this activity.





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# Personality

MIKE MYERS HAS BEEN FAMOUS FOR HIS COMEDIC TALENTS since he starred in *Saturday Night Live*, where he introduced eccentric characters such as Wayne Campbell of “Wayne’s World” and Dieter from “Sprockets.” He went on to star in a number of hit movies, including the Austin Powers series, and he provided the voice of Shrek in that series of animated features. He tends to play likable and goofy characters and has won a strong popular following. Given everything that you know about Myers’s public persona, what kind of person do you think he is? What do you suppose makes people find him so appealing onscreen?

Would it surprise you to learn that Mike Myers is quite shy? He hosted the MTV Awards in 2008, but told *People* magazine, “I rarely host things, because I’m very, very shy,” and he admitted to being only “an intermittent extrovert.” Very little in Myers’s modest upbringing, in

## How Have Psychologists Studied Personality?

- Psychodynamic Theories Emphasize Unconscious and Dynamic Processes
- Humanistic Approaches Emphasize Integrated Personal Experience
- Type and Trait Approaches Describe Behavioural Dispositions
- Personality Reflects Learning and Cognition

## How Is Personality Assessed, and What Does It Predict?

- Personality Refers to Both Unique and Common Characteristics
- Researchers Use Objective and Projective Methods to Assess Personality

- Observers Show Accuracy in Trait Judgments
- People Sometimes Are Inconsistent
- Behaviour Is Influenced by the Interaction of Personality and Situations
- There Are Cultural and Gender Differences in Personality

## What Are the Biological Bases of Personality?

- Animals Have Personalities
- Personality Is Rooted in Genetics
- Temperaments Are Evident in Infancy
- Personality Is Linked to Specific Neurophysiological Mechanisms
- Personality Is Adaptive

- Critical Thinking Skill: Avoiding Single-Cause Explanations
- Personality Traits Are Stable over Time

## How Do We Know Our Own Personalities?

- Our Self-Concepts Consist of Self-Knowledge
- Perceived Social Regard Influences Self-Esteem
- Critical Thinking Skill: Resisting Appeals to Snobbery
- We Use Mental Strategies to Maintain Our Views of Self
- There Are Cultural Differences in the Self

Scarborough, Ontario, gave indications that he had the outgoing personality that we might expect from a comedian and actor. Myers was a relatively quiet student in high school, according to at least one source (co-author Heathererton's wife, Patricia) who remembers him from Scarborough's Sir John A. Macdonald Collegiate Institute.

So who is the real Mike Myers? Does knowing that he was shy as a child tell us anything about what he is like as an adult? If Myers is still shy, how can he stand in front of thousands of people to host an awards show? Did becoming an actor as a teenager enable Myers to overcome his shyness? Or did he just decide not to be shy when on stage? Psychologists consider these sorts of questions as they seek to understand what makes each person—a movie star, a college student, or any type of person—unique.

In 1982, Myers graduated from Stephen Leacock Collegiate Institute. Coincidentally, the Emmy Award-winning actor Eric McCormack, of *Will & Grace* fame, also attended Sir John A. Macdonald and Stephen Leacock. McCormack, a month older than Myers, also reports being shy during childhood, when he saw himself as an outsider who did not play sports (Lee, 2000). How might frequent taunting by his peers have contributed to McCormack's desire to take the stage? Other celebrities who report being shy include Tom Hanks, Sigourney Weaver, David Letterman, and Jim Carrey (who, like Myers and McCormack, is from Ontario).

Understanding personality may be one of the oldest quests in psychology. Since antiquity, a vast array of theories has been proposed to explain basic differences among individuals. **Personality** consists of the characteristic thoughts, emotional responses, and behaviours that are relatively stable in an individual over time and across circumstances. (The word *personality* comes from the Latin *persona*, meaning “mask”; in ancient Greek and Roman theatre, actors would speak through masks, each representing a separate personality.) People constantly try to figure out other people—to understand why they behave in certain ways and to predict their behaviour. In fact, many students take psychology courses partly because they want to know what makes other people tick.

One challenge of figuring out people is that they may act differently depending on the situation. How much can a person's behaviour tell us about his or her personality? What else do we need to know to understand someone? If each person is unique, what determines this uniqueness? For instance, what factors during childhood affect personality? Also, to what extent does a person's personality change throughout that person's life?

Personality psychologists study the processes that influence personality, and their research explores the influence of culture, learning, and biological and cognitive factors. Some personality psychologists are most interested in understanding *whole persons*—that is, what makes each person unique. Another approach is to study individual traits—that is, how people differ on one or a few dimensions. People obviously differ in many ways: Some are hostile, some are nurturing, some are withdrawn. Each characteristic is a **personality trait**, a dispositional tendency to act in a certain way over time and across circumstances. What sort of person are you? More to the point, why are you who you are?

**personality** The characteristic thoughts, emotional responses, and behaviours that are relatively stable in an individual over time and across circumstances.

**personality trait** A characteristic; a dispositional tendency to act in a certain way over time and across circumstances.

#### LEARNING OBJECTIVE

List the major theorists and concepts associated with four general approaches to the study of personality.

## How Have Psychologists Studied Personality?

Dan McAdams, a leading American personality researcher, has asked, “What must we know to know a person well?” Different psychological scientists try to answer this question in different ways, often depending on their theoretical approaches. Some personality psychologists emphasize biological and genetic factors. Others emphasize culture, patterns of reinforcement, or mental and unconscious processes.

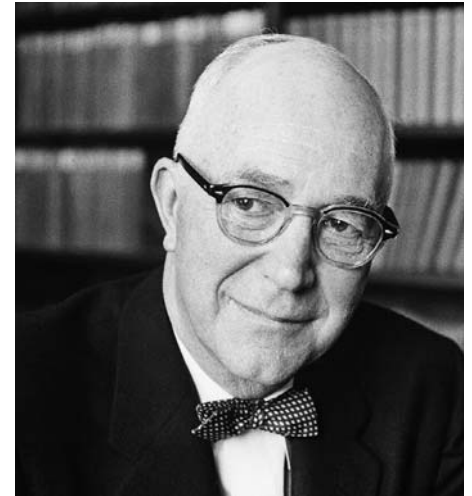
To understand people well is to understand everything about them—their biological makeups, their childhood experiences, their cultural backgrounds, the way they think. All these factors shape people in unique ways. Therefore, personality psychologists approach the study of personality on many levels.

Gordon Allport, of Harvard University, gave a classic scientific definition of personality: “the dynamic organization within the individual of those psychophysical systems that determine his characteristic behaviour and thought” (1961, p. 28; **FIGURE 13.1**). This definition includes many of the concepts most important to a contemporary understanding of personality. The notion of *organization* indicates that personality is not just a list of traits but a coherent whole. Moreover, this organized whole is *dynamic* in that it is goal seeking, sensitive to context, and adaptive to environment. By emphasizing *psychophysical systems*, Allport highlights the psychological nature of personality while recognizing that personality arises from basic biological processes. In addition, his definition stresses that personality causes people to have *characteristic* behaviours and thoughts (and feelings). In other words, they do and think and feel things relatively consistently over time.

## Psychodynamic Theories Emphasize Unconscious and Dynamic Processes

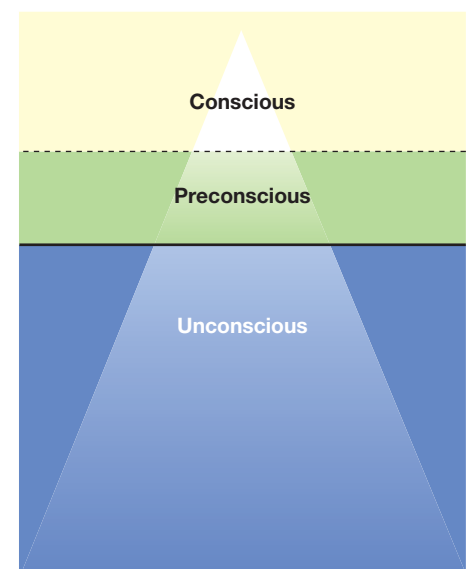
As discussed in Chapter 1, Sigmund Freud was a physician whose theories dominated psychological thinking for many decades. Focusing on the individual level of analysis, Freud developed many ideas about personality by observing patients he was treating for psychological disturbances, such as paralysis without any apparent physical cause. The central premise of Freud’s **psychodynamic theory** of personality is that unconscious forces influence behaviour. Freud referred to these psychic forces as *instincts* (although he used the term in a way slightly different from its contemporary use), defining them as mental representations arising out of biological or physical need. For instance, he proposed that people satisfy the *life instinct* by following the *pleasure principle*, which directs people to seek pleasure and to avoid pain. The energy that drives the pleasure principle is the *libido*. Although today the term has a sexual connotation, Freud used it to refer more generally to the energy that promotes pleasure seeking. The life instinct can be viewed as the desire to satisfy libidinal urges for pleasure. Multiple forces can be in conflict, and Freud viewed such conflict as the essential cause of mental illness.

**A TOPOGRAPHICAL MODEL OF MIND** Freud believed that most of the conflict between psychological forces occurs below the level of conscious awareness. In his *topographical model*, he proposed that the structure of the mind, or its topography, is divided into three zones of mental awareness (**FIGURE 13.2**). At the *conscious* level, people are aware of their thoughts. The *preconscious* level consists of content that is not currently in awareness but that could be brought to awareness; it is roughly analogous to long-term memory. The *unconscious* level contains material that the mind cannot easily retrieve. According to Freud, the unconscious mind contains wishes, desires, and motives, and they are associated with conflict, anxiety, or pain; to protect the person from distress, they are not accessible. Sometimes, however, this information leaks into consciousness, such as occurs during a *Freudian slip*, in which a person accidentally reveals a hidden motive (e.g., introducing herself or himself to someone attractive by saying, “Excuse me, I don’t think we’ve been properly seduced”).



**FIGURE 13.1 Gordon Allport** In 1937, Allport published the first major textbook of personality psychology, which defined the field. He also championed the study of individuals and established traits as a central concept in personality research.

**psychodynamic theory** Freudian theory that unconscious forces, such as wishes and motives, influence behaviour.



**FIGURE 13.2 Levels of Consciousness** Sigmund Freud theorized that mental activity occurred in these three zones. He believed that much of human behaviour was influenced by unconscious processes.

**psychosexual stage** According to Freud, the developmental stages that correspond to the pursuit of satisfaction of libidinal urges.

**DEVELOPMENT OF SEXUAL INSTINCTS** An important component of Freudian thinking is the idea that early childhood experiences have a major impact on the development of personality. Freud believed that children go through developmental stages corresponding to their pursuit of satisfaction of libidinal urges. At each **psychosexual stage**, libido is focused on one of the *erogenous zones*: the mouth, the anus, or the genitals. The *oral stage* lasts from birth to approximately 18 months, during which time pleasure is sought through the mouth; hungry infants experience relief when they breastfeed and thus associate pleasure with sucking. When children are two to three years old, toilet training leads them to focus on the anus; learning to control the bowels is the focus of the *anal phase*. From age three to five, children enter the *phallic stage* and direct their libidinal energies toward the genitals. Children often discover the pleasure of rubbing their genitals during this time, although they have no sexual intent per se.

One of the most controversial Freudian theories (there are few data to support it) applies to children in the phallic stage. According to Freud, children desire an exclusive relationship with the opposite-sex parent. Because the same-sex parent is thus considered a rival, children develop hostility toward that parent; in boys, this is known as the *Oedipus complex* (after the Greek character Oedipus, who unknowingly killed his father and married his mother). Freud believed that children develop unconscious wishes to kill the one parent in order to claim the other and that they resolve this conflict through identification with the same-sex parent, taking on many of that parent's values and beliefs. This theory was mostly applicable to boys. Freud's theory for girls was more complex and even less convincing.

Following the phallic stage, according to Freud, children enter a brief *latency stage*, in which libidinal urges are suppressed or channelled into doing schoolwork or building friendships. Finally, in the *genital stage*, adolescents and adults attain mature attitudes about sexuality and adulthood. Libidinal urges are centred on the capacity to reproduce and contribute to society.

According to Freud, progression through these psychosexual stages profoundly affects personality. For example, some people become *fixated* at a stage during which they receive excessive parental restriction or indulgence. Those fixated at the oral stage develop *oral personalities*; they continue to seek pleasure through the mouth, such as by smoking, and are excessively needy. Those fixated at the anal phase may have *anal-retentive personalities*, being stubborn and highly regulating. Anal fixation may arise from overly strict toilet training or excessively rule-based child rearing.

**id** In psychodynamic theory, the component of personality that is completely submerged in the unconscious and operates according to the pleasure principle.

**superego** In psychodynamic theory, the internalization of societal and parental standards of conduct.

**ego** In psychodynamic theory, the component of personality that tries to satisfy the wishes of the id while being responsive to the dictates of the superego.

**defence mechanisms** Unconscious mental strategies the mind uses to protect itself from conflict and distress.

**STRUCTURAL MODEL OF PERSONALITY** Freud proposed an integrated model of how the mind is organized, consisting of three theoretical structures that vary in degree of consciousness. At the most basic level and completely submerged in the unconscious is the **id**, which operates according to the pleasure principle, acting on impulses and desires. The innate forces driving the id are sex and aggression. Acting as a brake on the id is the **superego**, the internalization of parental and societal standards of conduct. Developed during the phallic phase, the superego is a rigid structure of morality, or conscience. Mediating between the superego and the id is the **ego**, which tries to satisfy the wishes of the id while being responsive to the dictates of the superego. The ego operates according to the *reality principle*, which involves rational thought and problem solving.

Conflicts between the id and the superego lead to anxiety, which the ego copes with through various **defence mechanisms**, unconscious mental strategies that the mind uses to protect itself from distress. For instance, people often *rationalize* their behaviour by blaming situational factors over which they have little control, as when

you tell your parents you did not call them because you were too busy studying for an exam. Finding good excuses keeps people from feeling bad and can also prevent others from getting mad at them. Much of the theoretical work on defence mechanisms can be credited to Freud's daughter, Anna Freud (1936; **FIGURE 13.3**). Research in psychology over the past 40 years has provided considerable support for the existence of many of these defence mechanisms (Baumeister, Dale, & Sommers, 1998), although contemporary researchers believe these mechanisms protect self-esteem rather than relieve unconscious conflict over libidinal desires. For instance, *reaction formation* occurs when a person wards off an uncomfortable thought about the self by embracing the opposite thought. In one study of reaction formation in men, participants who had earlier expressed the most negative views of homosexuality showed greater physiological arousal when viewing video depictions of homosexual sex than did men who were more accepting of homosexuality (Adams, Wright, & Lohr, 1996). These findings suggest homophobia might result from repression of homosexual impulses, leading to reaction formation.

**PSYCHODYNAMIC THEORY SINCE FREUD** Although Freud is the thinker most closely identified with psychodynamic theory, a number of scholars, while rejecting certain aspects of Freudian thinking, embraced the notion of unconscious conflict. These *neo-Freudians* include Carl Jung, Alfred Adler, and Karen Horney, all of whom modified Freud's ideas in their own psychodynamic theories. For instance, Adler and Horney strongly criticized Freud's view of women, finding many of his theories misogynist. The phallic stage of development, for example, is named for the male sex organ, yet Freud used this label for female and male development. Many neo-Freudians rejected Freud's emphasis on sexual forces and instead focused on social interactions, especially children's emotional attachments to their parents. This focus is embodied in *object relations theory*, in which the object of attachment is another person, such as a parent or spouse. In addition, some neo-Freudians, including Horney and Erik Erikson, emphasized the influence of culture, which Freud saw monolithically as "civilization."

Psychological scientists largely have abandoned psychodynamic theories because Freud's central premises cannot be examined through accepted scientific methods. However, Freud has to be understood in the context of his time and the methods he had at his disposal. He was an astute observer of behaviour and a creative theorist. His observations and ideas continue to affect personality psychology and have framed much of the research in personality over the last century (Hines, 2003; Westen, 1998).

## Humanistic Approaches Emphasize Integrated Personal Experience

By the early 1950s, most psychological theories of personality were heavily deterministic; that is, personality and behavioural characteristics were considered to arise from forces beyond a person's control. Whereas Freud believed that personality is determined by unconscious conflicts, behaviourists such as B. F. Skinner (see Chapter 6, "Learning") argued that patterns of reinforcement determine response tendencies, which are the basis of personality. Against this backdrop emerged a view of personality that emphasizes the uniqueness of the human condition. **Humanistic approaches** emphasize personal experience and belief systems and propose that humans seek to fulfill their potential for personal growth through greater self-understanding; this process is referred to as *self-actualization*. Humanism focuses on subjective human experience, or *phenomenology*, and views each person as inherently



**FIGURE 13.3 Anna Freud** Anna Freud studied defence mechanisms and contributed to the understanding of children's development.

**humanistic approaches** Approaches to studying personality that emphasize personal experience and belief systems; they propose that people seek personal growth to fulfill their human potential.



**FIGURE 13.4 Carl Rogers** Rogers emphasized people's subjective understandings of their whole lives.

good. Abraham Maslow's theory of motivation (see Chapter 9, "Motivation and Emotion") is an example: Maslow believed that the desire to become self-actualized is the ultimate and most important human motive.

The most prominent humanistic psychologist was Carl Rogers, whose *person-centred approach* to personality emphasizes people's personal understandings, or phenomenology (**FIGURE 13.4**). In the therapeutic technique Rogers advocated, the therapist would create a supportive and accepting environment and would deal with clients' problems and concerns as clients understood them. Rogers's theory highlights the importance of how parents show affection for their children and how parental treatment affects personality development. Rogers speculated that most parents provide love and support that is conditional: The parents love their children as long as the children do what the parents want them to do. Parents who disapprove of their children's behaviour may withhold their love; as a result, children quickly abandon their true feelings, dreams, and desires and accept only those parts of themselves that elicit parental love and support. Thus people lose touch with their true selves in their pursuit of positive regard from others. To counteract this effect, Rogers encouraged parents to raise their children with *unconditional positive regard*, in which the children are accepted, loved, and prized no matter how they behave. Parents may express disapproval of bad behaviour, but in a context that ensures the children feel loved. According to Rogers, a child raised with unconditional positive regard will develop a healthy sense of self-esteem and will become a *fully functioning person*.

Humanistic psychology has not been overly concerned with the scientific study of personality, emphasizing instead subjective personal experience. Recently, as discussed in Chapter 10, psychologists have begun to use the methods of science to study humanity's positive aspects. The *positive psychology movement* was launched by the clinical psychologist Martin Seligman (Seligman & Csikszentmihalyi, 2000). Seligman and others have encouraged the scientific study of qualities such as faith, values, creativity, courage, and hope. For instance, Ed Diener (2000), of the University of Illinois, has conducted extensive research on *subjective well-being*, a general term for the degree of happiness and satisfaction people feel (**FIGURE 13.5**). He has found that well-being varies across cultures, such that the wealthiest countries often have the highest levels of satisfaction (a finding that fits well with Maslow's proposal that people need to satisfy basic needs such as food, shelter, and safety before they can address self-esteem needs). More recently, Michele Tugade and Barbara Frederickson (2004), of the University of Michigan, have found that people who are resilient, who can bounce back from negative events, experience positive emotions even when under stress. According to the *broaden-and-build theory*, positive emotions prompt people to consider novel solutions to their problems, and thus resilient people tend to draw on their positive emotions in dealing with setbacks or negative life experiences (Frederickson, 2001).

### Type and Trait Approaches Describe Behavioural Dispositions

Psychodynamic and humanistic approaches seek to explain the mental processes that shape personality. The same underlying processes likely occur in everyone, but individuals differ because they experience different conflicts, are treated differently by their parents, and so on. Other approaches to personality focus more on description than explanation. For example, in describing a friend you probably would not delve into unconscious conflicts; rather, you would describe the person as a certain

**FIGURE 13.5 Try for Yourself: Measuring Subjective Well-Being**

**Satisfaction with Life Scale**

Using the 1–7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Be open and honest in your responding. Then add the five numbers to determine your overall life satisfaction.

- |                                |                       |
|--------------------------------|-----------------------|
| 7 = strongly agree             | 3 = slightly disagree |
| 6 = agree                      | 2 = disagree          |
| 5 = slightly agree             | 1 = strongly disagree |
| 4 = neither agree nor disagree |                       |

- \_\_\_ In most ways, my life is close to my ideal.
- \_\_\_ The conditions of my life are excellent.
- \_\_\_ I am satisfied with my life.
- \_\_\_ So far, I have gotten the important things I want in life.
- \_\_\_ If I could live my life over, I would change almost nothing.

- |                           |                             |
|---------------------------|-----------------------------|
| 31–35 extremely satisfied | 15–19 slightly dissatisfied |
| 26–30 satisfied           | 10–14 dissatisfied          |
| 21–25 slightly satisfied  | 5–9 extremely dissatisfied  |
| 20 neutral                |                             |

**Result:** The Satisfaction with Life Scale has been found to reliably and validly assess a person's general satisfaction in life.

SOURCE: Pavot and Diener, 1993.

type, such as an *introvert* or an *extrovert*. **Personality types** are discrete categories of people; we fill in gaps in our knowledge about individuals with our beliefs about the behaviours and dispositions associated with these types. Our tendency to assume that certain personality characteristics go together, and therefore to make predictions about people based on minimal evidence, is called *implicit personality theory*. For example, we might think that introverts dislike parties, like books, and are sensitive.

Many personality psychologists are concerned with *traits* in addition to types (remember that traits are behavioural dispositions that endure over time and across situations). Traits exist on a continuum—most people fall toward the middle and relatively few at the extremes. Thus, for example, people range from being very introverted to very extroverted, but most are somewhere in the middle. The **trait approach** to personality provides a method for assessing the extent to which individuals differ in personality dispositions, such as sociability, cheerfulness, and aggressiveness (Funder, 2001).

How many traits are there? Early in his career, Gordon Allport, along with his colleague Henry Odbert, counted the dictionary words that could be used as personality traits. They found nearly 18,000. During the 1950s, the researcher Raymond Cattell set out to ascertain the basic elements of personality, believing that statistical procedures would enable him to take the scientific study of personality to a higher level and perhaps to uncover the basic structure of personality. Cattell's participants filled out personality questionnaires containing a number of trait items, which he had reduced from the larger set produced by Allport and Odbert. Cattell then performed *factor analysis*, grouping items according to their similarities. For instance, all the terms that referred to friendliness (*nice, pleasant, cooperative*, and so on) were grouped together. Through this procedure, Cattell (1965) identified 16 basic dimensions of personality, such as those relating to intelligence,

**personality types** Discrete categories based on global personality characteristics.

**trait approach** An approach to studying personality that focuses on the extent to which individuals differ in personality dispositions.

sensitivity, dominance, and self-reliance. Many were given rather unusual names to avoid confusion with everyday language; most personality psychologists no longer use these terms.

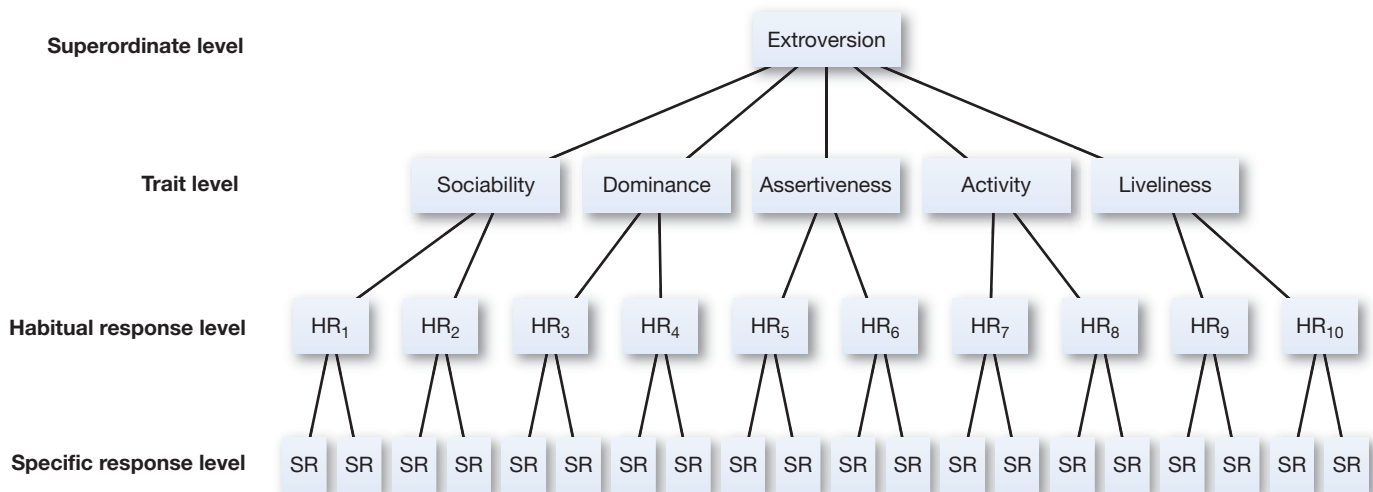
**EYSENCK'S HIERARCHICAL MODEL** Further reducing the number of basic traits was the German-born British psychologist Hans Eysenck, who in the 1960s proposed a hierarchical model of personality (FIGURE 13.6). The basic structure of this model begins at the *specific response level*, which consists of observed behaviours. For instance, a person might buy an item because it is on sale and then repeat the behaviour on different occasions; these behaviours are at the *habitual response level* (i.e., some people cannot pass up sale items, whether they need them or not). If a person is observed to behave the same way on many occasions, the person is characterized as possessing a *trait*. Traits such as impulsiveness and sociability can be viewed as components of *superordinate traits*, of which Eysenck proposed three: introversion/extroversion, emotional stability, and psychoticism.

*Introversion/extroversion*, coined by the psychoanalyst Carl Jung, refers to the extent to which people are shy, reserved, and quiet versus sociable, outgoing, and bold. As discussed later in this chapter, Eysenck believed that this dimension reflects differences in biological functioning. *Emotional stability* refers to the extent to which people's moods and emotions change; those low in emotional stability, *neurotic* people, experience frequent and dramatic mood swings, especially toward negative emotions, compared with people who are more stable. Highly neurotic people report often feeling anxious, moody, and depressed, and they generally hold very low opinions of themselves. *Psychoticism* is a mix of aggression, impulse control, and empathy; those high in psychoticism are more aggressive, impulsive, and self-centred than those low in psychoticism. The term *psychoticism* implies a level of psychopathology that Eysenck did not intend. More-recent conceptions of this superordinate trait call it *constraint*: People range from restrained to disinhibited (Watson & Clark, 1997).

**five-factor theory** The idea that personality can be described using five factors: openness to experience, conscientiousness, extroversion, agreeableness, and neuroticism.

**FIGURE 13.6 Eysenck's Hierarchical Model of Personality** Extroversion is a superordinate trait made up of sociability, dominance, assertiveness, activity, and liveliness. Each of these subordinate traits is made up of habitual and specific responses.

**THE BIG FIVE** In the last 20 years or so, many personality psychologists have embraced the **five-factor theory**, which is similar to Eysenck's model and identifies five basic personality traits (McCrae & Costa, 1999). The so-called *Big Five* are *openness to experience, conscientiousness, extroversion, agreeableness, and neuroticism*





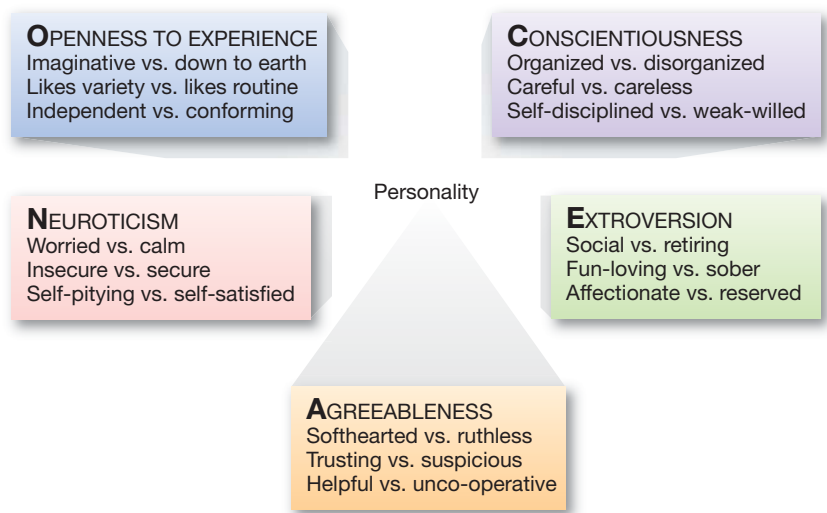
(FIGURE 13.7). Each factor is a higher-order trait comprising interrelated lower-order traits. For instance, conscientiousness is determined by how careful and organized one is, while agreeableness reflects the extent to which one is trusting and helpful. Those high in openness to experience are imaginative and independent; those low in this basic trait are down-to-earth and conformist.

Considerable evidence supports the five-factor theory (John, 1990). The Big Five emerge across cultures, among adults and children, even when vastly different questionnaires assess the factors, and the same five factors appear whether people rate themselves or are rated by others. Furthermore, people’s “scores” on the Big Five traits have been shown to predict a wide variety of different behaviours (Paunonen & Ashton, 2001), as well as their satisfaction with their jobs, marriages, and life more generally (Heller, Watson, & Ilies, 2004). Some cross-cultural differences emerge, however. For example, personality studies conducted in China have shown that interpersonal relatedness, or harmony, is an important personality trait there but not in Western cultures (Cheung et al., 2001; Cheung, Cheung, & Leung, 2008)—possibly because many Chinese live in densely populated areas, so getting along with others is more essential than in societies where people live farther apart.

Some researchers have questioned whether the five-factor theory really clarifies personality, since the factor terms are descriptive rather than explanatory, and reducing all of human personality to five dimensions ignores individual subtleties. However, the theory is valuable as an organizational structure for the vast number of traits that describe personality; by providing a common descriptive framework, it integrates and invigorates the trait approach (John & Srivastava, 1999). Moreover, the factors uniquely predict certain outcomes. For instance, conscientiousness predicts grades in university but not scores on standardized tests, whereas openness to experience predicts scores on standardized tests but not grades (Nofle & Robins, 2007). These effects may occur because highly conscientious people tend to work very hard, a characteristic that matters for grades, whereas people who are high in openness tend to use words very well, a characteristic that matters for achievement tests. Thus factors exist at more than a descriptive level. Working across levels of analysis provides new ways to understand the basic traits (Clark & Watson, 1999).

## Personality Reflects Learning and Cognition

In contrast to psychologists who saw personality as the result of internal processes, behaviourists such as B. F. Skinner viewed personality mainly as learned responses to patterns of reinforcement. However, growing dissatisfaction with strict models of learning theory led researchers to incorporate cognition into the understanding of personality. For instance, the American early cognitive theorist George Kelly (1955) emphasized the importance of people’s understandings, or *personal constructs*, of their circumstances. These constructs are personal theories of how the world works. Kelly thought that people viewed the world as if they were scientists, constantly testing out their theories by observing ongoing events and then revising those theories based



**FIGURE 13.7 The Big Five Personality Factors** The acronym OCEAN is a good way to remember these terms.



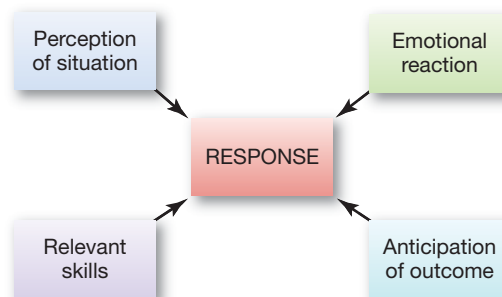
**FIGURE 13.8 Expectancies and Value**  
The expectation of positive reinforcement from doing well on a test may be enough to keep this student studying in his dorm room rather than going out to a party.

on what they observe. According to Kelly, personal constructs develop through people's experiences and represent their interpretations and explanations for events in their social worlds. The American researcher Julian Rotter (1954), of the University of Connecticut, built further on the cognitive approach by introducing the idea that behaviour is a function of people's *expectancies* for reinforcement, as well as the *values* they ascribe to particular reinforcers. Thus a person deciding whether to study for an exam or go to a party will weigh the likelihood that studying will lead to a good grade, as well as how much that grade matters, against the likelihood that the party will be fun and the extent to which he or she values having fun (**FIGURE 13.8**). Rotter proposed that people differ in their beliefs that their efforts will lead to positive outcomes. People with an *internal locus of control* believe they bring about their own rewards, whereas those with an *external locus of control* believe that rewards—and therefore their personal fates—result from forces beyond their control. These generalized beliefs affect individuals' psychological adjustment.

The incorporation of cognition into learning theories led to the development of *cognitive-social theories* of personality, which emphasize how personal beliefs, expectancies, and interpretations of social situations shape behaviour and personality. For instance, Albert Bandura (1977) argued that humans possess mental capacities, such as beliefs, thoughts, and expectations, that interact with environment to influence behaviour. For Bandura, as discussed in Chapter 9, the extent to which people believe they can achieve specific outcomes, called *self-efficacy*, is an important determinant of behaviour. Moreover, as discussed in Chapter 6, Bandura proposed that people develop expectancies in part through *observational learning*, such as by noticing whether others are rewarded, or punished, for acting in certain ways.

One of the most influential cognitive-social theorists has been Walter Mischel, who approached the study of personality at the social level of analysis. Mischel sparked controversy by proposing that personality traits often fail to predict behaviour across different circumstances. According to his *cognitive-affective personality system* (CAPS; Mischel & Shoda, 1995), people's responses are influenced by how they perceive a given situation, their affective (emotional) response to the situation, their skills in dealing with challenges, and their anticipation of the outcomes of their behaviour (**FIGURE 13.9**).

Imagine, for instance, a person who walks into a party expecting to make a good impression, having done so many times in the past. This person will act very differently from someone whose past experiences of awkwardness, discomfort, and shyness lead to the expectation of rejection. Consider also the personality style *defensive pessimism*, studied by Julie Norem and Nancy Cantor, of the University of Michigan. Defensive pessimists expect to fail and therefore enter test situations with dread. By contrast, optimists enter test situations with high expectations. Yet pessimists and optimists tend to perform similarly on exams (Norem, 1989). These two personality styles reflect different motivational strategies: Pessimists expect the



**FIGURE 13.9 CAPS Model** Mischel and Shoda believed personality traits alone could not predict behaviour.

worst so they can be relieved when they succeed, whereas optimists focus on positive outcomes.

The CAPS model and other cognitive-social theories of personality also emphasize *self-regulatory capacities*, in which people set personal goals, evaluate their progress, and adjust their behaviour accordingly. Indeed, many personality psychologists believe that motives and strivings, such as those for achievement, power, or intimacy, are an essential aspect of personality (Snyder & Cantor, 1998). Personality, then, represents behaviour that emerges from people's interpretations of their social worlds and from their beliefs about how they will affect and be affected by their social situations.

## SUMMING UP

### How Have Psychologists Studied Personality?

According to the psychodynamic approach, unconscious motives and conflicts that are experienced throughout life, but especially in childhood, shape personality. Humanists believe each person is unique and capable of fulfilling great potential. Trait theorists describe behaviour on the basis of dispositions. Cognitive-social theorists focus on how beliefs and cognitive interpretations affect people's perceptions of their social environments. These varied approaches share a goal of trying to understand the ways in which people are similar to and different from one another.

## MEASURING UP

1. Indicate which theorists are associated with each of the following four approaches to studying personality: psychodynamic, humanistic, type and trait, and learning and cognition.
  - a. Abraham Maslow
  - b. Albert Bandura
  - c. Anna Freud
  - d. Carl Jung
  - e. Carl Rogers
  - f. Erik Erikson
  - g. George Kelly
  - h. Gordon Allport
  - i. Hans Eysenck
  - j. Karen Horney
  - k. Martin Seligman
  - l. Raymond Cattell
  - m. Sigmund Freud
  - n. Walter Mischel
2. Indicate which concepts are associated with each of the four approaches to studying personality (see question 1).
  - a. defence mechanisms
  - b. id, ego, superego
  - c. describing how individuals differ from one another
  - d. locus of control
  - e. people seeking to fulfill their potential for personal growth through greater self-understanding
  - f. personal beliefs, expectations, and interpretations of social situations shaping personality
  - g. personality traits
  - h. personality types
  - i. self-efficacy
  - j. sexual instincts
  - k. the Big Five
  - l. unconditional positive regard
  - m. unconscious forces influencing behaviour

# How Is Personality Assessed, and What Does It Predict?

## LEARNING OBJECTIVES

Identify strengths and limitations of different methods of personality assessment.

Explain why personality does not always predict behaviour.

**idiographic approaches** Person-centred approaches to studying personality that focus on individual lives and how various characteristics are integrated into unique persons.

**nomothetic approaches** Approaches to studying personality that focus on how people vary across common traits.



**FIGURE 13.10 Adolf Hitler** In his personality analysis of Hitler, Henry Murray (1943) stated the German leader was impotent in heterosexual relations and had engaged in a homosexual relationship. Murray's collaborative report predicted Hitler's suicide.

Personality researchers have yet to agree on the best method for assessing aspects of personality. As mentioned, personality encompasses thoughts, feelings, and behaviours, all of which need to be considered. Psychological scientists measure personality by having people report on themselves, by asking people's friends or relatives to describe them, or by watching how people behave. Each method has strengths and limitations. The following section considers how psychological scientists assess personality and how the different methods influence our understanding of individuals.

## Personality Refers to Both Unique and Common Characteristics

Allport divided the study of personality into two approaches: **Idiographic approaches** are *person-centred* in that they focus on individual lives and how various characteristics are integrated into unique persons. **Nomothetic approaches**, in contrast, focus on characteristics common among all people but on which individuals vary. In other words, idiographic approaches use a different metric for each person, whereas nomothetic approaches use the same metric to compare all people.

Idiographic approaches assume all individuals are unique. If your classmates were to identify 10 personality traits that described them, although there would be some overlap each person would probably list some different traits. After all, people like to be distinctive, so they tend to choose traits that are particularly descriptive of themselves compared with other people. These *central traits* are especially important for how individuals define themselves. In contrast, people consider *secondary traits* less personally descriptive or not applicable. In general, central traits are more predictive of behaviour than are secondary traits.

Researchers who use idiographic approaches often examine case studies of individuals through interviews or biographical information. For example, many scholars, including Harvard University's Henry Murray, who pioneered the approach, have tried to account for Adolf Hitler's behaviour in Nazi Germany by studying his early childhood experiences, his physical stature, and his personal motivations (**FIGURE 13.10**). This type of study emphasizes the idea that personality unfolds over the life course as people react to their particular circumstances.

Another idiographic approach considers a human life as a narrative (McAdams, 1999, 2001). According to Dan McAdams, to give life meaning and make sense of the world, each person weaves a *life story* that integrates self-knowledge into a coherent whole. The life story is a reconstructive and imaginative process in which the person links his or her motives, goals, and beliefs with events, people, and circumstances. In so doing, the individual creates *personal myths* that bind together past events and future possibilities. To study personality, then, narrative psychologists pay attention to the stories people tell about their lives.

Nomothetic approaches focus on common traits (e.g., agreeable/disagreeable) rather than individual uniqueness. Researchers in this tradition compare people by using common trait measures, such as questionnaires or other similar methods. For example, they might give participants a list of 100 personality traits and have them rate themselves on each, using a scale from 1 to 10. From the nomothetic perspective, individuals are unique because of their unique combinations of common traits.

## Researchers Use Objective and Projective Methods to Assess Personality

Researchers use numerous methods to assess personality, ranging from self-reports to clinical interviews to observer reports. In addition, the way researchers choose to measure personality depends to a great extent on their theoretical orientations. For instance, trait researchers use personality descriptions, whereas humanistic psychologists use more holistic approaches. At the broadest level, assessment procedures can be grouped into projective and objective measures.

**PROJECTIVE MEASURES** According to psychodynamic theory, personality is influenced by unconscious conflicts. **Projective measures** explore the unconscious by having people describe or tell stories about ambiguous stimulus items. The general idea is that people will project their mental contents onto the ambiguous items, thereby revealing hidden aspects of personality such as motives, wishes, and unconscious conflicts. Many such procedures are used to assess psychopathology. One of the best-known projective measures is the *Rorschach ink blot test*, in which people look at an apparently meaningless inkblot and describe what it looks like to them. How a person describes the inkblot is supposed to reveal unconscious conflicts and other problems. However, the Rorschach does a poor job of diagnosing specific psychological disorders, and it finds many normal adults and children to be psychologically disturbed (Wood, Garb, Lilienfeld, & Nezworski, 2002).

One classic projective measure used by personality psychologists is the *Thematic Apperception Test (TAT)*, developed by Henry Murray and Christiana Morgan to study achievement motivation. A person is shown an ambiguous picture and is asked to tell a story about it (FIGURE 13.11). Scoring of the story is based on the motivational schemes that emerge, which are assumed to reflect the storyteller's personal motives. Although many projective measures have been criticized for being too subjective and poorly validated, the TAT has been useful for measuring motivational traits, especially those related to achievement, power, and affiliation, and therefore it continues to be used in contemporary research (McClelland, Koestner, & Weinberger, 1989). Indeed, evidence shows that the TAT, if used properly, reliably predicts how interpersonally dependent people are—for example, how much they seek approval and support from others (Bornstein, 1999).

**OBJECTIVE MEASURES** **Objective measures** of personality make no pretense of uncovering hidden conflicts or secret information. They measure only what the raters believe or observe. Personality researchers use them to compare people's responses and assess the extent to which the answers predict behaviour. Objective measures are straightforward assessments, usually involving self-report questionnaires or observer ratings. A questionnaire might target a specific trait, such as how much excitement a person seeks out of life, but more often objective measures are large personality inventories, such as the *NEO Personality Inventory*, which consists of 240 items designed to assess the Big Five personality factors (Costa & McCrae, 1992). Although they are called objective, the tests require people to make subjective judgments. Self-reports can be affected by desires to avoid looking bad and by biases in self-perception.

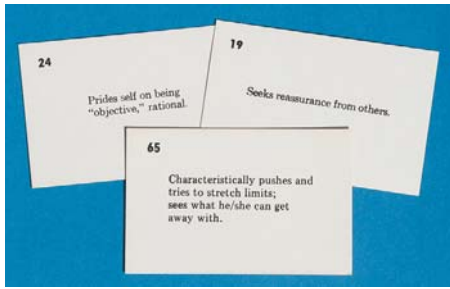
It can be difficult to compare self-reported objective measures directly, because individual respondents do not have objective standards against which to rate themselves. For example, two individuals reporting a 5 on a 7-point shyness scale may not be equally shy because the term can mean different things to different people.

**projective measures** Personality tests that examine unconscious processes by having people interpret ambiguous stimuli.



**FIGURE 13.11 Thematic Apperception Test** Pictures of this type are used in the TAT.

**objective measures** Relatively direct assessments of personality, usually based on information gathered through self-report questionnaires or observer ratings.



**FIGURE 13.12 California Q-Sort** These are three of the cards participants sort when taking the Q-Sort assessment.

## Real World PSYCHOLOGY

One technique that assesses traits is the *California Q-Sort*, in which people sort 100 statements printed on cards into nine piles according to how accurately the statements describe them. The piles represent categories ranging from “not at all descriptive” to “extremely descriptive” (**FIGURE 13.12**). A participant may place only so many cards in each pile, with fewer cards being allowed for the extreme ends of the scale. Because most of the cards must be piled in the moderately descriptive categories, the Q-Sort has a built-in procedure for identifying central dispositions. The Q-Sort, like most objective measures, can also be used by observers, such as parents, teachers, therapists, and friends.

### Observers Show Accuracy in Trait Judgments

Do other people know you pretty well? Imagine that you often feel shy in new situations, as many people do. Would others know that shyness is part of your personality? Some shy people force themselves to be outgoing to mask their feelings, so their friends might have no idea that they feel shy. Others react to the fear of social situations by remaining quiet and aloof, so observers might believe them to be cold, arrogant, and unfriendly. Indeed, we are all judged by others throughout our lives, but how accurate are those judgments? And how well do observers’ personality judgments predict others’ behaviour?

An important study by the American researcher David Funder (1995) found a surprising degree of accuracy for trait judgments under certain circumstances. For instance, a person’s close acquaintances may predict the person’s behaviour more accurately than the person does. In one study, for example, friends predicted assertiveness and other behaviours better than did the person’s own ratings (Kolar, Funder, & Colvin, 1996; Vazire & Mehl, 2008). This effect may occur because our friends observe how we behave in situations, whereas we may be preoccupied with evaluating other people and therefore fail to notice how we actually behave. Another possibility is that our subjective perceptions may diverge from our objective behaviours. In either case, the study implies that there is a disconnect between how people view themselves and how they behave. Not surprisingly, evidence indicates that people come to know others better over time, as they witness others’ behaviour across different circumstances; thus we are more accurate in predicting a close friend’s behaviour than that of a mere acquaintance (Biesanz, West, & Millevoi, 2007).

### People Sometimes Are Inconsistent

Imagine again that you are shy. Are you shy in all situations? Probably not. Shy people tend to be most uncomfortable in new situations in which they are being evaluated; they usually are not shy around family and close friends. In 1968, Walter Mischel dropped a bombshell on the field of personality by proposing that behaviours are determined more by situations than by personality traits, a theory referred to as **situationism**. For evidence, he referred to studies in which people who were dishonest in one situation were completely honest in another. For instance, a student who is not totally honest with a professor in explaining why a paper is late probably is no more likely to steal or to cheat on taxes than is a student who admits to oversleeping. Mischel’s critique of personality traits caused considerable rifts between social psychologists, who emphasize situational forces, and personality psychologists, who focus on individual dispositions. After all, the most basic definition of personality holds that it is relatively stable across situations and circumstances. If Mischel was correct and there was relatively little stability, the whole concept of personality seemed empty.

**situationism** The theory that behaviour is determined more by situations than by personality traits.

As you might expect, there was a vigorous response to Mischel's critique. The argument made by personality researchers in the *person/situation debate* is that the extent to which a trait predicts behaviour depends on the *centrality* of the trait, the *aggregation* of behaviours over time, and the *type* of trait being evaluated. People tend to be more consistent in their central traits than in their secondary traits, since the former are most relevant to them. In addition, if behaviours are averaged across many situations, personality traits are more predictive of behaviour. Shy people may not be shy all the time, but on average they are shy more than those who are not shy. Moreover, people who report being shy in university continue to report being shy many years later, so the trait of shyness seems to be stable. Some traits, such as honesty, will also more likely be consistent across situations, whereas others, such as shyness, might vary depending on the situation. Finally, some people may be more consistent than others. Consider the trait of *self-monitoring*, which involves being sensitive to cues of situational appropriateness. Those high in self-monitoring alter their behaviour to match the situation, so they exhibit low levels of consistency. By contrast, those low in self-monitoring are less able to alter their self-presentations to match situational demands, so they tend to be much more consistent across situations.

### Behaviour Is Influenced by the Interaction of Personality and Situations

Considerable evidence indicates that personality traits are predictive of behaviour. For instance, people high in neuroticism tend to be more depressed and have more illnesses, are more likely to have mid-life crises, and so on. Indeed, being highly neurotic is the best personality predictor of marital dissatisfaction and divorce (Karney & Bradbury, 1995). Likewise, those high in sensation seeking are more likely to smoke, use drugs, have sex, be impulsive, watch erotic movies, begin conversations, and engage in physically risky activities such as mountain climbing. Researchers have found strong evidence that personality dispositions are meaningful constructs that predict behaviour over time and across circumstances. Yet people are also highly sensitive to social context, and most conform to situational norms. Few people would break the law in front of a police officer or drive on the wrong side of the road just because they felt like it; the situation dictates behaviour irrespective of personality.

Situational influences can be subtle. Consider your own behaviour. You may reveal different aspects of your personality during your interactions with different people. Your goals for social interaction change, as do the potential consequences of your actions. For example, your family may be more tolerant of your bad moods than your friends are. Thus you may feel freer to express your bad moods around your family.

Situations differ in the extent to which they constrain the expression of personality (Kenrick & Funder, 1991). Consider two people, one highly extroverted, aggressive, and boisterous, and the other shy, thoughtful, and restrained. At a funeral, it might be hard to tell them apart based on their behaviour, but at a party the differences would be obvious. Personality psychologists differentiate between *strong situations* (e.g., elevators, religious services, job interviews) and *weak situations* (e.g., parks, bars, one's house); the former mask differences in personality because of the power of the social environment (FIGURE 13.13). Most trait theorists are



(a)



(b)

**FIGURE 13.13 Strong and Weak Situations** (a) A strong situation, such as a funeral, tends to discourage displays of personality. (b) A weak situation, such as hanging out with friends, tends to let people behave more freely.

**interactionists** Theorists who believe that behaviour is determined jointly by underlying dispositions and situations.



**FIGURE 13.14 Jim Carrey** Carrey, here performing in the movie *Yes Man* (2008), appears to have all the hallmarks of an extroverted personality.

**interactionists**, believing that behaviour is determined jointly by situations and underlying dispositions.

People also affect their social environments, however. First, people choose their situations. Introverts tend to avoid parties or other situations in which they might feel anxious, whereas extroverts seek out social opportunities. Once people are in situations, their behaviour affects those around them. Some extroverts may draw people out and encourage them to have fun, whereas others might act aggressively and turn people off (**FIGURE 13.14**). Some introverts might create an intimate atmosphere that encourages people to open up and reveal personal concerns, whereas others might make people uncomfortable and anxious. A reciprocal interaction occurs between the person and the social environment so that they simultaneously influence each other. The important point is that personality reflects both underlying dispositions and the activation of goals and of emotional responses in given situations.

## There Are Cultural and Gender Differences in Personality

How similar are people around the world? Certainly there are stereotypes about people from different countries, as well as about men and women. But is there any truth to these stereotypes? Does scientific evidence document differences in personality among cultures or between women and men?

Studying cultural differences in personality presents many challenges. As noted in Chapter 2, cross-cultural research can be difficult when language is a central component of what is being studied. Recall from Chapter 1 that people from Eastern cultures tend to think in terms of relations with other people, whereas those from Western cultures tend to think in terms of independence (how this affects the sense of self is discussed later in this chapter). People from various cultures might therefore interpret any question about personality traits from different perspectives, such as what it means for their family or group (Eastern) versus what it means for them alone (Western). Comparing across cultures also requires the use of standardized questionnaires that are reliably translated so that the questions clearly refer to the same personality trait in all cultures and all respondents interpret the questions in the same way. Another problem involves sampling: Often researchers use samples of convenience, such as university students taking the researchers' classes, but in different countries different types of people may go to college or university. Thus apparent cultural differences result from examining different types of people in the different cultures.

Recognizing these issues, one research team conducted a careful investigation of personality differences across 56 nations (Schmitt, Allik, McCrae, & Benet-Martinez, 2007). They found support for the Big Five personality traits across all the countries, in turn supporting the argument that those traits are universal for humans. However, the investigators found modest differences in Big Five traits across the 56 nations; people from East Asia (e.g., Japan, China, Korea) rated themselves comparatively lower than other respondents on extroversion, agreeableness, and conscientiousness, and comparatively higher on neuroticism (**FIGURE 13.15**). By contrast, respondents from countries in Africa rated themselves as more agreeable and conscientious and less neurotic than did people from most other countries. However, these ratings might have reflected differences in cultural norms for saying good and bad things about oneself, and people from East Asian countries might be the most modest.

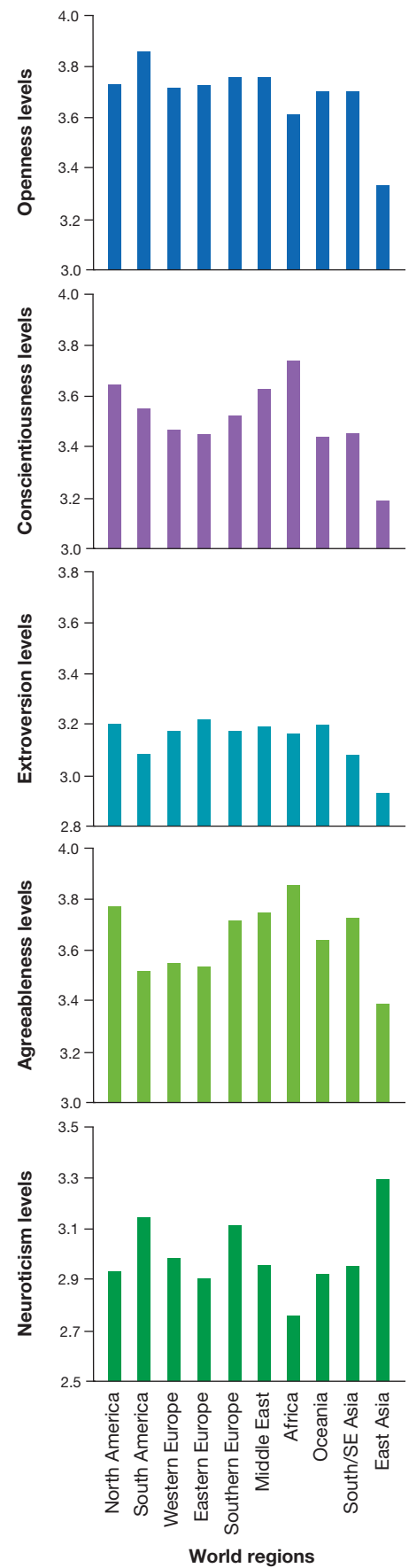
Clear from research, however, is that self-reports often do not match cultural stereotypes about the respondents. One team of researchers examined beliefs about personality characteristics typical of people from 49 cultures and then compared those ratings to self-reports and observer reports of people from those cultures



(Terracciano et al., 2005). There was little correspondence. For instance, Canadians were widely believed to be relatively low in neuroticism and high in agreeableness, yet self-reports by Canadians did not support this pattern; they reported themselves to be just as neurotic and disagreeable as people from other cultures. Steven Heine and his colleagues (2008) have argued that national reputations may be accurate and that self-reports might be biased by individuals' comparisons of themselves to their national reputations. Imagine that everyone in Country X works extremely hard and is always on time; therefore, these people are high in conscientiousness compared with those in Country Y, who work only when the urge strikes them. An individual in Country X may be just as conscientious as a person in Country Y, but compared to his or her fellow citizens the person in Country X may feel average, whereas the person in Country Y would feel far above average. Thus people can view the same behaviour differently depending on how they compare themselves to others. In other words, maybe Canadians really are especially agreeable, and it is simply hard to notice one person's agreeableness around all those other agreeable Canadians.

What about gender? Are the stereotypes about men and women accurate? Women and men are much more similar than different in terms of personality, but the differences between them largely support the stereotypes. That is, across various studies, women typically report and are rated as being more empathetic and agreeable than men, but also as being somewhat more neurotic and concerned about feelings. By contrast, men tend to report and are rated as being more assertive (Costa, Terracciano, & McCrae, 2001; Feingold, 1994; Maccoby & Jacklin, 1974).

Of particular interest is how gender differences emerge across cultures. You might guess that the more egalitarian and developed a society, the more similarity between the sexes would be observed. After all, if we treat boys and girls equally, we might expect them to turn out to be more similar than they would if we treated them differently. Thus it is puzzling to discover that gender differences in personality are largest in societies in North America and Europe, which provide more equal opportunities and treatment than many other societies, and smallest in Asian and African communities (Costa et al., 2001; Guimond et al., 2007; Schmitt, Realo, Voracek, & Allik, 2008). One theory to explain this pattern is that prosperous, developed societies that emphasize women's rights to education and to work allow for greater personal expression of individuality (Schmitt et al., 2008). Still, why might differences between females and males emerge when people can express themselves freely? According to the French social psychologist Serge Guimond (2008), people in individualistic cultures, such as within Western Europe and North America, tend to compare themselves against other groups. Thus women in such cultures describe themselves in ways that differentiate them from men, thereby creating gender differences in personality. From this perspective, the apparent cultural differences in the gender gap result from cultural differences in how people compare themselves rather than from any genuine cultural differences. However, as you will see later in this chapter, some evidence suggests that certain sex differences in characteristics related to personality emerge during early childhood.



SOURCE: Schmitt et al., 2007.

**FIGURE 13.15 Cross-Cultural Research on Personality Traits** A team of more than 120 scientists investigated the Big Five personality traits around the world, from Argentina to Zimbabwe.

## SUMMING UP

### How Is Personality Assessed, and What Does It Predict?

Personality is assessed through projective or objective measures, depending on the researcher's goals. Sometimes personality psychologists examine individuals—for example, by studying personal myths. Sometimes they examine many people by using a common measure to assess whether individual differences predict behaviour. People are relatively good at assessing others' personality traits, and some evidence suggests that observers might be better at predicting others' behaviour than people are at predicting their own. Observers may be more sensitive to environmental cues that shape behaviour. Indeed, traits interact with environments, such that situations sometimes constrain behaviour, and personality sometimes influences situations. The structure of personality is stable across cultures, although self-reports concerning some traits differ across cultures. These differences may be attributed to biases in self-report. Reliable gender differences in personality are somewhat consistent with common sex stereotypes. Gender differences more likely emerge in prosperous and developed societies.

## MEASURING UP

1. Match the strengths and limitations listed below to the following assessment methods: California Q-Sort, NEO Personality Inventory, Rorschach ink blot test, Thematic Apperception Test. (Each method may be associated with multiple strengths and multiple limitations.)

Strengths:

- a. Can be completed by an individual or by observers who evaluate that individual.
- b. Can reveal hidden aspects of personality.
- c. Effectively measures motivational states.
- d. Offers a built-in procedure for identifying traits perceived to be most central to the rater.

Limitations:

- e. Can be biased by the rater's desire to avoid looking bad.
- f. Does a poor job of diagnosing psychological disorders.
- g. Many normal individuals who take this test are misdiagnosed as being psychologically disturbed.

2. For each scenario, indicate which person is most likely to engage in the behaviour described, and explain why in a sentence.

Scenario 1: The two people described below each have a birthday party. After the party, who is more likely to follow through on his plan to send thank-you cards to the guests? Why?

- a. Chad describes himself as highly conscientious; moreover, he says his conscientiousness is vital to who he is.
- b. Malik takes the NEO Personality Inventory. He is a little surprised by the results, which indicate he is highly conscientious.

Scenario 2: The two people described below are each engaged in conversations with total strangers. Which person is most likely to give an honest answer when asked, "How are you doing?" Why?

- a. Hayley is in an office conference room, talking with the boss's administrative assistant while waiting for the boss to arrive for Hayley's interview.
- b. Roxanne is at a bar talking to the bartender while sipping her drink.

Being positive seems to have many survival advantages. Happy people reap benefits including more friends, more social support, higher incomes, a better chance of staying married, greater creativity, and greater productivity. Happy people have greater self-control, better self-regulatory and coping abilities, stronger immune systems, and longer lives. They are more co-operative, social, charitable, and “other-centred” (Lyubomirsky, Sheldon, & Schkade, 2005). It also appears that a majority of people are generally happy. In one survey, the self-rated level of subjective well-being was above neutral in 86 percent of 43 nations (Diener & Diener, 1996). About 85 percent of Canadians report being quite happy (Veenhoven, 1993).

To a great extent, happiness seems to be something a person wins in the lottery at birth. Research on twins has shown that 50 percent to 80 percent of the variance in average levels of happiness can be accounted for by genes rather than by life experience (Lykken & Tellegen, 1996). Every individual has a characteristic and highly heritable range of happiness; at what point in that range he or she operates is determined by external factors that fall into two groups: conditions and voluntary activities. Conditions include wealth, marital status, where the person lives, age, sex, race, and physical abilities. Voluntary activities are things the person chooses to do, such as learning a new skill or language, meditating, travelling, engaging in hobbies, exercising, and socializing.

Might taking drugs be a way to increase happiness? In many individuals diagnosed with disorders such as depression, selective serotonin reuptake inhibitors (SSRIs) such as Prozac, Paxil, Zoloft, Lexapro, or Celexa brighten or stabilize moods, presumably as a result of the increased availability of serotonin in certain crucial places in the brain (FIGURE 13.16). Serotonin, a neurotransmitter, is released from one neuron to activate another. (On neurotransmitters, neurons, and brain chemistry generally, see Chapter 3, “Biological Foundations.”) The brain recycles serotonin after each release by means of a reuptake system. SSRIs inhibit the serotonin reuptake system, thereby increasing the concentration of serotonin. Although scientists do not know how serotonin functions, how inhibiting serotonin reuptake alters the mental state, or even whether serotonin deficiency causes depression in the first place, millions of North Americans take SSRIs. Many of these people suffer from severe depression, but some doctors prescribe mood-brighteners for people whose moods are not extreme and whose neurochemistry may be normal.



**FIGURE 13.16 Mood-Enhancing Drugs** Advertisements for mood-enhancing drugs, such as this one for the antidepressant Paxil, depict them as a surefire way to produce happiness.

Prescribing mood enhancers for individuals who have no mental disorders raises ethical issues. First, safety is a primary concern for healthy people using these drugs long-term, since little is known about the physical effects of long-term use. There may also be social effects, whereby having an easy way to achieve well-being might lead to a redefinition and narrowing of the range of normal emotions, moods, and temperaments. More and more people might feel pressured to take SSRIs because their chemically enhanced peers have set a new standard for cheerfulness. In a more extreme scenario, such treatments could be misused for social control.

Third, mood enhancement raises issues of personal identity and truth. If SSRIs change a user’s personality, do the drugs alter who the person actually is? If Katie is taking an SSRI, are Katie on meds and Katie off meds two different people? If Keith falls in love with Katie, has Keith fallen in love with Katie or with Katie on medication?

Fourth, SSRIs give an overall sense of well-being but do not promote well-being itself, so people taking them may lack the motivating force of discontent to make beneficial changes. Thus they may become emotionally estranged from reality and fail to respond to experiences properly. Would popping a mood-brightening drug be such an easy fix that people would engage less in mood-enhancing activities that may also benefit society, and would this shift eventually change society for the worse?

### LEARNING OBJECTIVES

Describe the causal links among genes, temperament, and personality traits.

Recognize empirical findings supporting biological bases of personality.

## What Are the Biological Bases of Personality?

Where does personality come from? Freud emphasized early childhood experiences in his theory of psychosexual stages, and Rogers believed that unconditional positive regard leads to positive mental health. Most people assume that how a child is treated—by parents, guardians, and so on—will substantially affect that child's personality and subsequent development. As discussed above, both gender and culture influence personality. So what role does biology play? Is each person born with certain predispositions? How do the workings of body and of brain affect the development of personality?

Over the past few decades, evidence has emerged that biological factors—such as genes, brain structures, and neurochemistry—play an important role in determining personality. This is not to say that these factors are insensitive to experience. As discussed in Chapter 3, every cell in the body contains the genome, or master recipe, that provides detailed instructions for physical processes. Gene expression—whether the gene is turned off or on—underlies all psychological activity. Ultimately, genes have their effects only if they are expressed, and environment determines when or if this happens. In terms of personality, genetic makeup may predispose certain traits or characteristics, but whether these genes are expressed depends on the unique circumstances that each child faces during development. For instance, as noted in Chapter 3, children with a certain gene variation were found to be more likely to become violent criminals as adults if they were abused during childhood. An important theme throughout this book is that nature and nurture work together to produce individuals; this theme holds particularly true for personality.

### Animals Have Personalities

If you have ever owned a pet, you probably felt that your pet had a distinct personality. For most of the history of psychological science, your intuition would have been regarded skeptically, the assumption being that you were projecting your own sense of personality onto your pet. However, the principles of evolution suggest a continuity across species in that humans and other animals evolved as they solved occasionally similar adaptive challenges; this view raises the possibility that animals might display consistent individual differences in behaviours, across circumstances, that reflect underlying biological bases of personality (Gosling, 2001). But how do psychological scientists determine animals' personalities?

The British researcher Sam Gosling, studying the behaviour of a group of 34 spotted hyenas, created a personality scale consisting of 44 traits applicable to both humans and hyenas (Gosling, 1998). Four observers who knew hyenas well used the scale independently to rate the animals. Agreement among raters was as high as is typically found in personality studies of humans, suggesting that the raters could assess the hyenas reliably. Using factor analysis, Gosling found that the traits clustered into five factors, albeit not exactly the same five factors found for humans. Although there were rough similarities between humans and hyenas in traits related to agreeableness, neuroticism, and openness to experience, hyenas showed no evidence of a conscientiousness factor, and extroversion seemed to exist mainly in the form of assertiveness—a finding that makes sense given that hyenas form dominance hierarchies (FIGURE 13.17).

Gosling and Oliver John (1999) summarized the findings of 19 studies that assessed multiple personality traits in modestly large samples of nonhuman animals, including household pets, monkeys and other primates, pigs, donkeys, and aquatic animals. They found evidence that traits similar to extroversion, neuroticism, and agreeableness could be seen in most species. Extroversion reflected different levels

## Real World PSYCHOLOGY

## FIGURE 13.17 Scientific Method: Gosling's Study of Personality in Animals

**Hypothesis:** Nonhuman animals can be described in terms of basic personality traits.

**1** The researchers defined 44 traits and asked four observers to rate 34 spotted hyenas on each trait.



**2** Through factor analysis, the 44 traits were clustered into five principal dimensions:

ASSERTIVENESS	CURIOSITY
EXCITABILITY	HUMAN-DIRECTED
SOCIABILITY	AGREEABLENESS

**Results:** The four judges' ratings showed as much agreement as in most personality studies of humans, and the five personality dimensions could not be accounted for by other factors, such as sex or age.

**Conclusion:** The finding that hyenas can reliably be described in terms of personality traits lends support for further personality research on nonhuman animals.

of energy, approachability, and sociability. Neuroticism indicated differences in emotional reactivity, fearfulness, and excitability, whereas agreeableness reflected differences in aggression, hostility, and affinity for mates. For openness to experience, animals in about half the species displayed individual differences in both curiosity and play, and Gosling and John speculated that animals' openness might be similar to behaviours observed in young children. Conscientiousness, a core human trait, was found only among chimpanzees, some of whom showed more unpredictability and disorganized behaviour than others. The finding that only chimpanzees showed any signs of conscientiousness may not be surprising, since they are humans' closest relatives. Indeed, a recent study of personality in orangutans also failed to find evidence of conscientiousness, but it found evidence for the other four of the Big Five traits (Weiss, King, & Perkins, 2006).

Do these judgments of personality in animals reflect true variations, or are they just stereotypes of certain species or breeds (FIGURE 13.18)? To test whether differences in personality traits among animals exist and can be measured, Gosling and his colleagues (2003) examined personality judgments for domestic dogs and compared those to judgments made for humans. The researchers selected three measures of accuracy: (1) the extent to which ratings by the same judges were consistent for similar behaviours over time, (2) whether there was agreement among independent judges viewing the same behaviour, and (3) the extent to which the behaviour corresponded to the definition of the trait, as when a dog was rated as aggressive for baring its teeth angrily. Using these measures of accuracy, Gosling asked each dog owner to rate his or her animal and also to provide the name of a friend who



(a)



(b)

**FIGURE 13.18 Do Dogs Have Personalities?** Which is friendlier, (a) a golden retriever or (b) a Rottweiler? How might you test your hypothesis?

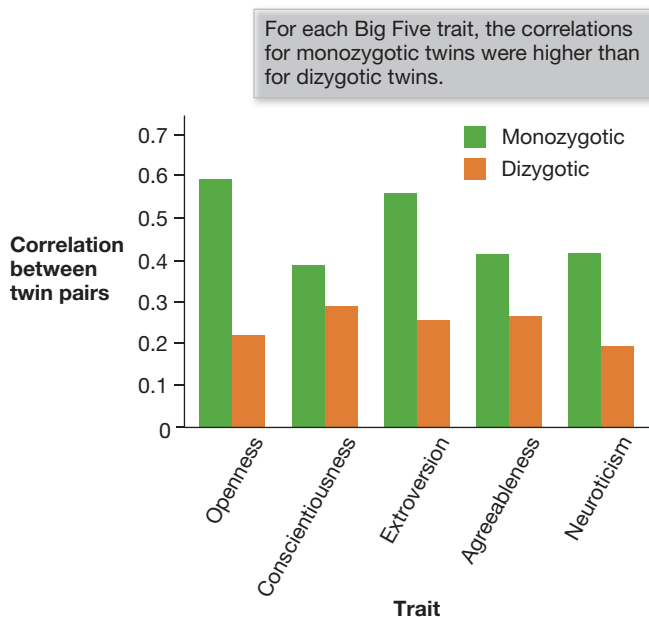
knew the dog well enough to rate it. Independent judges also assessed the behaviour of the dog while it played in a park and performed a wide array of tasks. The dogs were assessed on four personality factors that corresponded roughly to openness to experience, extroversion, agreeableness, and neuroticism. The findings generally indicated that the ratings of the dogs were consistent over time, that the judges agreed, and that the trait behaviours displayed by the dogs corresponded to ratings of those traits made by independent judges. To rule out the possibility that breed stereotypes based solely on appearance influenced the ratings, another group of judges rated only pictures of the dogs. The personality ratings remained accurate even after statistical controlling for the ratings made of the pictures. This study suggests that dogs' personalities can be rated with impressive accuracy. That animals show clear evidence of basic personality traits suggests that these traits are biologically based and passed along through genes.

### Personality Is Rooted in Genetics

Overwhelming evidence indicates that nearly all personality traits have a genetic component (Plomin & Caspi, 1999). One of the earliest studies to document the heritability of personality was conducted by James Loehlin and Robert Nichols (1976), who examined similarities in personality between more than 800 pairs of twins. Across a wide variety of traits, identical twins proved much more similar than fraternal twins. As discussed in Chapter 3, this pattern reflects the actions of genes,

since identical twins share nearly the same genes whereas fraternal twins do not. Numerous twin studies subsequently have found that genetic influence accounts for approximately half the variance (40 percent to 60 percent) between individuals in personality traits, including the Big Five, as well as in specific attitudes that reflect personality traits, such as attitudes toward the death penalty, abortion on demand, and enjoying roller coaster rides (Olson, Vernon, Harris, & Jang, 2001). Further, the genetic basis of these five traits has been shown to be the same across cultures (FIGURE 13.19; Yamagata et al., 2006). These patterns persist whether the twins rate themselves or whether friends, family, or trained observers rate them.

Of course, identical twins might receive more similar treatment than other siblings, and that treatment might explain the similarities in personality. The best evidence refuting this idea was obtained by Thomas Bouchard and his colleagues (1990). Their studies of twins raised apart (as described in Chapter 3, “Biological Foundations”) revealed that these twins are often as similar as, or even more similar than, twins raised together. One possible explanation for this finding is that parents strive to bring out individual strengths in each twin so that each feels unique and special. Thus parenting style may foster differences rather than similarities. If this explanation is correct, we might expect stronger correlations between personality traits for older twins than for younger twins, since the effects of parenting would diminish over time. And indeed, identical twins become more alike as they grow older. By contrast, siblings and fraternal twins do not.



**FIGURE 13.19 Correlations in Twins** Researchers examined correlations between 123 pairs of identical twins (monozygotic) and 127 pairs of fraternal twins (dizygotic) in Vancouver, Canada.

individual strengths in each twin so that each feels unique and special. Thus parenting style may foster differences rather than similarities. If this explanation is correct, we might expect stronger correlations between personality traits for older twins than for younger twins, since the effects of parenting would diminish over time. And indeed, identical twins become more alike as they grow older. By contrast, siblings and fraternal twins do not.

**ADOPTION STUDIES** Further evidence for the genetic basis of personality comes from adoption studies, although such studies usually yield lower estimates of gene influence than do twin studies. Siblings who are adopted (and not biologically related) and raised in the same household are no more alike in personality than any two strangers

randomly plucked off the street (Plomin & Caspi, 1999). Moreover, the personalities of adopted children bear no significant relationship to those of the adoptive parents. These findings suggest that parenting style may have relatively little impact on personality. In fact, current evidence suggests that parenting style has much less impact than has long been assumed. For instance, although studies typically find only small correlations in personality between biological siblings or between children and their biological parents, these correlations are still larger than for adopted children, suggesting that the similarities have a genetic component. Why are children raised together in the same household (who are not identical twins) so different? One explanation is that the lives of siblings diverge as they establish friendships outside the home, and even though they are raised in the same home, their environments differ as a function of age and the fact that they have younger or older sisters or brothers. Siblings' personalities slowly grow apart as their initial differences become magnified through their interactions with the world.

Although the small correlations in personality among siblings might imply that parenting style has little effect, this does not mean that parents are unimportant (see Chapter 11, "Human Development"). David Lykken (2000), a leading American behavioural genetics researcher, has argued that children raised with inadequate parenting are not socialized properly and therefore will much more likely become delinquent or display anti-social behaviour. Thus a minimum level of parenting is crucial, but the particular style of parenting may not have a major impact on personality.

**ARE THERE SPECIFIC GENES FOR PERSONALITY?** Research has revealed genetic components for particular behaviours such as viewing television or getting divorced, and even for specific attitudes such as feelings about capital punishment or appreciation of jazz (Tesser, 1993). These findings do not mean, of course, that genes lurking in people's DNA determine the amount or types of television people watch. Rather, genes predispose certain personality traits associated with behavioural tendencies. In most cases, researchers note the influence of multiple genes that interact independently with the individual's environment to produce general dispositions, such as a preference for indoor activities over outdoor pursuits.

However, growing evidence indicates that genes can be linked with some specificity to personality traits. For instance, a gene that regulates one particular dopamine receptor has been associated with novelty seeking (Cloninger, Adolfsson, & Svrakic, 1996; Ekelund, Lichtermann, Jaervelin, & Peltonen, 1999). The theory is that people with one form of this gene are deficient in dopamine and seek out novel experiences to increase the release of dopamine. Research on neuroticism and agreeableness implicates a gene that regulates serotonin, although the effect is not large (Jang et al., 2001). These genes and perhaps thousands of others contribute to specific traits that combine to influence a person's overall personality and sense of psychological well-being (Weiss, Bates, & Luciano, 2008). For instance, some pairs of genes seem to work in opposite ways, such as making people more or less neurotic, and therefore they may cancel each other out (Savitz & Ramesar, 2004).

David Lykken and his colleagues (1992) note that it may be the chance aggregation of genes that produces unique individuals. They provide the analogy of a poker hand, in which the mother has dealt the ten and king of hearts and the father has dealt the jack, queen, and ace of hearts. Although neither parent alone has dealt a meaningful hand, together they have passed on a royal flush. Of course, some people receive winning hands and others receive difficult hands to play. The point is that



*"I could cry when I think of the years I wasted accumulating money, only to learn that my cheerful disposition is genetic."*



**temperaments** Biologically based tendencies to feel or act in certain ways.



**FIGURE 13.20 Temperament and Location** Finns who move to urban centres—such as Helsinki, as shown here—are more likely to score high on sociability.

each person's personality reflects the genetic hand dealt jointly by both of that person's parents. Moreover, each person experiences different circumstances that may cause the selective expression of certain genes. Given the complexity of most personalities, the complexity of their underlying physiology is hardly surprising. As psychological scientists gain a greater understanding of the human genome in general, they likely will continue to identify how specific genes interact with environments to produce various aspects of personality.

## Temperaments Are Evident in Infancy

Genes work by affecting biological processes. Therefore, to the extent that genes influence personality, there ought to be corresponding biological differences in personality, called **temperaments**. Temperaments, which are considered broader than traits, are general tendencies to feel or act in certain ways. Although life experiences may alter personality traits, temperaments represent the innate biological structures of personality.

The American researchers Arnold Buss and Robert Plomin (1984) have argued that three personality characteristics can be considered temperaments. *Activity level* is the overall amount of energy and of behaviour a person exhibits. For example, some children race around the house, others are less vigorous, and still others are slow-paced. *Emotionality* describes the intensity of emotional reactions. For example, children who cry often or easily become frightened, as well as adults who quickly anger, are likely high in emotionality. Finally, *sociability* refers to the general tendency to affiliate with others. People high in sociability prefer to be with others rather than to be alone. These temperaments have been linked to people's propensities to move to new locations. A study of migration patterns in Finland found that those people who scored high on sociability were more likely to migrate to urban areas and were likely to migrate to places that were quite distant from their hometowns (**FIGURE 13.20**). Those people who had high activity levels were more likely, in general, to migrate to a new location, regardless of that location. Last, those who were high in emotionality were likely to migrate to places that were close to their hometowns (Jokela, Elovainio, Kivimaki, & Keltikangas-Jarvinen, 2008). According to Buss and Plomin, these three temperamental styles are the main personality factors influenced by genes. Indeed, evidence from twin studies, adoption studies, and family studies indicates a powerful effect of heredity on these core temperaments.

**LONG-TERM IMPLICATIONS OF TEMPERAMENTS** To what extent do infant temperaments predict adult personality? Recent research has documented compelling evidence that early childhood temperaments significantly influence behaviour and personality structure throughout a person's development (Caspi, 2000). In one study (also discussed in Chapter 3, "Biological Foundations"), researchers investigated the health, development, and personalities of more than 1,000 people born during a one-year period (Caspi et al., 2002). These individuals were examined approximately every two years. At three years of age, children were classified into temperamental types based on examiners' ratings. The classification at age three predicted personality structure and a variety of behaviours in early adulthood (**FIGURE 13.21**). For instance, inhibited children were much more likely to become depressed. These findings suggest that early childhood temperaments may be good predictors of later behaviours.



**GENDER AND TEMPERAMENTS** As discussed earlier, reliable differences exist between males and females in terms of personality traits, at least within Western cultures. How early do these differences emerge? Do temperament differences exist between girls and boys? A recent meta-analysis found robust gender differences in temperament in early childhood (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006). Girls demonstrated a stronger ability to control their attention and to resist their impulses, whereas boys were more physically active and experienced more high-intensity pleasure, such as in rough-and-tumble play. However, there were no temperamental differences in negative emotions, such as being angry or neurotic, during childhood.

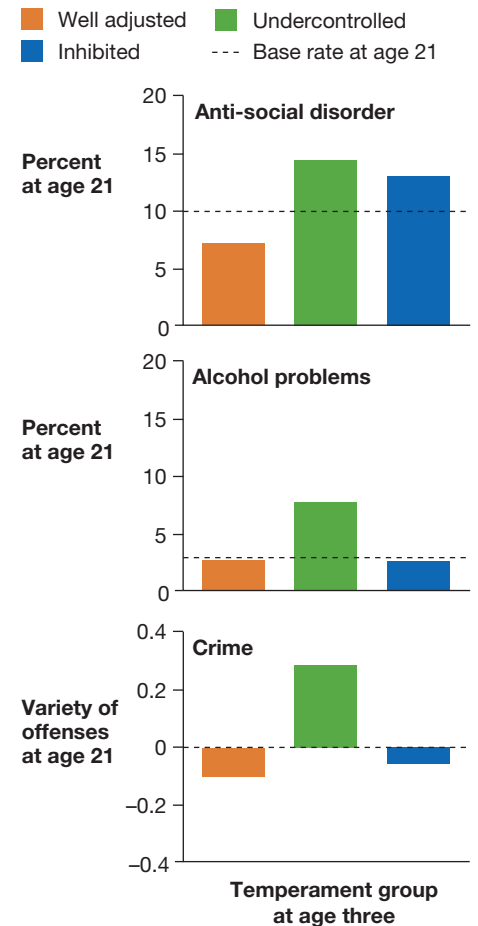
**SHYNESS AND INHIBITION** The extent to which people are shy has been linked to early differences in temperament. Research has shown that children as young as six weeks of age can be identified as likely to be shy (Kagan & Snidman, 1991). Approximately 15 percent to 20 percent of newborns react to new situations or strange objects by becoming startled and distressed, crying, and vigorously moving their arms and legs. Kagan refers to these children as *inhibited*, a characteristic he views as biologically determined. Showing signs of inhibition at two months of age predicts later parental reports that the children are shy at four years of age, and such children are likely to be shy well into their teenage years. Indeed, measures of brain stem reactivity, indicating the ease with which a person is aroused, at ages 10 to 12 correspond to ratings made of these children at four months of age (Woodward et al., 2001), such that inhibited children show greater reactivity. Similar genetic findings for inhibited behaviour have been found in species including dogs and monkeys. The biological evidence suggests that the amygdala—the brain region involved in emotional responses, especially fear—is involved in shyness.

Although shyness has a biological component, it has a social component as well: Approximately one-quarter of behaviourally inhibited children are not shy later in childhood. This development typically occurs when parents create supportive and calm environments in which children can deal with stress and novelty at their own paces. But these parents do not completely shelter their children from stress, so the children gradually learn to deal with their negative feelings in novel situations. Moreover, shyness varies across cultures: For example, it is quite common in Japan and less common in Israel. Such social and cultural factors highlight the interplay between nature and nurture.

### Personality Is Linked to Specific Neurophysiological Mechanisms

Genes act to produce temperaments, which affect how children respond to and shape their environments, which in turn interact with temperament to shape personality. But how do these genetic predispositions produce personality? That is, what neurophysiological mechanisms are linked to personality? Some theories focus on the biological processes that produce the thoughts, emotions, and behaviours that make up personality. From this perspective, personality differences may reflect differences in the relative activation of different biological systems (Canli, 2006). Most research on the neurobiological underpinnings of personality has explored the dimension of extroversion/introversion.

**AROUSAL AND EXTROVERSION/INTROVERSION** The intellectual founder of the modern biological approach to personality was Hans Eysenck, who believed that differences in cortical arousal produce the behavioural differences between



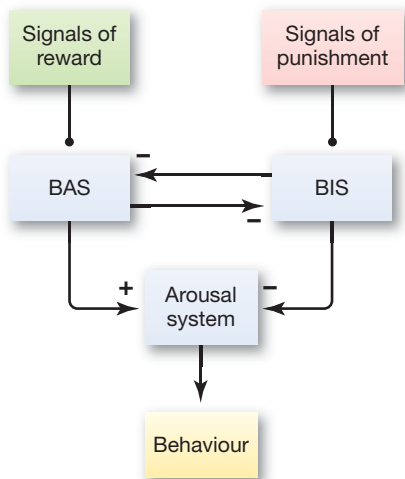
**FIGURE 13.21 Predicting Behaviour** Researchers investigated the personality development of more than 1,000 people, 97 percent of whom remained in the study through their 21st birthdays. Those judged undercontrolled at age three were later more likely to have alcohol problems, to be criminals or unemployed, to attempt suicide, to be anti-social and anxious, and to have less social support than those judged either well adjusted or inhibited.



**FIGURE 13.22 Hans Eysenck** Eysenck was one of the leading proponents of the idea that personality is rooted in biology.

**behavioural approach system (BAS)** The brain system involved in the pursuit of incentives or rewards.

**behavioural inhibition system (BIS)** The brain system that is sensitive to punishment and therefore inhibits behaviour that might lead to danger or pain.



**FIGURE 13.23 Behavioural Approach System and Behavioural Inhibition System** Signals of potential reward are processed by the BAS. Signals of potential punishment are processed by the BIS. Based on the information each receives, the BAS activates behaviour and the BIS inhibits behaviour.

extroverts and introverts (**FIGURE 13.22**). Cortical arousal, or alertness, is regulated by the *ascending reticular activating system (ARAS)*, and Eysenck proposed that this system differs between extroverts and introverts. He noted that extroverts seem constantly to seek additional arousal—for example, by attending parties or meeting new people. By contrast, introverts seem to avoid arousal by preferring solitary, quiet activities such as reading. According to earlier psychological theories, each person prefers to operate, and operates best, at some *optimal level of arousal* (see Chapter 9, “Motivation and Emotion”). Eysenck proposed that the resting levels of the ARAS are higher for introverts than for extroverts. Extroverts typically are below their optimal levels, such that they are chronically underaroused. To operate efficiently, they have to find arousal, so they impulsively seek out new situations and new emotional experiences. Introverts, whose arousal is above their optimal levels, do not want any additional arousal. They prefer quiet solitude with few stimuli. If you are an introvert, a noisy environment will distract you; if you are an extrovert, quiet places will bore you. Consistent with Eysenck’s theory, research has demonstrated that extroverts perform better in noisy settings (Geen, 1984).

If introverts are chronically more aroused than extroverts, they ought to be more sensitive to stimuli at all levels of intensity. Generally, introverts do appear more sensitive—to pain, for example, and to sourness (they salivate more when lemon juice is placed on their tongues than extroverts do). However, evidence for baseline differences in arousal has been more difficult to produce. Thus what differentiates introverts from extroverts appears to be their level of *arousability*, or reactivity to stimuli, such that introverts are more arousable.

The American researcher Marvin Zuckerman (1994) describes the arousal-based trait of *sensation seeking* as similar to extroversion but with an impulsive element that more closely matches psychoticism, one of Eysenck’s superordinate traits. According to Zuckerman, sensation seekers have a neurochemical deficiency that motivates them to seek arousal through adventures and new experiences. Moreover, sensation seekers tend to be easily bored and to escape boredom through the use of drugs and/or alcohol.

**NEUROPHYSIOLOGY OF EXTROVERSION/INTROVERSION** A number of theorists have offered refinements to Eysenck’s initial work that reflect more recent understandings of how the brain functions. The various theories have some common features, including a basic differentiation between approach learning and avoidance learning. The British psychologist Jeffrey Gray (1987) incorporated this distinction in his approach/inhibition model of the relation between learning and personality. Gray proposed that personality is rooted in motivational functions that have evolved to help organisms respond efficiently to reinforcement and punishment. In Gray’s model, the **behavioural approach system (BAS)** consists of the brain structures that lead organisms to approach stimuli in pursuit of rewards. This is the “go” system. The “stop” system, known as the **behavioural inhibition system (BIS)**, is sensitive to punishment and therefore inhibits behaviour that might lead to danger or pain (**FIGURE 13.23**). According to Gray, extroverts have a stronger BAS than BIS, so they are more influenced by rewards than by punishments. Indeed, extroverts tend to act impulsively in the face of strong rewards, even following punishment (Patterson & Newman, 1993). By contrast, introverts have a more active BIS. Their chronic anxiety often leads them to avoid social situations in which they anticipate possible negative outcomes.

The BIS is associated with activity in the frontal lobes, which help inhibit inappropriate social behaviour. Those with injury to the frontal lobes, especially the prefrontal cortex, exhibit social incompetence, disinhibition, impaired social judgment,

and a lack of sensitivity to social cues. (For an image of these brain regions, see Figure 3.25.) One imaging study found that introversion was associated with greater activation of the frontal lobes (Johnson et al., 1999), a finding that supports Gray's model of BIS. The amygdala is another brain region involved in both social sensitivity and the processing of cues related to possible punishment. As mentioned previously, some researchers believe personality traits such as fearfulness, anxiousness, and shyness are associated with excessive activation of the amygdala (Zuckerman, 1995). People who are usually anxious show a heightened amygdala response when observing pictures of neutral facial expressions, perhaps because such people are especially sensitive to signs of social rejection, so the neutral faces may trigger evaluation concerns (Somerville, Kim, Johnstone, Alexander, & Whalen, 2004).

We still have much to learn about the biological bases of personality. Only with recent advances in technology have researchers started to explore personality's genetic and neurophysiological correlates. For example, in one study of people who possess a particular form of a serotonin gene associated with greater fearfulness and negativity, participants showed greater amygdala activity when looking at pictures of human faces with emotional expressions than did participants with the other form of the gene (Hariri et al., 2002). Using brain imaging and gene data together may become a powerful new way to assess the biological basis of personality. We can anticipate many exciting new discoveries relevant to personality and temperament as a result of the biological revolution in psychological science (Canli, 2004).

## Personality Is Adaptive

As natural selection has shaped the human genome over the course of evolution, adaptive characteristics likely spread through the gene pool and occurred in increasing numbers from generation to generation. Thus we might expect that personality traits useful for survival and reproduction were favoured. It is easy to imagine how being competitive might lead an individual to obtain great rewards or to enjoy increased value in his or her social group. But traits also provide important information about desirable and undesirable qualities in mates, such as whether a person is conscientious, agreeable, neurotic, and so on. David Buss (1999) has argued that the Big Five personality traits emerged as foundational because each one provides important information regarding mate selection.

But if traits are adaptive, why do individuals differ so greatly? Natural selection ought to have made people more similar rather than more different. One possible explanation is that individual differences reflect characteristics, perhaps resulting from random processes, that were of trivial importance over the course of evolution (Tooby & Cosmides, 1990). However, Buss and Greiling (1999) have proposed that individual differences may reflect the inheritance of alternative strategies that become activated according to situational contexts. For example, consider a situation in which most people are honest and co-operative and therefore trust others to be honest and co-operative as well. A dishonest person in such a system could do well by exploiting others' basic trust. Of course, if too many people acted dishonestly, the system would change or collapse. The important point is that evolution has allowed for multiple strategies that are differentially adaptive depending on environmental demands.

Another possible explanation for individual differences is that human groups whose members possess diverse skills have a selective advantage over other human groups (Caporael, 2001). Members of successful groups are all more likely to survive and reproduce. Consider the trait of novelty seeking. Having group members who seek out and explore new territory might lead to the discovery of new

resources, such as an abundant food supply. At the same time, novelty seekers expose themselves to greater risks, and the group would suffer if all its members followed this strategy. Therefore, it is to the group's advantage to have cautious members as well; these individuals may enhance the group in other ways, perhaps by being more considerate or providing social support.

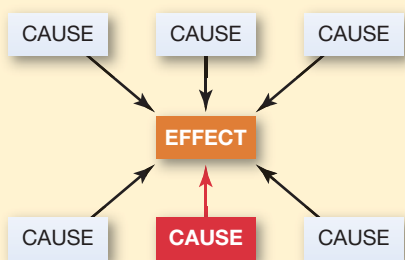
### CRITICAL THINKING SKILL

## Avoiding Single-Cause Explanations

Imagine you are talking to two people who are brother and sister. The brother explains that he is a terrible spendthrift because he grew up very poor, whereas his sister explains that she is thrifty, to the point of being cheap, because she grew up very poor. In other words, they provide the same explanation for opposite behaviours. Although most of us understand that differences among people result from multiple causal factors, we often act as though single explanations are correct (Nisbett and Ross, 1980).

Most people prefer single explanations that confirm their pre-existing biases. (See the discussion of confirmation bias in Chapter 8, "Thinking and Intelligence," and see the discussion of belief persistence in Chapter 9, "Motivation and Emotion.") For example, people who have never received welfare (assistance from the government for basic necessities) are likely to describe welfare recipients as lazy. People on welfare, in contrast, might explain that they need the help because they have been unlucky or because a weak economy does not provide enough job opportunities. (Notice that these single explanations also reflect the actor/observer discrepancy bias, discussed in Chapter 12, "Social Psychology"; it is the tendency to explain other people's behaviour as caused by their own actions and to view one's own behaviour as caused by external events.)

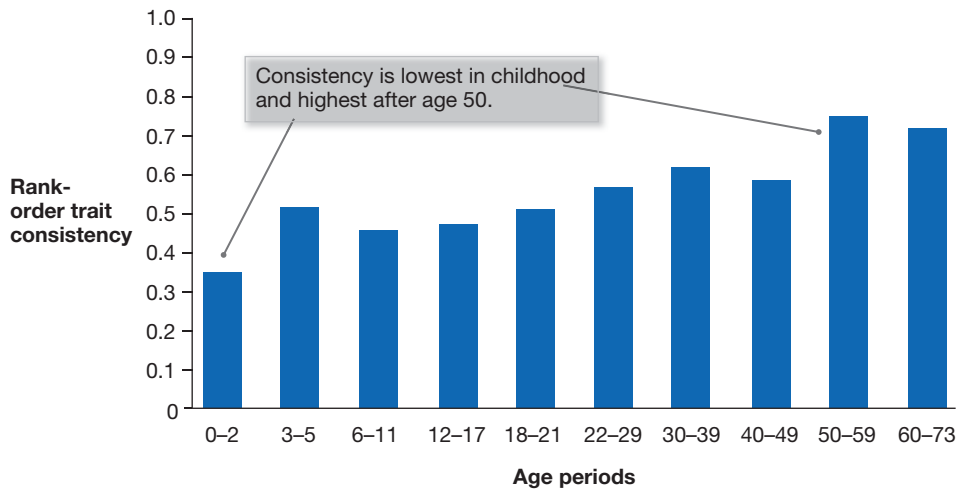
In the debate over why men or women constitute the majority in different occupations (e.g., women in nursing and clerical jobs, men in the building trades and architecture), most people argue from the standpoint of either nature or nurture, even though they admit that both must be important. Similarly, individuals usually are on welfare for multiple reasons, such as insufficient education, poverty in childhood, limited access to good jobs, poor health, and so on. Whenever you hear people claiming single causes for complex phenomena, or when you find yourself starting to do so, remember to consider multiple causes instead (FIGURE 13.24).



**FIGURE 13.24 Think Critically: Cause(s) and Effect** Be sure to consider multiple causes of a phenomenon, not just the one that jumps out at you.

## Personality Traits Are Stable over Time

The Jesuit maxim *Give me a child until he is seven, and I will show you the man* is the thesis of Michael Apted's *Up* series of documentary films, which follows the development of a group of British schoolchildren through interviews at ages 7, 14, 21, 28, 35, 42, and 49. A striking aspect of these films is the apparent stability of personality over time. The child interested in the stars and science becomes a professor of physics; the boy who finds his childhood troubling and confusing develops an apparent schizo-affective personality; the reserved, well-mannered, upper-class girl at age 7 grows into the reserved, well-mannered woman in her pastoral retreat at age 35. Are people really so stable? Childhood temperaments may predict behavioural outcomes in early adulthood, but what about change during adulthood?



**FIGURE 13.25 The Stability of Personality** This graph shows the levels of consistency, at different ages, of the study participants' personalities.

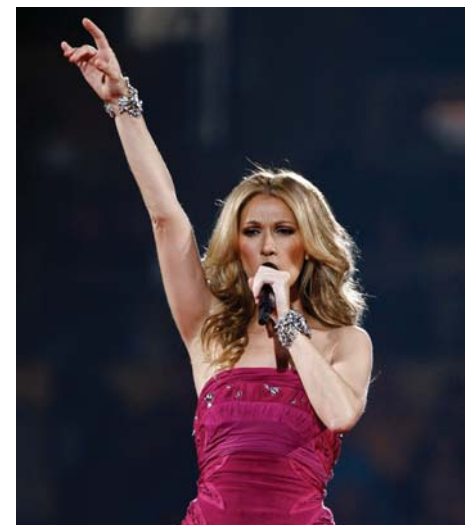
Indeed, the foundation of clinical psychology is the belief that people can and do change important aspects of their lives. They exert considerable energy trying to change—they attend self-help groups, read self-help books, pay for therapy sessions, and struggle to make changes in their lives. But how much can people really change?

How we define the essential features of personality has tremendous implications for whether it is fixed or changeable. Continuity over time and across situations is inherent in the definition of *trait*, and most research finds personality traits to be remarkably stable over the adult lifespan (Heatherton & Weinberger, 1994). For instance, over many years the relative rankings of individuals on each of the Big Five personality traits remain stable (McCrae & Costa, 1990). A meta-analysis of 150 studies consisting of nearly 50,000 participants, who had been followed for at least one year, found strong evidence for stability in personality (Roberts & Friend-DelVecchio, 2000). The rank orderings of individuals on any personality trait were quite stable over long periods across all age ranges. However, stability was lowest for young children and highest for those over age 50 (FIGURE 13.25). This finding suggests that personality changes somewhat in childhood but becomes more stable by middle age. Such findings support the contention of the American psychologist William James, who stated in 1890, “For most of us, by age 30, the character has set like plaster and will never soften again” (p. 12b). According to the meta-analysis, James was right that personality becomes set, but it appears to happen a little later than age 30 (FIGURE 13.26).

**AGE-RELATED CHANGE** Stability in rank ordering means that individuals stay the same as compared with others. However, might all people change in personality as they grow older, while retaining their relative rankings? For instance, do people always become wiser and more cautious as they get older? In general, people become less neurotic, less extroverted, and less open to new experiences. They also tend to become more agreeable and more conscientious (Srivastava, John, Gosling, & Potter, 2003). These effects are not large, but they are consistent (Roberts, Walton, & Viechtbauer, 2006). Moreover, the pattern holds in different cultures (McCrae et al., 2000; FIGURE 13.27); this finding suggests that age-related changes in personality occur independently of environmental influences and therefore that personality change itself may be based in human physiology. Indeed, evidence shows that personality change has a genetic component, such that the extent of change is more similar in monozygotic twins than in dizygotic twins (McGue, Bacon, & Lykken, 1993).

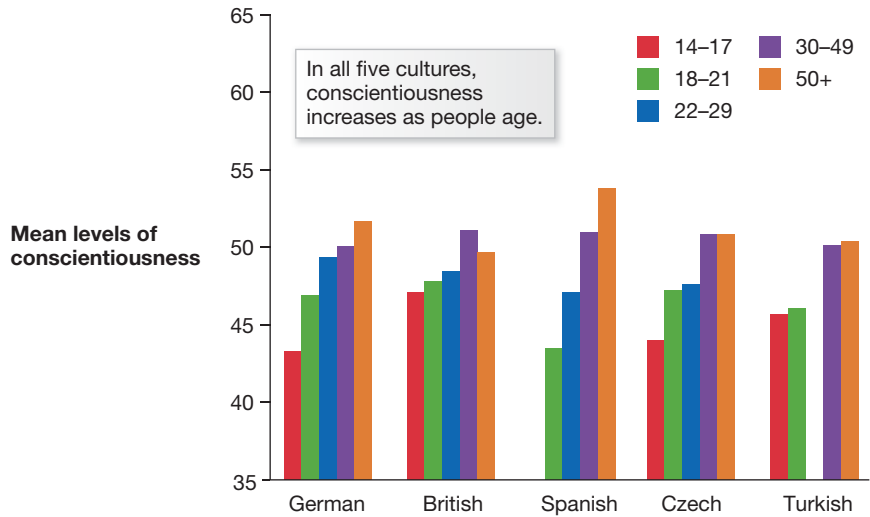


(a)



(b)

**FIGURE 13.26 Céline Dion** How similar has the personality of Céline Dion, shown here in (a) 1980 and (b) 2008, remained over the years?

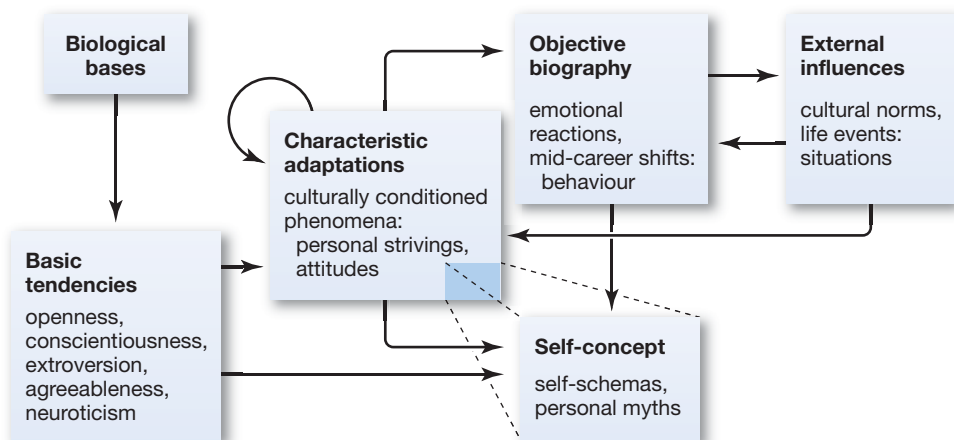


**FIGURE 13.27** Mean Levels of Conscientiousness at Different Ages in Five Cultures

**CHARACTERISTIC ADAPTATIONS** In their research on potential change in personality, Robert McCrae and Paul Costa (1999), of the National Institute of Aging, emphasize an important distinction between basic tendencies of personality and characteristic adaptations (FIGURE 13.28). *Basic tendencies* are dispositional traits determined largely by biological processes; as such, they are very stable. *Characteristic adaptations* are adjustments to situational demands; such adaptations tend to be somewhat consistent because they are based on skills, habits, roles, and so on. But changes in behaviour produced by characteristic adaptations do not indicate changes in basic tendencies. Consider a highly extroverted woman: In her youth, she may go to parties frequently, be a thrill seeker, and have multiple sexual partners. In her old age, she will less likely do these things, but she may have many friends and enjoy travelling. Although the exact behaviours differ, they reflect the core trait of extroversion.

Overall, then, personality appears to be relatively stable, especially among adults, because of numerous factors. If personality is determined partly by biological mechanisms, some of its changes will be tied to changes in biological makeup. Indeed, damage to certain brain regions is associated with dramatic changes in personality. For example, damage to the frontal lobes (such as in the railroad worker Phineas Gage, described in Chapter 3, “Biological Foundations,” or Elliot, described in

**FIGURE 13.28** McCrae and Costa’s Model of Personality Basic tendencies are biologically based, but characteristic adaptations are influenced by situations. The lines with arrows indicate some of the ways in which the different components interact. The important point is that basic tendencies do not change across situations, but observable behaviour (objective biography) does because it is influenced by personal goals and motives as well as by situations.



Chapter 9, “Motivation and Emotion”) has been found to produce various changes in personality, such as increased extroversion, impulsiveness, moodiness, and socially inappropriate behaviour (Stuss, Gow, & Hetherington, 1992). That the brain develops well into early adulthood may explain the greater evidence of personality change before age 30. At the same time, people’s environments tend to be relatively stable, especially after early adulthood. People tend to have successive jobs with the same status level and to marry those similar in attitudes and personality. The stability of situations likely contributes to the stability of personality.



## SUMMING UP

### What Are the Biological Bases of Personality?

Evidence from behavioural genetics has demonstrated that personality has a substantial genetic component accounting for approximately half the variance in most traits. Temperaments, biology-based personality tendencies, are evident in early childhood and have long-term implications for adult behaviour. Temperamental styles reflect underlying differences in biological processes, especially those related to neurophysiology. Such differences may reflect adaptive advantages over the course of human evolution. Given that personality is rooted partly in biology, it is not surprising that most people’s personalities remain relatively stable over time, especially in adulthood.



## MEASURING UP

1. Which of the following statements are true regarding the relationships among environment, genes, personality traits, and temperament? Select all that apply.
  - a. Environment interacts with personality traits to shape temperament.
  - b. Environment interacts with temperament to shape personality traits.
  - c. Genes act to produce temperament.
  - d. Temperament affects how each child responds to and shapes his or her environment.
  - e. The influence of genes on temperament and on personality traits changes over the lifespan.
2. Which of the following findings support biological bases of personality?
  - a. Children as young as six weeks of age can be classified as evidencing specific temperaments (Kagan & Snidman, 1991).
  - b. Factor analysis reveals five basic personality traits (McCrae & Costa, 1999).
  - c. Introversion is associated with greater activation of the frontal lobes (Johnson et al., 1999).
  - d. Personality traits can predict academic outcomes, including scores on standardized tests and grades in university (Noftle & Robins, 2007).
  - e. Changes in personality as people age occur the same across all cultures (McCrae et al., 2000).
  - f. Siblings who are adopted (and not biologically related) and raised in the same household are no more alike in personality than random strangers (Plomin & Caspi, 1999).
  - g. Twin studies suggest that 40 percent to 60 percent of the variance between individuals in personality traits can be accounted for by genetics.

### LEARNING OBJECTIVES

Differentiate among leading theoretical perspectives concerning the nature and origins of self-esteem.

Describe cultural differences in self-construal.

## Real World PSYCHOLOGY

# How Do We Know Our Own Personalities?

In the previous sections, the subject was people's personalities generally, and the central question was *What must we know to know a person well?* In considering our own personalities, we can rephrase that question as *What must we know to know ourselves well?* The following section examines how we process information about ourselves and how that processing shapes our personalities.

Although we all have a notion of something we refer to as the “self,” the self is difficult to define. At a general level, it involves each person's mental representation of personal experience and includes his or her thought processes, physical body, and conscious awareness of being separate from others and unique. This sense of self is a unitary experience, continuous over time and space. When you wake up in the morning, for example, you do not have to figure out who you are (even if you sometimes have to figure out where you are, such as when you are on vacation).

## Our Self-Concepts Consist of Self-Knowledge

Write down 20 answers to the question *Who am I?* The information in your answers is part of your *self-concept*, which is everything you know about yourself (FIGURE 13.29). For example, answers commonly given by university students include gender, age, student status, interpersonal style (e.g., shy, friendly), interpersonal characteristics (e.g., moody, optimistic), and body image. But how would thinking of yourself as shy or optimistic or overweight affect how you feel and function from day to day? Many psychologists view the self-concept as a cognitive knowledge structure that guides your attention to information relevant to you and that helps you adjust to your environment. If you think of yourself as shy, you might avoid a raucous party; if you believe yourself to be optimistic, you might easily bounce back from a poor grade in organic chemistry; and so on.



**FIGURE 13.29** Sense of Self Each of us has a self-concept.

**SELF-AWARENESS** William James and the American sociologist George Herbert Mead were among the first modern thinkers to consider the nature of the self, and both differentiated between the self as the knower (“I”) and the self as the object that is known (“me”)—now called the *objectified self*. As the knower, the self is the subject doing the thinking, feeling, and acting. It is involved in executive functions such as choosing, planning, and exerting control. The objectified self is the knowledge the subject holds about itself, such as its best and worst qualities. The sense of self as the object of attention is the psychological state known as *self-awareness*—when the “I” thinks about the “me.”

What are the consequences of being self-aware? In 1972, the American psychologists Shelley Duval and Robert Wicklund introduced the theory of objective self-awareness, which proposes that self-awareness leads people to act in accordance with the values and beliefs they hold. For instance, one study showed that university students are less likely to cheat, when given the opportunity, if they are sitting in front of mirrors (Diener & Wellborn, 1976). Perhaps seeing their own faces reminds them that they do not value cheating. As discussed in Chapter 9, discrepancies between personal standards (e.g., not cheating) and goals (e.g., passing the test) can motivate behaviours (e.g., studying) that reduce the discrepancy. According to the psychologist Tory Higgins's *self-discrepancy theory* (1987), this awareness of differences between personal standards and goals leads to strong emotions. For instance, being aware of a discrepancy between seeing yourself as lazy and preferring to see yourself as hard-working can lead you to feel disappointed, frustrated, and depressed; being aware

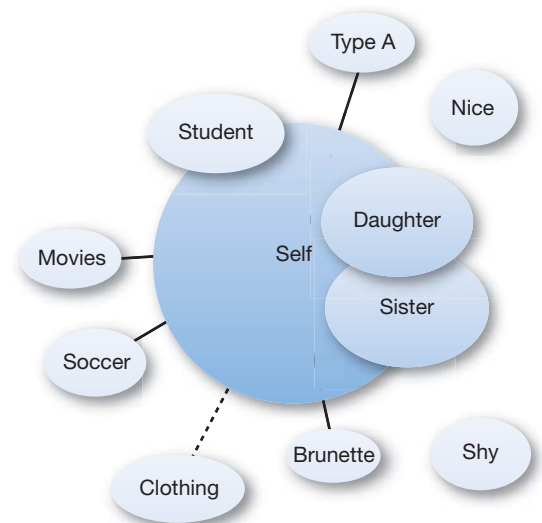


of a discrepancy between seeing yourself as lazy and wanting others to see you as hard-working can lead you to feel anxious and guilty. So if you fail an important class because you did not study enough, you might feel depressed; but if you think about how your parents will feel when you fail an important class because you did not study enough, you might feel anxious.

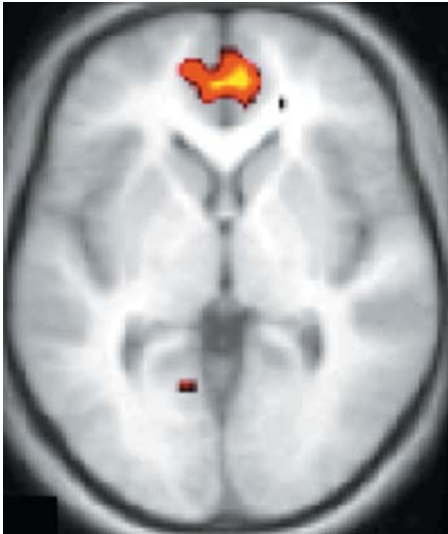
From studies of patients with brain injuries, we know that self-awareness is highly dependent on normal development of the frontal lobes. People with damage to the frontal lobes tend to be only minimally self-reflective and seldom report daydreaming or other types of introspection. They also often show a lack of interest in or knowledge about their disorders. Such individuals are not completely unaware of themselves, but they do not find information about the self personally significant. The Canadian neuropsychologist Donald Stuss (1991) reported on a highly intelligent patient who had a tumour removed from his frontal lobes. Subsequently, the patient had difficulty at work and became extremely unproductive, even though his intelligence and knowledge about the world were intact. As noted in Chapter 3, people with damage to the frontal lobes often have social and motivational impairments, which may interfere with job performance. Despite 18 months of therapy, the patient continued to do poorly on the job, but he could not recognize that he had a problem. When asked to role-play the situation as if he were the boss, he quickly recognized the problem and made appropriate recommendations—that the worker (himself) be put on a disability pension. However, when asked to evaluate himself from his own subjective perspective, he disagreed with the recommendation he had just made. Dramatic examples such as this one show the types of distortion that frontal-lobe patients may experience in processing information about the self.

**SELF-SCHEMA** Have you ever been at a loud, crowded party where you could barely hear yourself speak, but when someone across the room mentioned your name, you heard it clearly above the noise? As discussed in Chapter 7, the *cocktail party phenomenon* occurs because information about the self is processed deeply, thoroughly, and automatically. According to the American psychologist Hazel Markus (1977), the self-schema is the cognitive aspect of the self-concept, consisting of an integrated set of memories, beliefs, and generalizations about the self. The self-schema can be viewed as a network of interconnected knowledge about the self (FIGURE 13.30). It helps us perceive, organize, interpret, and use information about the self; it also helps filter information so that each of us will likely notice things that are self-relevant, such as our own names. Examples of our behaviour, and aspects of our personalities, that are important to us become prominent in our self-schemas. For instance, being a good athlete or a good student may be a major component of your self-schema, whereas having few cavities probably is not. Thus when asked if you are ambitious, you can answer without sorting through occasions in which you did or did not act ambitiously. Your self-schema summarizes the relevant past information.

Self-schemas may lead to enhanced memory for information processed in a self-referential manner. Tim Rogers and his colleagues (1977) showed that trait adjectives processed with reference to the self (e.g., “Does the word *honest* describe you?”) were better recalled than comparable items processed only for their general meanings (e.g., “Does the word *honest* mean the same as *trustworthy*?”). Researchers more recently have examined the neural dimensions of self-referential processing (Gillihan & Farah, 2005). A typical finding is activation of the middle of the frontal lobes when people process information about themselves



**FIGURE 13.30 Self-Schema** The self-schema consists of interrelated knowledge about the self. The strength of the line (from dotted to thick) indicates the strength of the connection to self-knowledge. Concepts that overlap are the most strongly related to the self. Concepts with no connecting lines do not relate to the self.



**FIGURE 13.31 Frontal Lobe Activity** On this brain scan from the study by Kelley et al., the red, orange, and yellow area indicates the activation.

**FIGURE 13.32 Working Self-Concept** When considering themselves or their personalities, people are especially likely to mention characteristics that distinguish them from other people.

Who am I?



Who am I?



(Kelley et al., 2002; **FIGURE 13.31**). This brain region is more active when we answer questions about ourselves (e.g., “Are you honest?”) than when we answer questions about other people (e.g., “Is Madonna honest?”). The greater the activation of this area during self-referencing, the more likely we will remember the item later during a surprise memory task (Macrae, Moran, Heatherton, Banfield, & Kelley, 2004). Along with the self-awareness deficit shown in neurological patient studies, this finding further supports the idea that the frontal lobes are important for processing information about the self.

**WORKING SELF-CONCEPT** The immediate experience of self, the *working self-concept*, is limited to the amount of personal information that can be processed cognitively at any given time. Because the working self-concept includes only part of the vast array of self-knowledge, the sense of self varies from situation to situation. For instance, at a party you might think of yourself as fun-loving rather than as intelligent, even though both traits are aspects of your self-concept. Thus your self-descriptions vary as a function of which memories you retrieve, which situation you are in, which people you are with, and your role in that situation.

When people consider who they are or think about different features of their personalities, they often emphasize characteristics that make them distinct from others. For instance, think back to your 20 responses to the question *Who am I?* Which answers stressed your similarity to other people or membership in a group? Which ones stressed your differences from other people, or at least from the people immediately around you? Respondents are especially likely to mention features such as ethnicity, gender, or age if the respondents differ from other people around them at the moment (**FIGURE 13.32**). Thus Canadians would more likely note their nationality if they were in Boston, for example, than if they were in Toronto. Because the working self-concept guides behaviour, this tendency implies that Canadians also would more likely feel and act like “Canadians” when in Boston than when in Toronto. Most people have optimal levels of distinctiveness, however, since generally they want to avoid standing out too much; teenagers especially want to stand out and fit in at the same time.

## Perceived Social Regard Influences Self-Esteem

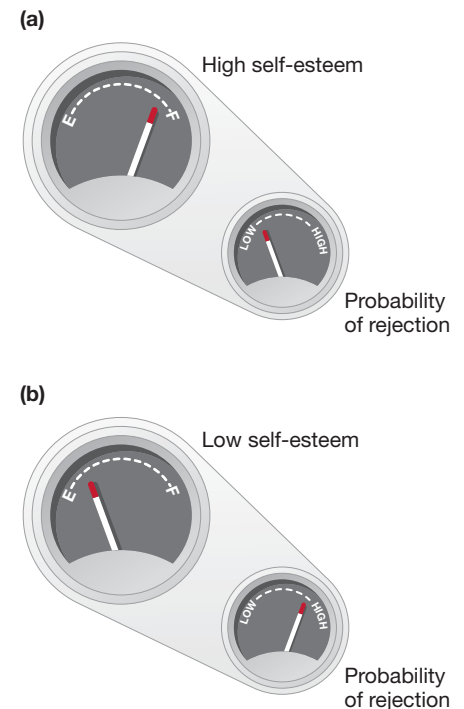
North American culture has been obsessed with self-esteem since at least the 1980s. At a basic level, *self-esteem* is the evaluative aspect of the self-concept, indicating people’s emotional response as they contemplate various characteristics about themselves (e.g., worthy or unworthy, good or bad). Although self-esteem is related to self-concept, people can objectively believe positive things about themselves without liking themselves very much. Conversely, people can like themselves very much, and therefore have high self-esteem, even when objective indicators do not support such positive self-views.

Many theories assume that people’s self-esteem is based on how they believe others perceive them. According to this view, known as *reflected appraisal*, people internalize the values and beliefs expressed by important people in their lives,

adopting those attitudes (and related behaviours) as their own. Consequently, people come to respond to themselves in manners consistent with how others respond to them. From this perspective, when important figures reject, ignore, demean, or devalue a person, the person likely will experience low self-esteem.

This social view of self-esteem, as espoused by psychologists such as Carl Rogers, has led some theorists to promote parents' unconditional acceptance of their children. Later theorists have noted, however, that unconditional acceptance must occur in the context of relatively strict parenting, in which parents define limits clearly and enforce them by providing positive reinforcement for behaviours within, and punishment for behaviours outside, those limits (Coopersmith, 1967). In other words, children will be accepted and loved no matter what they do, but their inappropriate behaviours will be corrected through punishment.

**SOCIOMETER THEORY** In a novel and important account of self-esteem, Mark Leary and his colleagues (1995) have proposed that self-esteem monitors the likelihood of social exclusion. This theory assumes that, as discussed in Chapter 12, humans have a fundamental, adaptive need to belong. For most of human evolution, those who belonged to social groups have been more likely to survive and reproduce than those who were excluded and left to survive on their own. When people behave in ways that increase the likelihood that they will be rejected, they experience a reduction in self-esteem. Thus self-esteem is a **sociometer**, an internal monitor of social acceptance or rejection (FIGURE 13.33). Those with high self-esteem have sociometers indicating a low probability of rejection; such individuals do not worry about how they are perceived by others. By contrast, those with low self-esteem have sociometers indicating the imminent possibility of rejection; therefore they are highly motivated to manage their public image. An abundance of evidence supports the sociometer theory, including the consistent finding that low self-esteem correlates highly with social anxiety (Leary, 2004; Leary & MacDonald, 2003).



**FIGURE 13.33 Sociometers** According to sociometer theory, self-esteem is the gauge that measures the extent to which a person believes he or she is being (a) included in or (b) excluded from a social group.

**sociometer** An internal monitor of social acceptance or rejection.

### CRITICAL THINKING SKILL

## Resisting Appeals to Snobbery

*Inquiring minds want to know.*

*L'Oreal: Because you're worth it.*

*When you care enough to send the very best.*

Appeals to snobbery, such as these advertising slogans, effectively play on people's desire to perceive themselves (and be perceived by others) as superior—more sophisticated, intelligent, stylish, wealthy, or educated. Such advertisements might suggest that you, as the consumer, are among the select few who can appreciate the product (FIGURE 13.34). The messages are not always verbal. An appeal to snobbery might be conveyed through images—by portraying well-dressed, attractive people in luxurious homes, for example. On television, the radio, and the Internet, sounds such as background music or actors' accents can provide subtle cues suggesting wealth, high social class, and advanced education.



**FIGURE 13.34 Appeals to Snobbery** This advertisement, for a residential development in Dubai, presents housing as not just a place to live but also a lifestyle.

Not all appeals to snobbery have an economic objective, however. Political advertisements often convey subtle messages about the type of people who support a certain political candidate or party—intelligent and hard-working people, who will not be fooled by the opposing candidate’s rhetoric. The message is that if you belong to (or want to belong to) this group of people, you will support the candidate.

With practice, you will recognize when a persuasive message is trying to play on your desire to be better than others. The next time you watch television or leaf through a magazine, look for advertisements that make appeals based on consumers’ snobbery. How do the advertisers convey their messages? What desired traits do they associate with their product? Most important, if you buy this product, will it make you feel smarter, trendier, or classier than everyone else, or will you be falling prey to clever advertising?

**SELF-ESTEEM AND DEATH ANXIETY** One provocative theory proposes that self-esteem provides meaning for individuals by staving off anxiety over their mortality (Greenberg, 2008). According to *terror management theory*, self-esteem protects people from the horror associated with knowing they eventually will die (Greenberg, Solomon, & Pyszczynski, 1997; Pyszczynski, Greenberg, Solomon, Arndt, & Schimel, 2004). People counter mortality fears by creating a sense of symbolic immortality through contributing to their culture and upholding its values. From this cultural perspective, self-esteem develops from a person’s belief that he or she is living up to criteria valued within the culture. Accordingly, exaggerations of personal importance reflect attempts to buffer anxiety about inevitable death. Research has demonstrated that reminding people of their mortality leads them to act in ways that enhance their self-esteem (Goldenberg, McCoy, Pyszczynski, Greenberg, & Solomon, 2000). Likewise, encountering information that threatens people’s self-esteem and their cultural values leads people to think about death more (Schimel, Hayes, Williams, & Jahrig, 2007).

**SELF-ESTEEM AND LIFE OUTCOMES** With such emphasis placed on self-esteem within Western culture, you might expect that having high self-esteem is the key to life success. However, the evidence from psychological science indicates that self-esteem may be less important than is commonly believed. After reviewing several hundred studies, Roy Baumeister and colleagues (Baumeister, Campbell, Krueger, & Vohs, 2003, 2005) found that although people with high self-esteem report being much happier, self-esteem is weakly related to objective life outcomes. People with high self-esteem who consider themselves smarter, more attractive, and better liked do not necessarily have higher IQs and are not necessarily thought of more highly by others. Many people with high self-esteem are successful in their careers, but so are many people with low self-esteem. Moreover, to the extent a small relationship exists between self-esteem and life outcomes, perhaps success causes high self-esteem; people might have higher self-esteem because they have done well in school or in their careers. Correlation does not prove causation.

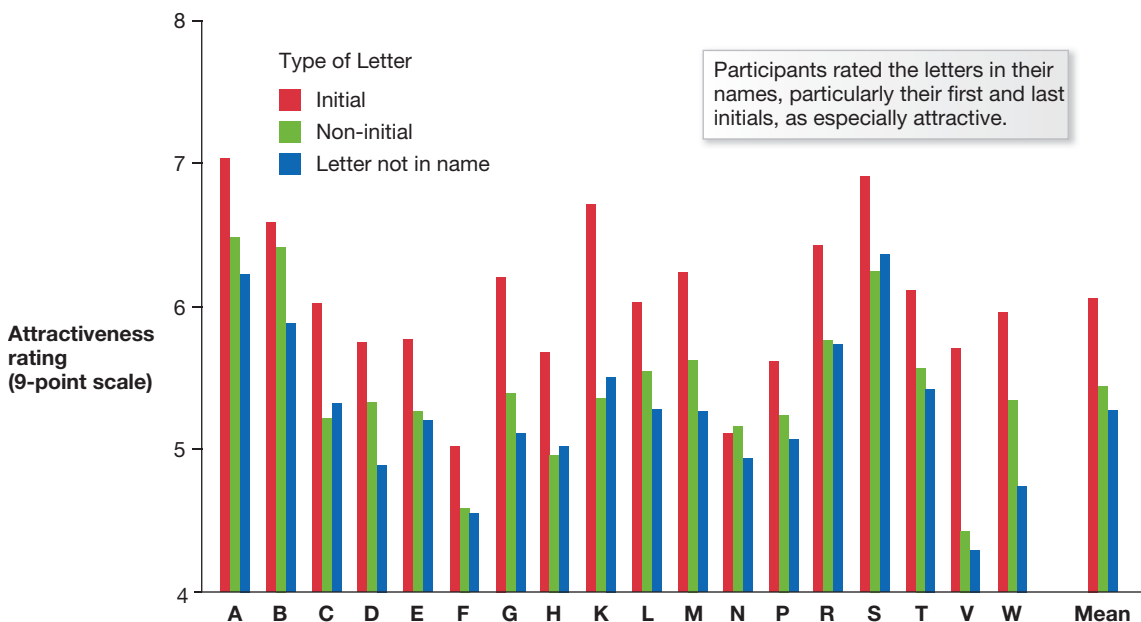
In fact, there may even be some downsides to having very high self-esteem. Violent criminals commonly have very high self-esteem; indeed, some people become violent when they feel that others are not treating them with an appropriate level of respect (Baumeister, Smart, & Boden, 1996). School bullies also often have high

self-esteem (Baumeister et al., 2003). When people with high self-esteem believe their abilities have been challenged, they may act in ways (e.g., antagonistic or boastful) that cause people to dislike them (Heatherton & Vohs, 2000; Vohs & Heatherton, 2004). Thus although having high self-esteem seems to make people happier, it does not necessarily lead to successful social relationships or life success.

A personality trait associated with inflated self-esteem is *narcissism*, in which self-centred people view themselves in grandiose terms, feel entitled to special treatment, and are manipulative (Bosson et al., 2008). (The term comes from Greek mythology, in which Narcissus rejected the love of others and fell in love with his own reflection in a pond.) Narcissists' greatest love is for the self, and they tend to have poor relations with others (Campbell et al., 2005). They become angry when challenged (Rhodewalt & Morf, 1998), become abusive to those who do not share their lofty opinions of themselves (Bushman & Baumeister, 1998; Twenge & Campbell, 2003), and are manipulative, selfish, and unfaithful in their relationships (Campbell, Foster, & Finkel, 2002). You might be interested to note that a meta-analysis found increasing narcissism among American university students between 1979 and 2006 (Twenge et al., 2008). According to the researchers, contributing factors might include programs aimed at increasing self-esteem among young schoolchildren (such as having them sing songs about how they are special), grade inflation that makes students feel more capable than they might really be, and a rise in the use of self-promotion websites such as Facebook and MySpace. However, a different team of researchers was unable to replicate this finding, and there is controversy regarding what the pattern observed by Twenge et al. means (Trzesniewski, Donnellan, & Roberts, 2008).

## We Use Mental Strategies to Maintain Our Views of Self

Most people show favouritism to anything associated with themselves. For example, people consistently prefer their belongings to things they do not own (Beggan, 1992), and they even prefer the letters of their own names, especially their initials, to other letters (Koole, Dijksterhuis, & van Knippenberg, 2001; **FIGURE 13.35**).



**FIGURE 13.35 Favouritism** This graph shows the study participants' ratings of the letters of the alphabet.

Sometimes these positive views of the self seem inflated. For instance, 90 percent of adults claim they are better-than-average drivers, even if they have been hospitalized for injuries caused by car accidents (Guerin, 1994; Svenson, 1981). Similarly, in a College Entrance Examination Board survey of more than 800,000 college-bound seniors, none rated themselves as below average, and a whopping 25 percent rated themselves in the top 1 percent (Gilovich, 1991). Most people describe themselves as above average in nearly every way, a phenomenon referred to as the *better-than-average effect* (Alicke, Klotz, Breitenbecher, Yurak, & Vredenburg, 1995). People with high self-esteem are especially likely to do so.

According to Shelley Taylor and Jonathan Brown (1988), most people have positive illusions—overly favourable and unrealistic beliefs—in at least three domains. First, they continually experience the better-than-average effect. Second, they unrealistically perceive their personal control over events. For example, some fans believe they help their favourite sports teams win if they attend games or wear their lucky jerseys. Third, most people are unrealistically optimistic about their personal futures, believing they probably will be successful, marry happily, and live long lives. Although positive illusions can be adaptive when they promote optimism in meeting life's challenges, they can lead to trouble when people overestimate their skills and underestimate their vulnerabilities.

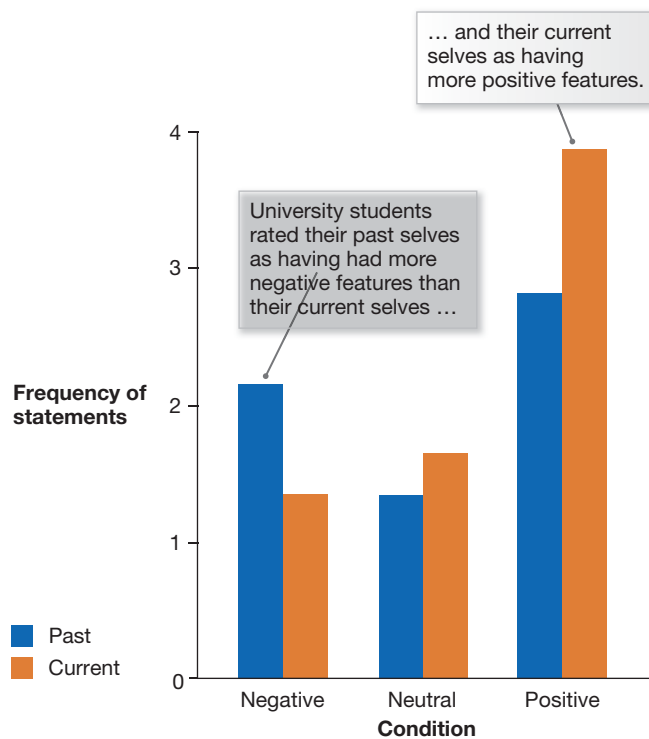
Life is filled with failure, rejection, and disappointment, yet most people feel pretty good about themselves. How do people maintain such positive views? Psychologists have catalogued (though not necessarily endorsed) a number of unconscious strategies that help people maintain a positive sense of self. Among the most common are *self-evaluative maintenance*, *social comparisons*, and *self-serving biases*.

**SELF-EVALUATIVE MAINTENANCE** The American psychologist Abraham Tesser (1988) notes that self-esteem can be affected not only by how people perform but also by how relevant their performances are to their self-concepts and how their performances compare with those of significant people around them. According to the theory of *self-evaluative maintenance*, people can feel threatened when someone close to them outperforms them on a task that is personally relevant. If you had a twin brother who shared your aspiration to be a world-class chef, his brilliant success at cooking would have important implications for how you felt about yourself. To maintain your sense of self-esteem, Tesser argues, you would either distance yourself from the relationship or select a different aspiration. Of course, if your twin brother excels at something you do not find relevant, you might bask in the glow of reflected glory and experience a boost in self-esteem based on your relationship. Indeed, self-evaluative maintenance causes people to exaggerate or publicize their connections to winners and to minimize or hide their relations to losers. However, in some situations people will feel good about themselves when they encounter someone who is doing much better than they are on a relevant dimension. For example, the psychologists Penelope Lockwood, of Canada, and Ziva Kunda, of Israel (1997), found that students who planned to be teachers or accountants rated themselves more positively when they read about a high-achieving teacher or accountant than when they read about someone who was successful in a domain that was not relevant to them. At first glance, this finding seems to contradict those reported by Tesser. The key difference is that people feel good about themselves as a result of comparing themselves with “superstars” in their chosen fields when they feel that such successful performance is attainable for them. If people can believe that “someday, that will be me,” successful others can be very inspirational. In contrast, if the successful performance seems unattainable to people, witnessing superstars tends to make people feel that much worse about themselves.

**SOCIAL COMPARISONS** *Social comparison* occurs when people evaluate their own actions, abilities, and beliefs by contrasting them with other people's. Especially when they have no objective criteria, such as knowing how much money represents a good income, people compare themselves to others to see where they stand. As discussed in Chapter 9, social comparisons are an important means of understanding our actions and emotions. In general, people with high self-esteem make downward comparisons, contrasting themselves with people deficient to them on relevant dimensions. People with low self-esteem tend to make upward comparisons with those superior to them. People also use a form of downward comparison when they recall their own pasts—they often view their current selves as better than their former selves (Wilson & Ross, 2001; **FIGURE 13.36**). These findings suggest that viewing ourselves as better than others or as better than we used to be makes us feel good about ourselves. But people who constantly compare themselves with others who do better may confirm their negative self-feelings.

**SELF-SERVING BIASES** People with high self-esteem tend to take credit for success but blame failure on outside factors, a tendency referred to as a **self-serving bias**. For instance, students who do extremely well on exams often explain their performance by referring to their skills or hard work. Those who do poorly might describe the test as an arbitrary examination of trivial details. People with high self-esteem also assume that criticism is motivated by envy or prejudice. Indeed, members of groups prone to discrimination (e.g., the disabled; ethnic minorities) tend to have high self-esteem. One theory, proposed by the American researchers Jennifer Crocker and Brenda Major (1989), suggests that members of these groups maintain positive self-esteem by taking credit for success and blaming negative feedback on prejudice. Thus if they succeed, the success is due to personal strengths

**self-serving bias** The tendency for people to take personal credit for success but blame failure on external factors.



**FIGURE 13.36 Making Comparisons** This graph shows the results of Wilson and Ross's 2001 study.

and occurs despite the odds. If they fail, the failure is due to external factors and unfair obstacles.

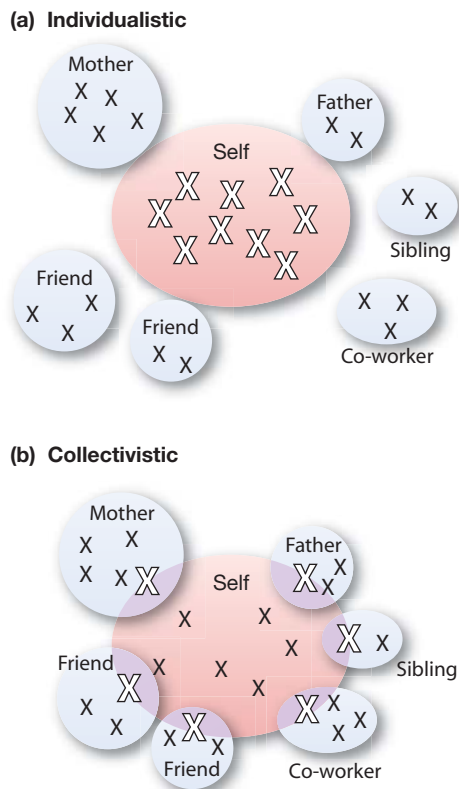
Over the last thirty years, psychologists have documented many ways that people show bias in thinking about themselves compared with how they think about others (Campbell & Sedikides, 1999). In thinking about our failures, for example, we compare ourselves with others who did worse, we diminish the importance of the challenge, we think about the things we are really good at, and we bask in the reflected glory of both family and friends. The overall picture suggests we are extremely well equipped to protect our positive beliefs about ourselves. Some researchers have even argued that self-serving biases reflect healthy psychological functioning (Mezulis, Abramson, Hyde, & Hankin, 2004; Taylor & Brown, 1988). However, recall the earlier discussion of narcissism, which reflects more of a disorder of personality than healthy functioning.

### There Are Cultural Differences in the Self

An important way in which people differ in self-concept is whether they view themselves as fundamentally separate from or connected to other people. For example, as noted in Chapter 1, Westerners tend to be independent and autonomous, stressing their individuality, whereas Easterners tend to be more interdependent, stressing their sense of being part of a collective. Harry Triandis (1989) notes that some cultures (e.g., Japan, Greece, Pakistan, China, and some regions of Africa) emphasize the collective self more than the personal self. Collectivistic cultures emphasize connections to family, to social groups, and to ethnic groups; conformity to societal norms; and group cohesiveness. Individualistic cultures (e.g., northern and western Europe, Australia, Canada, New Zealand, and the United States) emphasize rights and freedoms, self-expression, and diversity. For example, in Canada, people dress differently from one another, cultivate personal interests, and often enjoy standing out from the crowd. In Japan, people tend to dress more similarly and respect situational norms. When a Canadian family goes to a restaurant, each person usually orders what he or she prefers. When a family goes to a restaurant in China, multiple dishes are shared by the entire table.

Hazel Markus and Shinobu Kitayama (1991) have noted that people in collectivistic cultures have *interdependent self-construals*, in which their self-concepts are determined to a large extent by their social roles and personal relationships (FIGURE 13.37). As children, they are raised to follow group norms and to be obedient to parents, teachers, and other people in authority. They are expected to find their proper place in society and not to challenge or complain about their status. By contrast, people in individualistic cultures have *independent self-construals*. Parents and teachers encourage children to be self-reliant and to pursue personal success, even at the expense of interpersonal relationships. Thus children's senses of self are based on their feelings of being distinct from others. Note, however, that within these broad patterns—in individualistic and collectivistic cultures—there is variability in terms of independent/interdependent self-construals.

**CULTURE AND SELF-SERVING BIAS** Psychologists generally have viewed the self-enhancing bias as a universal human trait—like eating, it is part of human nature (Sedikides & Gregg, 2008). Although depressed people might fail to show the effect, the assumption is that most healthy, functioning individuals show robust self-enhancement. Some researchers, however, have questioned whether the self-serving bias is truly universal across cultures. Steven Heine and his colleagues



**FIGURE 13.37 Self-Construals** Self-construals differ in (a) individualistic and (b) collectivistic cultures.



(1999) have argued that the self-serving bias may be more common in Western cultures, in which individuality is emphasized, than in Eastern cultures, in which the collective self is emphasized (**FIGURE 13.38**). That is, believing that you are an especially talented individual presupposes you are better than others. Such an attitude is not acceptable in Eastern cultures, in which the group, rather than the individual, is special.

What does the evidence indicate about whether the self-serving bias is universal? Consider a study by Endo and Meijer (2004), who asked American and Japanese students to list as many of the students' own successes and failures as they could. The Americans showed a bias for listing successes, whereas the Japanese students listed failures and successes equally. In addition, the Americans used outside forces to explain failure, but the Japanese students used them to explain success. Indeed, Markus and Kitayama (1991) have argued that self-criticism rather than self-promotion is the most common social norm in Asian cultures. The overall evidence supports the view that people in individualistic cultures are more concerned with self-enhancement than those in collectivistic, particularly Asian, cultures (Heine, 2003). For example, in a meta-analysis involving more than 500 studies, people in Western cultures showed a much larger self-serving bias than those in Eastern cultures (Mezulis et al., 2004). Although some Eastern cultures, especially China and Korea, show a modest self-serving bias, it typically is much smaller than in most Western cultures.

Might these differences reflect cultural rules about publicly admitting positive self-views? Perhaps people in the East are just more modest in public even though they engage in strategic self-enhancement. However, in studies using anonymous reporting, where presumably there is less call for modesty, Easterners continue to show a low level of self-serving bias (Heine, 2003). At the same time, indirect evidence indicates that people from China and Japan show a positivity bias (a tendency to see themselves as better than others) equivalent to Americans' (Yamaguchi et al., 2007). The researchers used an implicit measure of self-esteem that does not rely on self-reports but on how easily participants associate positive things with themselves versus with others. (As discussed in Chapter 12, implicit attitude assessment is useful for situations in which people are hesitant to make explicit reports.) This



(a)



(b)

**FIGURE 13.38 Individualistic versus Collectivistic Cultures** (a) Western cultures tend to highlight individual success, whereas (b) Eastern cultures tend to value those who fall in line with the masses.

finding suggests that although Easterners value themselves just as much as Westerners, they are hesitant to admit it.

Critics also have argued that researchers have a Western bias in the domains they study and therefore have failed to assess Eastern research participants in crucial domains. Some findings indicate that those from Asian cultures self-enhance in domains particularly important to them (Brown & Kobayashi, 2002). The assumption is that if a culture values industriousness, people will describe themselves as especially hard-working; but if the culture values kindness, people will emphasize how nice they are. People in Eastern cultures may emphasize what good group members they are as a method of self-enhancement (Sedikides, Gaertner, & Toguchi, 2003). According to this perspective, self-enhancement is universal but the traits people focus on to achieve it vary across cultures. Thus when the culture emphasizes personal achievement, people self-enhance as individuals; when the culture emphasizes group achievement, people self-enhance as group members. However, other research reveals a pattern that contradicts these findings: People in Eastern cultures are more critical of their groups compared with people in Western cultures (Heine & Lehman, 1997a), and East Asians often are especially self-critical in domains that are important to them (Heine, Kitayama, & Hamamura, 2007).

The question of whether self-serving bias is universal has led to lively debate among psychologists, in part because it relates to important questions about how culture shapes the sense of self (Heine, 2005; Sedikides et al., 2003). How much do *you* believe people really differ around the world? Is it more important to be respected by others or to feel good about yourself no matter what others think? Might people in Eastern cultures feel better about themselves when they demonstrate that they are modest and self-effacing, whereas Westerners feel better when they can show they are successful? What function does self-enhancement serve in different cultures?

## SUMMING UP

### How Do We Know Our Own Personalities?

Everything we know about ourselves constitutes our self-concepts. Often people are especially aware of their objective selves, a tendency that leads them to behave according to their personal standards and beliefs. Information about the self is processed efficiently and quickly through a self-schema, although how people describe themselves may vary depending on the situation. Researchers have found cultural differences in how the self is construed: Collectivistic cultures emphasize the interdependent self, and individualistic cultures emphasize the independent self. Self-esteem is the evaluative aspect of the self-concept. Most people have moderate to high levels of self-esteem, viewing themselves as better than average on a number of dimensions. These and other strategies help people maintain positive self-esteem.

## MEASURING UP

1. Imagine that while browsing the shelves of a local bookstore, you discover a series of books about self-esteem. Which of the following three theoretical perspectives is most likely addressed in each book: self-evaluation maintenance theory, sociometer theory, or terror management theory?
  - a. *Protecting Your Self-Esteem When Your Best Friend Is Better at Everything*
  - b. *Anxious about Your Inevitable Death? Self-Esteem Can Help*
  - c. *Feeling Bad about Feeling Left Out: What Your Self-Esteem Is Trying to Tell You*

2. Sort the following list of attributes into two groups: those more often evidenced in collectivistic cultures and those more often evidenced in individualistic cultures.
  - a. emphasis on the collective self
  - b. emphasis on the personal self
  - c. encouragement to pursue personal success, even at the expense of interpersonal relationships
  - d. fundamental separation of people
  - e. inherent connection between people
  - f. less variation in how people dress
  - g. particular concern with self-enhancement
  - h. emphasis on obedience to authority
  - i. emphasis on self-reliance
  - j. self-concepts determined largely by social roles and by personal relationships
  - k. self-criticism more normative than self-promotion
  - l. greater tendency to respect situational norms

## CONCLUSION

The study of personality is complex because each person is unique. By examining conscious and unconscious cognitive processes, behavioural dispositions, and people's life narratives, researchers have come to understand some principles underlying personality. We now know that the basic blueprint for personality is genetically determined and is manifest through biologically based temperaments. Yet these temperaments do not predetermine personality; interactions between people and their social worlds create unique individuals. Clearly, personality is coherent and stable. Although people change jobs, relationships, and living circumstances, the core of each person's personality stays the same throughout life.

Most of us see ourselves in a positive light, and we are quite capable of dismissing challenges to our positive self-views. Learning about aspects of personality and people's biases in how they think about themselves gives us better insight into ourselves and others.

## CHAPTER SUMMARY

### How Have Psychologists Studied Personality?

- **Psychodynamic Theories Emphasize Unconscious and Dynamic Processes:** Freud believed that personality resulted partly from unconscious conflicts. The personality results from the ego's use of defence mechanisms to reduce the anxiety of the oppositional demands of the id and the superego. Stages of psychosexual development occur from birth to adolescence. Neo-Freudians have focused on relationships, especially children's emotional attachments to their parents.
- **Humanistic Approaches Emphasize Integrated Personal Experience:** Humanists view personality as the result of experiences and beliefs. Humans strive to realize their full potential and may be hampered in doing so if they do not receive unconditional positive regard from their parents and/or guardians. The positive psychology movement researches subjective well-being.
- **Type and Trait Approaches Describe Behavioural Dispositions:** Personality type theories focus more on description than on explanation. Trait theorists assume that personality is a collection of traits that vary and that exist in a hierarchy of importance. In Eysenck's model of personality, lesser traits are organized under larger biologically based traits (extroversion, emotional stability, psychoticism). The Big Five theory considers personality to be composed of openness to new experience, conscientiousness, extroversion, agreeableness, and neuroticism.
- **Personality Reflects Learning and Cognition:** Through interaction with their environment, people learn patterns of responding that are guided by both expectancies and values. Self-efficacy, the extent to which people believe they can achieve specific outcomes, is an important determinant of behaviour. The cognitive-affective personality system (CAPS) emphasizes self-regulation.

### How Is Personality Assessed, and What Does It Predict?

- **Personality Refers to Both Unique and Common Characteristics:** Idiographic approaches are person-centred; they evaluate personality by assessing the unique pattern of an individual's characteristics. Nomothetic approaches focus on characteristics common among all people but on which individuals vary (i.e., traits).
- **Researchers Use Objective and Projective Methods to Assess Personality:** Projective measures subjectively evaluate the unconscious issues a person projects onto ambiguous stimuli. Objective measures are straightforward assessments, usually involving self-report questionnaires or observer ratings.
- **Observers Show Accuracy in Trait Judgments:** Close acquaintances may better predict a person's behaviour than the person can.
- **People Sometimes Are Inconsistent:** Mischel proposed that situations are more important than traits in predicting behaviour.
- **Behaviour Is Influenced by the Interaction of Personality and Situations:** Situations vary in the extent to which they both influence behaviour and interact with personality to determine behaviour.

- **There Are Cultural and Gender Differences in Personality:** Cross-cultural research presents problems because of translation issues, cultural norms for self-reporting, and individuals' judgments of themselves relative to other people from their own cultures. Some research suggests that the Big Five personality factors are universal for humans.

### What Are the Biological Bases of Personality?

- **Animals Have Personalities:** Research on a wide variety of animal species has shown that animals have distinct personality traits that correspond roughly to the Big Five in humans.
- **Personality Is Rooted in Genetics:** Twin and adoption studies have found that 40 percent to 60 percent of personality variation is due to genetics. Personality characteristics are influenced by multiple genes, and their expression is the result of interaction with environments.
- **Temperaments Are Evident in Infancy:** Temperaments, the general tendencies of how people behave, are biologically mediated and observable in infants.
- **Personality Is Linked to Specific Neurophysiological Mechanisms:** Cortical arousal is regulated by the ascending reticular activating system and results in characteristics of introversion/extroversion. The behavioural approach system and the behavioural inhibition system affect variations in arousal and the behavioural responses.
- **Personality Is Adaptive:** Variations in individuals' personality and skills benefit a group and provide an advantage for group survival.
- **Personality Traits Are Stable over Time:** Trait consistency is lowest for young children and highest for those over age 50. Biological and environmental factors are more stable in adulthood. Characteristic adaptations change across time and circumstances.

### How Do We Know Our Own Personalities?

- **Our Self-Concepts Consist of Self-Knowledge:** Self-schemas are the cognitive aspects of self-knowledge, and the working self-concept is the immediate experience of self at any given time.
- **Perceived Social Regard Influences Self-Esteem:** Self-esteem is influenced by people's beliefs about how other people view them. According to sociometer theory, the need to belong influences social anxiety relative to self-esteem. Self-esteem may also be influenced by death anxiety.
- **We Use Mental Strategies to Maintain Our Views of Self:** Positive illusions of self are common. Self-esteem is influenced by comparisons to others. A self-serving bias helps maintain positive self-esteem and may be culturally influenced.
- **There Are Cultural Differences in the Self:** People from collectivistic cultures (e.g., regions of Asia and Africa) tend to have interdependent self-concepts; people from individualistic cultures (e.g., the United States, Canada, Europe) tend to have independent self-concepts.

## KEY TERMS

behavioural approach system (BAS), p. 608	five-factor theory, p. 590	nomothetic approaches, p. 594	projective measures, p. 595	situationism, p. 596
behavioural inhibition system (BIS), p. 608	humanistic approaches, p. 587	objective measures, p. 595	psychodynamic theory, p. 585	sociometer, p. 617
defence mechanisms, p. 586	id, p. 586	personality, p. 584	psychosexual stage, p. 586	superego, p. 586
ego, p. 586	idiographic approaches, p. 594	personality trait, p. 584	self-serving bias, p. 621	temperaments, p. 606
	interactionists, p. 598	personality types, p. 589		trait approach, p. 589

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## ■ PRACTICE TEST

1. Your psychology instructor asks the students in your class to form groups of five and then take turns answering the question *What do we need to know about you to truly know you?* The people in your group give the following answers; label each as representative of psychodynamic approaches, humanistic theory, type and trait perspectives, or learning and cognition perspectives.
  - a. “To know me, you would have to ask me questions about myself. I took a survey once that said I am an extremely intuitive introvert.”
  - b. “To know me, you would have to know that I can’t control anything in my world. External forces determine my outcomes.”
  - c. “To know me, you would have to figure out a way to peer into my unconscious. There’s so much I can’t even know about myself; I’m not sure you could ever really know me.”
  - d. “To know me, you would have to know about my hopes and aspirations. I seek to become the best person I can be.”
2. June asks people to watch a five-minute recording of a play in which two characters find themselves in a dangerous situation. Then she asks her research participants to write an ending to the story, which she codes to reveal features of each participant’s personality. This proposed measure of personality can best be described as \_\_\_\_\_ and \_\_\_\_\_.
  - a. idiographic; projective
  - b. nomothetic; projective
  - c. idiographic; objective
  - d. nomothetic; objective
3. Which of the following statements might explain why our close acquaintances sometimes are better able to predict our behaviours than we are? Select all that apply.
  - a. Our ego defence mechanisms prevent us from knowing our true personalities and thus undermine our abilities to accurately predict our own behaviours.
  - b. Predictions of our own behaviours may be biased in favour of our subjective perceptions (how we *think* we act) rather than our objective behaviours (how we *do* act).
  - c. We tend to pay more attention to others than to ourselves and thus fail to notice our own behaviour; others notice how we behave and are better able to predict our future behaviours.
4. Which of the following are associated with the behavioural approach system (BAS), and which are associated with the behavioural inhibition system (BIS)?
  - a. “go” system
  - b. avoiding punishments
  - c. frontal lobe and amygdala activity
  - d. pursuit of rewards
  - e. “stop” system
5. Which of the following statements best describes the distinctions among traits, temperaments, and characteristic adaptations?
  - a. Temperaments, which are broader than traits, influence personality throughout development. Situational demands can lead to characteristic adaptations, which, although they do not reflect changes in the underlying dispositions, can reflect changes in how these dispositions are expressed.
  - b. Temperaments, which are broader than traits, influence personality throughout development. After childhood, situational demands lead to characteristic adaptations, which reflect changes in underlying dispositions.
  - c. Temperaments, which are narrower than traits, influence personality only during childhood. After childhood, situational demands lead to characteristic adaptations, which reflect changes in underlying dispositions.
  - d. Temperaments, which are narrower than traits, influence personality only during childhood. Situational demands can lead to characteristic adaptations, which, although they do not reflect changes in the underlying dispositions, can reflect changes in how these dispositions are expressed.
6. By extrapolating from research on self-schemas, indicate which of the following memorization techniques should be most effective in memorizing a list of nouns.
  - a. Imagine a friend or acquaintance doing something with each noun (e.g., “My friend bends over to tie his *shoe*”).
  - b. Imagine yourself doing something with each noun (e.g., “I wiggle my toes inside my *shoe*”).
  - c. Repeat the word three times (e.g., *shoe, shoe, shoe*).
  - d. Think of a word that rhymes with the noun (e.g., *shoe* rhymes with *who*).
7. A professional athlete makes the following statements during an interview with a sports reporter. Which statements are most likely to be positive illusions?
  - a. “I had a better-than-average game today.”
  - b. “I’m sure that wearing my lucky socks helped.”
  - c. “But it also helped that I’ve been taking care of my injury—lots of ice and physical therapy.”
  - d. “I’m done with injuries. From here on out, I’ll have a clean bill of health.”
8. Braunwin prides herself on her musical ability. Which of the following successes would most likely lead Braunwin to feel bad about herself? Which would most likely lead her to feel good? Why?
  - a. A student at Braunwin’s university is selected to play on the national volleyball team.
  - b. A student at Braunwin’s university receives a competitive scholarship to study music.
  - c. Braunwin’s best friend is asked to play a solo during the band concert.
  - d. Braunwin’s sister receives a prestigious athletic scholarship.

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## ■ PSYCHOLOGY AND SOCIETY

1. In 1953, the psychologist Henry A. Murray and the anthropologist Clyde Kluckhohn claimed that every person is like all other people, like some other people, and like no other person. Based on your understanding of the ideas from this chapter, describe the ways in which each individual is like all other people, like some other people, and like no other person.
2. Imagine your friend John is emotionally volatile and easily upset, and he often reports feeling anxious and depressed. He could be said to be high in neuroticism, one of the Big Five personality traits. Describe at least two ways in which John’s personality might influence his social environment and at least two ways in which his social environment might influence the expression of his personality.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.





# Psychological Disorders

BORN IN NAPLES, ITALY, AND RAISED IN HALIFAX AND TORONTO, the actor Tony Rosato became famous as a star of *SCTV* and *Saturday Night Live* (FIGURE 14.1). For his role in the television drama *Night Heat*, he was nominated for a Gemini Award in 1989. In 2005, however, Rosato's world fell apart. He developed the strange belief that his wife, Leah, and their infant had been replaced by imposters. He was arrested for repeatedly complaining to Kingston police about the “imposters” and for criminally threatening Leah and the child. According to the Crown's expert psychiatrist, Rosato was suffering from a quite rare psychological disorder called Capgras syndrome.

Named after the French psychiatrist who first described it, Capgras syndrome involves an otherwise perfectly lucid person believing that a family member or friend has been replaced

## How Are Psychological Disorders Conceptualized and Classified?

- Psychological Disorders Are Classified into Categories
- Psychological Disorders Must Be Assessed
- Critical Thinking Skill: Recognizing When Categories Represent Continuous Dimensions
- Dissociative Identity Disorder Is a Controversial Diagnosis
- Psychological Disorders Have Many Causes

## Can Anxiety Be the Root of Seemingly Different Disorders?

- There Are Different Types of Anxiety Disorders

- Anxiety Disorders Have Cognitive, Situational, and Biological Components

## Are Mood Disorders Extreme Manifestations of Normal Moods?

- There Are Different Types of Mood Disorders
- Mood Disorders Have Cognitive, Situational, and Biological Components

## What Is Schizophrenia?

- Schizophrenia Has Positive and Negative Symptoms
- Schizophrenia Is Primarily a Brain Disorder
- Environmental Factors Influence Schizophrenia

## Are Personality Disorders Truly Mental Disorders?

- Personality Disorders Are Maladaptive Ways of Relating to the World
- Borderline Personality Disorder Is Associated with Poor Self-Control
- Anti-social Personality Disorder Is Associated with a Lack of Empathy

## Should Childhood Disorders Be Considered a Unique Category?

- Autism Is a Lack of Awareness of Others
- Critical Thinking Skill: Recognizing and Resisting Hindsight Bias
- Attention Deficit Hyperactivity Disorder Is a Disruptive Impulse Control Disorder



**FIGURE 14.1 Tony Rosato** The Canadian actor Tony Rosato was well known for his zany portrayals of comic characters. His psychological disorder is no laughing matter.

by an identical-looking imposter. This disorder is often associated with schizophrenia or with a brain injury. The philosopher William Hirstein and the neuroscientist V. S. Ramachandran (1997) studied a 30-year-old Brazilian man, D.S., who developed Capgras after receiving a head injury in a traffic accident. When asked why he thought his father was an imposter, D.S. replied, “He looks exactly like my father, but he really isn’t. He’s a nice guy, but he isn’t my father, Doctor” (p. 348). D.S. did not believe his father was an imposter when he spoke with him on the phone. The belief occurred only when he could see his father. A series of tests showed that D.S. could recognize faces normally and also could discriminate different emotions. He lacked the ability to link an emotional response to a familiar face.

Given that Capgras syndrome had caused Tony Rosato so many problems, you might expect that he accepted the diagnosis with relief. Instead, however, he denied having mental health problems and refused treatment. He remained in jail until 2009, when he finally agreed to take antipsychotic medication that helped him deal with his condition. He was then released and reportedly is back with his family, trying to resurrect his career. His case raises many questions about psychological disorders, such as when it becomes clear that people have psychological problems, whether it is ethical to treat people who deny they have severe problems, and whether it is fair to put people with severe problems in prison rather than in hospital.

Psychological disorders are also referred to as mental disorders. Throughout history, the mentally disordered have not always been viewed humanely. In the Middle Ages, someone like Rosato might have been regarded as possessed by demons and been persecuted. In the 1700s, he likely would have languished in an understaffed, overcrowded mental institution, where there would have been little attempt to understand his disorder and even less of an attempt to treat him. At various points in history, the clinical focus would have been on environmental factors that contributed to his disorder, such as whether he was abused as a child. Although environmental factors are important, we now understand that biology plays a critical role in many mental health disorders, particularly those related to schizophrenia. Indeed, an important lesson in this chapter is that environment and biology interact to produce psychological disorders. As noted throughout the book, it is meaningless to state that a condition is caused by just biology or environment; both affect all psychological disorders to some extent. Advances in research have demonstrated that most psychological disorders are ultimately disorders of mind and body, attributable to mental and biological factors.

Over the course of history, people have struggled with how best to understand **psychopathology**—literally, sickness or disorder of the mind. Throughout recorded history, from the writings of Aristotle to those of Freud, accounts exist of people suffering from various forms of psychopathology. Psychological disorders are common around the globe, in all countries and all societies. Indeed, nearly 1 in 5 Canadians will have some form of mental disorder at some point in their lives, the most common being mood disorders (such as depression), impulse control disorders (such as hyperactivity and problems paying attention), anxiety disorders, and substance abuse disorders (Health Canada, 2002). Of course, mental disorders range in severity; only about 5–7 percent of the Canadian population is severely affected. This group also tends to suffer from multiple mental disorders, such that at a given time someone might be anxious and depressed and also abuse drugs or alcohol. There are also

**psychopathology** A disorder of the mind.



enormous gender differences in psychopathology; some disorders are much more likely in women (such as depression and anxiety disorders), and some are much more likely in men (such as anti-social personality disorder and autism). These gender differences likely reflect biology and culture, as the sexes may differ in their predispositions to mental disorders and in how cultural values influence the degree to which different disorders are diagnosed for women and for men.

Given that psychological disorders are common and vary in severity, most people have symptoms of psychological disorders at some point in their lives. Who among us has not felt exceedingly sad on occasion or has not felt anxious when contemplating some difficult challenge? As noted in Chapter 9, emotions are a central aspect of being human. Drawing the line between a natural emotional experience and a mental disorder can be challenging, because different people respond to events differently and personal suffering is hard to determine objectively. Psychological problems that disrupt a person's life and cause significant distress over a long period are considered a disorder rather than the normal ups and downs of everyday life. This means that you may have experienced some of the symptoms of many of the disorders discussed below. As you read, however, resist the urge to make diagnoses, even if particular symptoms seem to describe you, or anyone you know, perfectly. Just like medical students who worry they have every disease they learn about, you need to guard against overanalyzing yourself and others. At the same time, what you learn in this chapter and the next (on treating disorders) may help you understand the mental health problems you or people you care about might experience at some point.

## Real World PSYCHOLOGY

## How Are Psychological Disorders Conceptualized and Classified?

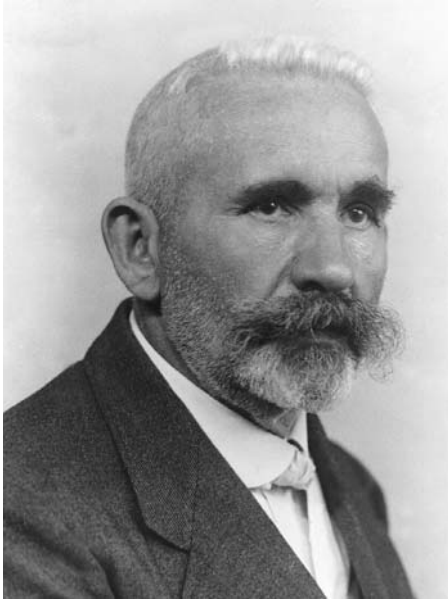
How do you know if a person has a psychological disorder? It can be challenging to decide if a given behaviour is caused by psychopathology, because behaviour—especially unusual behaviour—always must be reviewed according to the situation. A woman running through the streets screaming, sobbing, and grabbing and hugging people might have some form of mental disorder—or she might be celebrating because she just won the lottery. Many behaviours considered normal in one setting may be considered deviant in other settings. For example, some tribes in Africa spread feces in their hair as part of rituals; some First Nations and East Asian cultures consider it a great honour to hear the voices of spirits. In urban Canada, the former would be seen as deviant behaviour, and the latter as evidence of auditory hallucinations. However, it is important to consider certain criteria in determining whether behaviour represents psychopathology: (1) Does the behaviour deviate from cultural norms? (2) Is the behaviour maladaptive? (3) Is the behaviour causing the individual personal distress?

Because it is hard to draw the line between normal and abnormal, psychopathology increasingly is defined as thoughts, and behaviours, that are maladaptive rather than deviant. Excessive hand-washing can be deviant but adaptive—after all, it is the best way of avoiding contagious disease. The same behaviour, however, can be maladaptive when people cannot stop until they have washed their hands raw. Indeed, the diagnostic criteria for all the major disorder categories stipulate that the symptoms of the disorder must interfere with at least one aspect of the person's life, such as work, social relations, or self-care. This component is critical in determining whether a given behaviour or set of behaviours represents a mental disorder or is simply unusual.

**LEARNING OBJECTIVES**

- Differentiate among common methods for assessing psychological disorders.
- Describe different theoretical models that seek to explain the etiology of psychological disorders.

**etiology** Factors that contribute to the development of a disorder.



**FIGURE 14.2 Emil Kraepelin** Kraepelin was one of the first researchers to propose a classification system for mental disorders.

**multiaxial system** The system used in the *DSM* that provides assessment along five axes describing important mental health factors.

## Psychological Disorders Are Classified into Categories

Despite the problems in conceptualizing psychological disorders, there are clear advantages to categorizing them. To investigate the **etiology** (factors that contribute to the development) and possible treatments of mental disorders, psychologists need to group these disorders into meaningful categories. Researchers and clinicians have struggled for many years with how best to categorize mental disorders. In the late 1800s, for example, the German psychiatrist Emil Kraepelin recognized that not all patients with mental disorders suffer from the same disorder, and he identified mental disorders on the basis of groups of symptoms that occur together (**FIGURE 14.2**).

The idea of categorizing mental disorders systematically was not officially adopted until the first edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM)* was published, in 1952. Although it has undergone several revisions, the *DSM* remains the standard in psychology and psychiatry. Earlier versions focused on the presumed causes of mental disorders, but beginning with the *DSM-III*, in 1980, there was a return to classifying psychopathology based on observable symptoms. In the current edition, the fourth, disorders are described in terms of such symptoms, and a patient must meet specific criteria to receive a particular diagnosis. In addition, a patient does not receive a single label but rather is classified through a **multiaxial system** (detailed in **TABLE 14.1**), which is based on the growing realization that various factors affect mental health. Diagnoses include evaluations on five dimensions, or axes: (1) clinical disorders, (2) mental retardation or personality disorders, (3) medical conditions, (4) psychosocial problems, and (5) global or overall assessment of how well the person is functioning. Diagnosing a patient on all five axes provides a more complete picture of the person than simply assigning a clinical category. The text was revised in 2000, and it is now known as *Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR Fourth Edition (Text Revision)*, or *DSM-IV-TR*.

## Psychological Disorders Must Be Assessed

Physical disorders often can be detected by medical tests, such as blood tests or biopsies, but determining whether a person has a mental disorder is not as straightforward. Clinical psychologists often work like detectives, tracking down information from sources including self-reports, observations, and interviews. The process of

**Table 14.1 DSM-IV-TR Multiaxial Classification System**

<b>Axis I</b>	Clinical disorders and other conditions that may be a focus of clinical attention (e.g., schizophrenia, mood disorders, anxiety disorders, sexual and gender disorders, sleep disorders, eating disorders).
<b>Axis II</b>	Mental retardation and personality disorders (e.g., anti-social personality disorder, paranoid personality disorder, borderline personality disorder).
<b>Axis III</b>	General medical conditions that may be relevant to mental disorders (e.g., cancer, epilepsy, obesity, Parkinson's disease, Alzheimer's disease).
<b>Axis IV</b>	Psychosocial and environmental problems that might affect the diagnosis, treatment, and prognosis of mental disorders (e.g., unemployment, divorce, legal problems, homelessness, poverty, parental overprotection).
<b>Axis V</b>	Global assessment of functioning (social, psychological, and occupational). Rated on a scale from 1 to 100, with 1 representing danger of hurting self or others and 100 meaning superior functioning in a wide range of areas.

SOURCE: American Psychiatric Association, 2000.

examining a person's mental functions and psychological health is known as **assessment**. The first goal of assessment is to make a *diagnosis* so that appropriate treatment can be provided. Because the course and probable outcome, or *prognosis*, of different mental disorders can vary, the correct diagnosis helps the patient and family understand what the future might bring. Assessment does not stop with diagnosis, however, as ongoing assessment helps mental health workers understand whether specific situations might cause a worsening of the disorder, whether progress is being made in treatment, and any other factors that might help in understanding unique aspects of a given case (FIGURE 14.3).

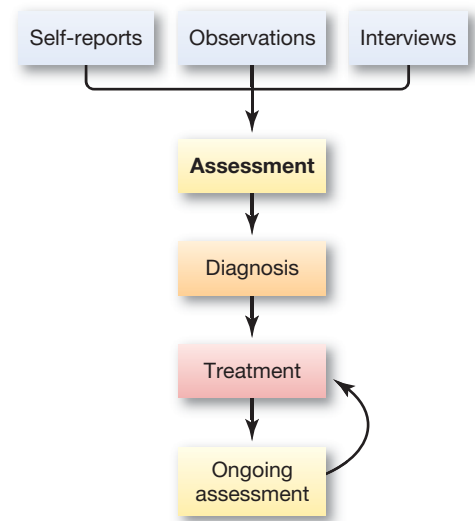
The method of initial assessment sometimes depends on how a person comes into contact with mental health workers. People often come to emergency rooms showing confusion, memory problems, or other mental impairments. A patient in this condition may be given a *mental status exam* to provide a snapshot of his or her psychological functioning. The exam involves behavioural observations that evaluate the person for characteristics such as personal grooming, ability to make eye contact, tremors or twitches, mood, speech, thought content, and memory. This evaluation can offer insights into whether a person has a mental disorder. For example, a patient who arrives in a dishevelled state and wearing excess layers of clothing more likely suffers from schizophrenia than from an anxiety disorder. The mental status exam is also useful for determining whether the mental impairments are due to a psychological condition or a physical condition, such as stroke or head injury.

Most symptoms of psychological problems develop over fairly long periods, and a person seeking help for such problems frequently is encouraged to see a mental health professional by family members or by a physician. A psychologist's first step in an assessment is to ask the person about current symptoms and about recent experiences that might be causing distress—for example, if the person is feeling depressed, the psychologist will likely ask whether he or she recently has experienced some sort of loss. In this *clinical interview*, the interviewer's skills determine the quantity and value of information obtained. A good interviewer expresses empathy, builds rapport quickly, is nonjudgmental and trusting, and supports the client's efforts to find out what is wrong and how it might be addressed.

**STRUCTURED VERSUS UNSTRUCTURED INTERVIEWS** Since the beginning of modern psychology, most interviews have been *unstructured*, such that the topics of discussion vary as the interviewer probes different aspects of the person's problems. The interview is guided by the clinician's past experiences as well as by his or her observations of the client and the type of problems that are most likely. Unstructured interviews are highly flexible—indeed, no two unstructured interviews will likely elicit identical information from the same patient. They also are overly dependent on the interviewer's skills. In *structured interviews*, standardized questions are asked in the same order each time. The patient's answers are coded according to a predetermined formula; the diagnosis is based on the specific patterns of responding. The most commonly used structured interview is the *Structured Clinical Interview for DSM (SCID)*, through which diagnoses are made according to *DSM* criteria (Spitzer, Williams, Gibbon, & First, 1992). The SCID begins with general questions such as *What kind of work do you do?* and proceeds to questions about the client's symptoms, such as about their frequency and severity. The SCID is also valuable for research and treatment, because the results obtained from one group of patients will likely apply to other patients diagnosed with the same disorder.

**TYPES OF TESTING** A psychological assessor often can gain valuable information simply by observing the client's *behaviour*. For instance, a client who avoids eye contact during an examination might suffer from social anxiety; a client whose

**assessment** In psychology, examination of a person's mental state to diagnose possible psychological disorders.



**FIGURE 14.3 Assessing a Patient**

Clinical psychologists examine a person's mental functions and psychological health to diagnose a mental disorder.

eyes dart around nervously may feel paranoid. Behavioural assessments often are useful with children—for instance, observing their interactions with others or seeing whether they can sit still in a classroom.

Another source of information regarding psychopathology is *psychological testing*. Chapter 13 provides examples of these types of tests for assessing personality. Of the thousands of psychological tests available to clinicians, some are for specific mental disorders, such as the widely used Beck Depression Inventory (Beck, Steer, & Brown, 1996; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). Other measures assess both a broad range of mental disorders and general mental health. The most widely used questionnaire for psychological assessment is the *Minnesota Multiphasic Personality Inventory (MMPI)*. Developed during the 1930s, the MMPI was updated in the 1990s for language changes. The latest version consists of 567 true/false items that assess emotions, thoughts, and behaviours. The MMPI has ten clinical scales (e.g., paranoia, depression, mania, hysteria) that generate a profile indicating whether the client may have a particular mental disorder.

As discussed in Chapter 2, a common problem with all self-report assessments, such as the MMPI, is that to make a favourable impression respondents sometimes distort the truth or lie outright. To avoid detection of a mental disorder, a test-taker might be evasive or defensive. To look especially troubled, another test-taker might untruthfully lean toward negative items. To counter such response biases, the MMPI includes validity scales, which measure the probability that respondents are being less than truthful. For instance, a person might try to present himself or herself too positively by agreeing with a large number of items such as “I always make my bed” and “I never tell lies”; a high score on this category would indicate an attempt to present a perfectly positive image. Even if the test-taker is not responding in this way consciously, the scoring of answers on the other items must take into account the positivity bias in responses. Other validity scales examine whether the test-taker answers similar questions in the same manner each time and whether he or she responds “true” to items that are extremely rare or to an especially large number of negative items (known as *faking bad*).

Although tests such as the MMPI are used widely in psychological assessment, they are seldom the sole source of information. Indeed, most clinicians do not diagnose until they have consistent results from psychological tests and structured interviews. In addition, although in North America the MMPI generally has been a reliable and valid assessment tool, it has been criticized as inappropriate for use in other countries or among groups such as the poor, the elderly, and racial minorities. The problem here is that scores considered “normal” on the MMPI are based on studies in which such people were inadequately represented.

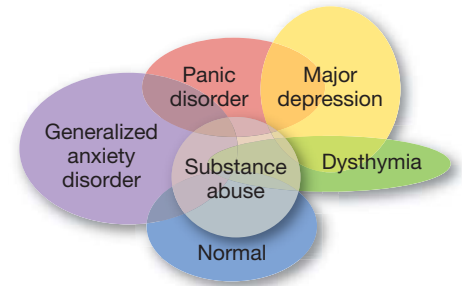
Another assessment method is *neuropsychological testing*. In this method, the client performs actions such as copying a picture; drawing a design from memory; sorting cards that show various stimuli into categories based on size, shape, or colour; placing blocks into slots on a board while blindfolded; and tapping fingers rapidly (FIGURE 14.4). Each task requires an ability such as planning, coordinating, or remembering. By highlighting actions that the client performs poorly, the assessment might indicate problems with a particular brain region. For instance, people who have difficulty switching from one rule to another for categorizing objects, such as sorting by shape rather than by colour, may have impairments in the frontal lobes. Subsequent assessment with MRI or PET might indicate brain damage caused by a tumour or by an injury (on these techniques, see Chapter 2, “Research Methodology”).



**FIGURE 14.4 Neuropsychological Testing** The assessment depicted here uses a neuropsychological test to examine mental function. In this timed test, a researcher watches a client fit wooden blocks into a corresponding template to test for signs of Alzheimer’s disease.

**EVIDENCE-BASED ASSESSMENT** One key theme of this book is that scientific research informs the understanding of mind, brain, and behaviour, and assessment

procedures are no exception. *Evidence-based assessment* is an approach to clinical evaluation in which research guides the evaluation of mental disorders, the selection of appropriate psychological tests and neuropsychological methods, and the use of critical thinking in making a diagnosis (Hunsley & Mash, 2007; Joiner, Walker, Pettit, Perez, & Cukrowicz, 2005). For instance, scientific research indicates that many mental disorders occur together, a state known as *comorbidity* (FIGURE 14.5). For example, people who are depressed often have substance abuse disorders, so an evidence-based assessment approach would indicate that people found to be depressed should also be assessed for comorbid conditions such as substance abuse.



**FIGURE 14.5 Comorbidity** As this diagram illustrates, mental disorders commonly overlap.

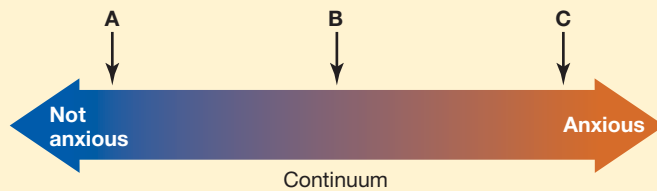
**CRITICAL THINKING SKILL**

## Recognizing When Categories Represent Continuous Dimensions

Can a woman be “a little bit” pregnant? Most people would agree that pregnancy is an all-or-none state and that a woman who is a few days pregnant is every bit as pregnant as a woman in her ninth month.

Many other categories are not so cut and dried. Is a person honest or dishonest? Smart or unintelligent? Good looking or ugly? Like these, most categories represent points along a continuum. Most dimensions in life (e.g., hot/cold, day/night) do not represent absolute differences. The same is true for mental health versus mental disorders: A diagnosis of a mental disorder indicates membership in a category, but the underlying dimension is continuous.

Suppose your neighbour has been diagnosed with an anxiety disorder. This means that a mental health practitioner such as a clinical psychologist has decided that your neighbour’s symptoms of anxiety are beyond what is considered normal. This label, or diagnosis, carries the understanding that to alleviate the symptoms your neighbour needs counselling or medication. The label lumps your neighbour with all people who share the diagnosis, though the severity of the disorder can range from just slightly more anxious than normal to extremely anxious in a way that interferes with daily living. You do not know from the diagnosis exactly where your neighbor falls along the continuum (FIGURE 14.6).



**FIGURE 14.6 Think Critically: Recognizing When Categories Represent Continuous Dimensions** It may seem obvious that a person at point A is not anxious and a person at point C is anxious, but how should a person at point B be classified?

## Dissociative Identity Disorder Is a Controversial Diagnosis

Sometimes the available evidence raises doubts about the validity of certain diagnoses. Consider multiple personalities. In 1978, Billy Milligan was found innocent of robbery and rape charges on the grounds that he had been diagnosed with multiple personality disorder. Milligan clearly committed the robberies and rapes,

but his lawyers successfully argued that he had multiple personalities and that different ones committed the crimes; therefore, Billy could not be held responsible. In his book *The Minds of Billy Milligan* (1981), Daniel Keyes describes the 24 separate personalities sharing the body of 26-year-old Billy Milligan. One is Arthur, who at age 22 speaks with a British accent and is self-taught in physics and biology. He reads and writes fluent Arabic. Eight-year-old David is the keeper of the pain; anytime something physically painful happens, David experiences it. Christene is a three-year-old dyslexic girl who likes to draw flowers and butterflies. Regan is 23 and Yugoslavian; speaks with a marked Slavic accent; and reads, writes, and speaks Serbo-Croatian. He is the protector of the “family” and acknowledges robbing his victims, but he denies raping them. Adalana, a 19-year-old lesbian who writes poetry, cooks, and keeps house for the others, later admitted to committing the rapes. After his acquittal, Milligan spent close to a decade in various mental hospitals. In 1988, psychiatrists declared that Milligan’s 24 personalities had merged into one and that he was no longer a danger to society. Milligan was released and reportedly has lived quietly since then. Many people respond to reports such as this with astonishment and incredulity, believing that people such as Milligan must be faking. To judge the facts, we need to examine what is known about his condition and how it is diagnosed.

**dissociative identity disorder (DID)** The occurrence of two or more distinct identities in the same individual.

**Dissociative identity disorder (DID)**, formerly called *multiple personality disorder*, involves the occurrence of two or more distinct identities in the same individual. DID is an example of the *DSM* category of *dissociative disorders*, which involve disruptions of identity, of memory, and of conscious awareness. Most people diagnosed with DID are women who report being severely abused as children. According to the most common theory of DID, children cope with abuse by pretending it is happening to someone else and entering a trancelike state in which they dissociate their mental states from their physical bodies. Over time, this dissociated state takes on its own identity. Different identities develop to deal with different traumas. Often the identities have periods of amnesia, and sometimes only one identity is aware of the others. Indeed, diagnosis often occurs only when a person has difficulty accounting for large chunks of his or her day. The separate identities usually differ substantially, such as in gender, sexual orientation, age, language spoken, interests, physiological profiles, and patterns of brain activation (Reinders et al., 2003). Even their handwritings can differ (**FIGURE 14.7**).

Despite this evidence, many researchers remain skeptical about whether DID is a genuine mental disorder or whether it exists at all (Kihlstrom, 2005). Moreover, some people may have ulterior motives for claiming DID. Diagnoses of DID often occur after people have been accused of committing crimes, raising the possibility that to avoid conviction they are pretending to have multiple identities. Other skeptics point to the sharp rise in reported cases as evidence that the disorder might not be real or that it is diagnosed far too often. Before the 1980s, this disorder was reported only sporadically. Famous cases include the women portrayed in *The Three Faces of Eve* (Thigpen & Cleckley, 1954) and *Sybil* (Schreiber, 1974). In the 1990s, the number of cases skyrocketed into the tens of thousands, particularly in the United States. Moreover, those displaying the disorder went from having two or three identities to having several dozen or even hundreds. What can explain these changes? Some of these patients may have developed DID after seeing therapists who believed strongly in the disorder. Indeed, in most cases those diagnosed as having DID were unaware of their other identities until after many therapy sessions. The 1980s and 1990s saw a surge of therapists who believed that childhood trauma frequently was repressed and that it needed to be uncovered during treatment. These therapists tended to use hypnosis, and they might have suggested DID symptoms to the patients they were assessing.

**Participant 1**

Satan opens that hot door for the people  
that wronged me !!!

No freedom - sitting in a jail cell / sitting in a jail  
cell for a crime someone else has done. I guess that

happened just as the names that I use actually  
belong to people I know, --

BY  
M L

By Johnny7

~~Frank~~

**Participant 2**

Kevin (arranged to get out in <sup>new</sup> Jersey - see Atlanta Journal  
of 11-80) in prison in ~~the~~ <sup>the</sup> ~~known~~ <sup>known</sup> during FAST 4 :  
Killed 61 yr. old Anna Mae Chalkley on Dec. 19, 1979. In prison from  
Aug. 24 - Dec. 1, 1979. What about KEST??

I also have the letter  
from the YMCA in Rochester,  
and the Bureau of Vital Statistics

Place him in a cell in Florida with a special handling from  
to this is being submitted August 1979, the name is in file.  
Name not on record as per handwriting that might be under the 6th

**Participant 3**

Vincent

Scott

Sadie

**FIGURE 14.7 Handwriting Samples of Three People Diagnosed with Dissociative Identity Disorder**

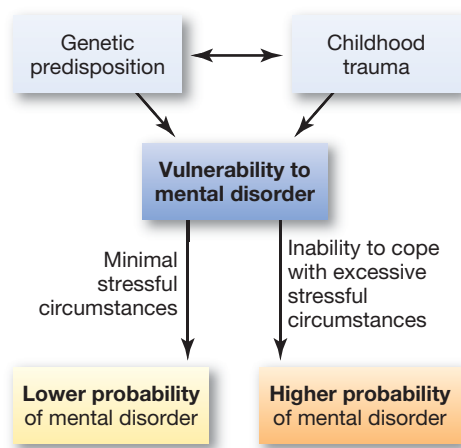
When researchers studied 12 murderers diagnosed with DID, writing samples from 10 of the participants revealed markedly different handwriting in each of their identities. Here, handwriting samples from three of the participants show different identities expressing themselves.

Despite this counterevidence, independent reports have verified that at least some patients with DID were abused, and physical or sexual abuse can cause psychological problems, including distortions of consciousness. But how can we know whether a diagnosis of DID is valid? As mentioned above, most often there is no objective, definitive test for diagnosing mental disorders. Ultimately, it is difficult to tell if a person is faking, whether he or she has come to believe what a therapist said, or whether he or she has a genuine mental disorder.

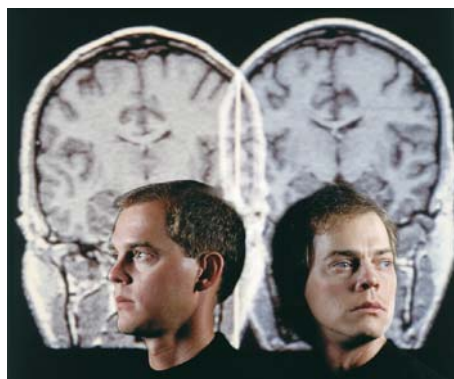
### Psychological Disorders Have Many Causes

Although there is not complete agreement for the causes of most psychological disorders, including dissociative identity disorder, some factors are thought to play important developmental roles. As discussed throughout this book, both nature and nurture matter, and it is futile to try to identify biology or environment as solely responsible for a given disorder. The **diathesis-stress model** provides one way of

**diathesis-stress model** A diagnostic model that proposes that a disorder may develop when an underlying vulnerability is coupled with a precipitating event.



**FIGURE 14.8 Diathesis-Stress Model** In this model, nature and nurture work together: A person can be vulnerable to a mental disorder because of an inherited predisposition, an environmental influence, or both. Stress then may act upon the person's vulnerability.



**FIGURE 14.9 Biological Factors in Mental Disorders** Although these men are twins, the one on the right has schizophrenia and the one on the left does not. In the MRI of the twin with schizophrenia, note the larger ventricles (these fluid-filled cavities appear dark in the image). This same pattern has emerged in the study of other twin pairs in which one has schizophrenia and the other does not.

**family systems model** A diagnostic model that considers symptoms within an individual as indicating problems within the family.

thinking about the onset of mental disorders. In this model, an individual can have an underlying vulnerability or predisposition (known as *diathesis*) to a mental disorder. This diathesis can be biological, such as a genetic predisposition to a specific disorder, or environmental, such as childhood trauma. The vulnerability may not be sufficient to trigger a mental disorder, but the addition of stressful circumstances can tip the scales. If the stress level exceeds an individual's ability to cope, the symptoms of mental disorder will occur. In this view (presented as a flowchart in **FIGURE 14.8**), a family history of mental disorder suggests vulnerability rather than destiny.

**BIOLOGICAL FACTORS** The biological perspective focuses on how physiological factors, such as genetics, contribute to psychological disorders. Chapter 3 describes how comparing the rates of mental disorders between identical and fraternal twins and studying individuals who have been adopted have revealed the importance of genetic factors. Other biological factors also influence the development and course of mental disorders. The fetus is particularly vulnerable, and evidence indicates that some mental disorders may arise from prenatal problems such as malnutrition, exposure to toxins, and maternal illness. Similarly, during childhood and adolescence, environmental toxins and malnutrition can put an individual at risk for mental disorders. All these biological factors may contribute to mental disorders because of their effects on the central nervous system. Evidence is emerging that neurological dysfunction contributes to the expression of many mental disorders.

The recent use of imaging to identify brain regions associated with psychopathology has allowed researchers to generate hypotheses about the types of subtle deficits that might be associated with different mental disorders. Structural imaging has revealed differences in brain anatomy, perhaps due to genetics, between those with mental disorders and those without, but functional neuroimaging is currently at the forefront of research into the neurological correlates of mental disorders. PET and fMRI have revealed brain regions that may function differently in individuals with mental disorders (**FIGURE 14.9**). Another source of insights into neural dysfunction has been research on neurotransmitters' role in mental disorders. In some cases, medications have been developed based on what is known about the neurochemistry of mental disorders. In other cases, however, the unexpected effects of medications have led to discoveries about the neurotransmitters involved in mental disorders.

Again, biological factors often reflect vulnerabilities, and situational factors often play prominent roles in the expression of mental disorders. As the diathesis-stress model reminds us, single explanations (nature or nurture) are seldom sufficient for understanding mental disorders.

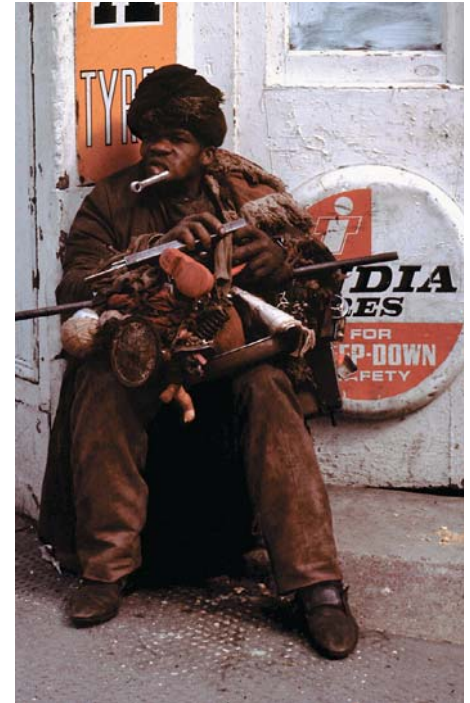
**PSYCHOLOGICAL FACTORS** The first edition of the *DSM* was influenced heavily by Freudian psychoanalytic theory. Freud believed that mental disorders were mostly due to unconscious conflicts, often sexual in nature, that dated back to childhood. Consistent with this perspective, many disorders in the first edition of the *DSM* were described as reactions to environmental conditions or as involving various defence mechanisms. Although Freud made important historical contributions in shaping psychology, most of his theories—particularly his theories on the causes of mental health disorders—have not stood the test of time. However, psychological factors clearly play an important role in the expression and treatment of mental disorders. At the social level of analysis, thoughts and emotions are shaped by environment and can profoundly influence behaviour, including disordered behaviour. Not only traumatic events but also less extreme circumstances, such as constantly being belittled by a parent, can have long-lasting effects. The **family systems model** proposes that an individual's behaviour must be considered within a social context, particularly





(a)

**FIGURE 14.10 Socio-cultural Model** According to the socio-cultural model, psychopathology results from the interaction between individuals and their cultures. These images exemplify such interactions. **(a)** This billboard, denouncing the use of anorexic fashion models, appeared in Milan during Italian fashion week. **(b)** This homeless man with schizophrenia lives on the streets in Notting Hill, a fashionable area of London.



(b)

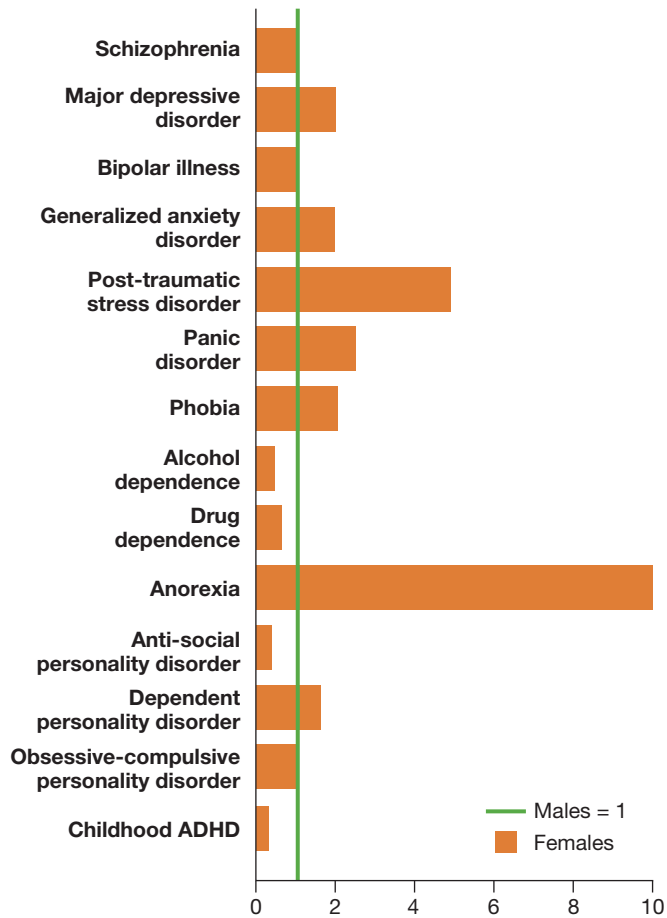
within the family. Problems that arise within an individual are manifestations of problems within the family. Developing a profile of an individual's family interactions can be important not only for understanding possible factors contributing to the disorder but also for determining whether the family is likely to be helpful or detrimental to the client's progress in therapy.

Similarly, the **socio-cultural model** views psychopathology as the result of the interaction between individuals and their cultures. Disorders such as schizophrenia appear more common among the lower socio-economic classes, whereas disorders such as anorexia nervosa appear more common among the middle and upper classes (**FIGURE 14.10**). From the socio-cultural perspective, these differences in occurrence are due to differences in lifestyles, in expectations, and in opportunities among classes. There may be cultural biases in people's willingness to ascribe disorders to different social classes, however. Eccentric behaviour among the wealthy elite might be tolerated or viewed as amusing, whereas the same behaviours observed among those living in poverty might be taken as evidence of mental disorders. Moreover, people who develop schizophrenia may have trouble finding work and so experience financial problems because of their disorder.

**COGNITIVE-BEHAVIOURAL FACTORS** At the level of the individual, the central principle of the **cognitive-behavioural approach** is that abnormal behaviour is learned. As discussed in Chapter 6, through classical conditioning an unconditioned stimulus produces an unconditioned response. For example, a loud noise produces a startled response. A neutral stimulus paired with this unconditioned stimulus can eventually by itself produce a similar response. As was the case with Little Albert, if a child is playing with a fluffy white rat and is frightened by a loud noise, the white rat alone can later cause fear in the child. In fact, this process is how John B. Watson,

**socio-cultural model** A diagnostic model that views psychopathology as the result of the interaction between individuals and their cultures.

**cognitive-behavioural approach** A diagnostic model that views psychopathology as the result of learned, maladaptive cognitions.



SOURCE: NIAAA; NIMH; R. Kessler/Harvard University

**FIGURE 14.11 Sex Differences in Mental Disorders** In this graph, males are set as the baseline of 1 for comparison purposes.

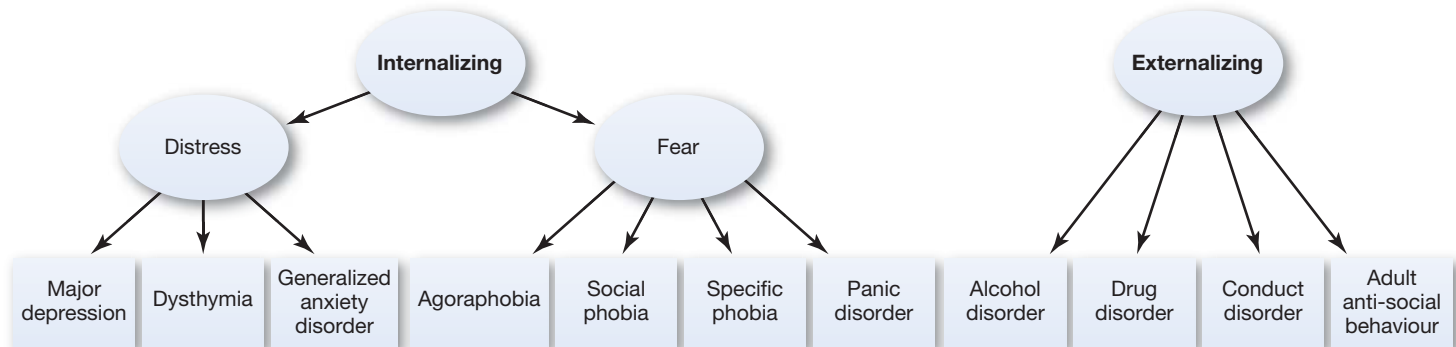
the founder of behaviourism, demonstrated that many fears are learned rather than innate.

Proponents of strict behaviourism argue that mental disorders result from classical and operant conditioning. Strict behaviourists originally defined behaviour as overt and observable actions, but later this view was challenged. According to the revised cognitive-behavioural perspective, thoughts and beliefs are types of behaviour and can be studied empirically. The premise of this approach is that thoughts can become distorted and produce maladaptive behaviours and maladaptive emotions. In contrast to the psychoanalytical perspective, cognitive-behavioural psychologists believe that thought processes are available to the conscious mind; individuals are aware of, or easily can be made aware of, the thought processes that give rise to maladaptive emotions and behaviours.

**SEX DIFFERENCES IN MENTAL DISORDERS**

Some mental disorders are more common for males and others for females. The reasons for these differences are both environmental and biological. As **FIGURE 14.11** shows, dependence on alcohol and/or drugs, anti-social personality disorders, and childhood attention deficit hyperactivity disorder are twice as likely to occur in males as in females. In contrast, anorexia is 10 times more likely to occur in females, post-traumatic stress disorder is four times more likely in females, and panic disorders are almost twice as likely in females. Some disorders, such as schizophrenia and bipolar disorder, are equally likely in the sexes. One way of categorizing mental disorders is to divide them into two major groups: *internalizing disorders*, those characterized by negative emotions such as distress and fear, and *externalizing disorders*, those characterized by disinhibition, such as alcoholism, conduct disorders, and anti-social behaviour. (A schematic diagram of this model of mental disorders appears in **FIGURE 14.12**.) In general, the disorders associated with internalizing are more prevalent in females, and those associated with externalizing are more prevalent in males (Krueger & Markon, 2006).

**FIGURE 14.12 Externalizing and Internalizing Model of Mental Disorders** Internalizing is more prevalent in females, and externalizing is more prevalent in males.



SOURCE: Krueger & Markon, 2006.

**Table 14.2 Culture-Bound Syndromes**

Name	Definition and Location
<b>Amok</b>	A sudden outburst of explosive and assaultive violence preceded by a period of social withdrawal and apathy (Southeast Asia, Philippines).
<b>Ataque de nervios</b>	Uncontrollable shouting and/or crying. Verbal and physical aggression. Heat in chest rising to head. Feeling of losing control. Occasional amnesia for experience (Caribbean Latinos and South American Latinos).
<b>Hwa-byung</b>	Acute panic, fear of death, fatigue, anorexia, dyspnea, palpitations, lump in upper stomach (Korea).
<b>Kuro (shook yong)</b>	Intense fear following perception that one's genitalia (men/women) or breasts (women) are withdrawing into one's body. Shame may also be present if perception is associated in time with immoral sexual activity (Chinese populations in Hong Kong and Southeast Asia).
<b>Latah</b>	Startle reaction followed by echolalia and echopraxia, and sometimes coprolalia and altered consciousness (Malaysia and Indonesia).
<b>Phii pob</b>	Belief that one is possessed by a spirit. Numbness of limbs, shouting, weeping, confused speech, shyness (Thailand).
<b>Pissu</b>	Burning sensations in stomach, coldness in body, hallucinations, dissociation (Ceylon).
<b>Suchi-bai</b>	Excessive concerns for cleanliness; changes street clothes, washes money, hops while walking to avoid dirt, washes furniture, remains immersed in holy river (Bengal, India—especially Hindu widows).
<b>Susto (espanto)</b>	Strong sense of fear that one has lost one's soul. Accompanied by anorexia, weight loss, skin pallor, fatigue, lethargy, extensive thirst, untidiness, tachycardia, and withdrawal (Latinos in South and Central America, Mexico; Latino migrants to North America).
<b>Taijin kyofusho</b>	Intense fear of interpersonal relations. Belief that parts of the body give off offensive odours or displease others (Japan).
<b>Tawatl ye sni</b>	Total discouragement. Preoccupation with death, ghosts, spirits. Excessive drinking, suicide thoughts and attempts (Sioux Indians).
<b>Uquamairineq</b>	Hypnotic states, disturbed sleep, sleep paralysis, dissociative episodes, and occasional hallucinations (Native Alaskans: Inuit, Yuit).
<b>Windigo psychosis</b>	An insatiable desire or craving to consume human flesh along with a worry about turning into a cannibal and consuming others (Algonquian).

Disorders with a strong biological component are more similar across cultures, whereas those heavily influenced by learning and by context will more likely differ across cultures. For example, depression is a major mental health problem around the world, but the manifestations of depression differ by culture.

Since the 1994 edition, the *DSM* has included a section on *culture-bound syndromes*, disorders mainly found in specific cultures or regions. (TABLE 14.2 lists examples of culture-bound disorders; FIGURE 14.13 depicts one example.) Clinicians and researchers need to be sensitive to cultural issues to avoid making mistakes in their diagnoses and treatments (Marsella & Yamada, 2007). Cultural factors can be critical in determining how a disorder is expressed and how an individual will respond to different types of therapies.

**FIGURE 14.13 Suchi-Bai Disorder**

Suchi-bai disorder involves an excessive concern for cleanliness and is particularly common among Hindu widows. In India, widows—such as this one, washing herself in an ashram—often are discriminated against and blamed for the deaths of their husbands.

## SUMMING UP

### How Are Psychological Disorders Conceptualized and Classified?

Because psychopathology takes many forms, mental disorders are difficult to define and categorize. Although the behavioural manifestations vary widely, people diagnosed with these disorders have three things in common: Their behaviour is maladaptive, it interferes with some important aspect of their lives, and it causes

personal distress. Diagnoses of specific mental disorders are based on the checklist system of the *DSM*. Clinical assessments typically consisting of interviews and psychological tests are used to examine a person's mental functions and psychological health, and there is growing emphasis on evidence-based assessments. Some diagnoses, such as DID, are controversial because evidence for the existence of these particular mental disorders is questionable. The specific causes of most mental disorders are unknown and may be complex interactions of psychological, biological, and cognitive-behavioural factors. In general, females will more likely suffer from internalizing disorders such as distress and fear, and males will more likely suffer from externalizing disorders such as alcoholism and anti-social behaviour. Disorders largely biological in origin are more similar throughout the world, and disorders that may be learned in a context vary more across cultures. Culture-bound disorders are found mainly in certain regions or cultures.

### MEASURING UP

1. Indicate whether each of the following scenarios is best described as a mental status exam, a structured interview, an unstructured interview, a behavioural test, a psychological test, or a neuropsychological test.
  - a. A child psychologist asks a young client to study a series of words and then to list the words immediately afterward; memory for the words is assessed again later in the session.
  - b. A social worker at a homeless shelter conducts systematic behavioural observations of new clients as they register for services.
  - c. The staff member in charge of assessing the mental health status of recently incarcerated persons asks the same series of questions of each new inmate.
2. While at a conference on mental disorders, you attend a symposium titled *Understanding the Origins of Mental Health*. Excerpts from three of the presentations appear below. Match each excerpt to one of the etiological models discussed in this chapter: diathesis-stress model, biological model, family systems model, socio-cultural model, and cognitive-behavioural approach. Not all the models will have matches.
  - a. "By understanding the mechanisms by which neurotransmitters affect behaviour and cognition and emotion, we gain insight into the underlying causes of mental illness."
  - b. "Children are not raised in vacuums; they are raised in families. Therefore, to understand the origins of mental illness, we must understand the dynamics of the client's family."
  - c. "Some individuals are predisposed—whether as a function of their biology or of their past experiences—to develop psychological disorders. Stressful circumstances amplify these predispositions, making the individual more likely to evidence symptoms of psychopathology."

#### LEARNING OBJECTIVES

Identify common symptoms experienced by people with anxiety disorders.

Provide evidence supporting the cognitive, situational, and biological underpinnings of anxiety disorders.

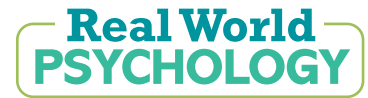
## Can Anxiety Be the Root of Seemingly Different Disorders?

What does the fear of spiders have in common with the need to repeatedly check that the stove is turned off? They are both manifestations of anxiety disorders. Anxiety itself is normal and even useful. It can prepare us for upcoming events and motivate us to learn new ways of coping with life's challenges. Being anxious about tests reminds us to keep up with our homework and study. Likewise, being slightly anxious when meeting new people helps us avoid doing bizarre things and making bad

impressions. For some people, however, anxiety can become debilitating and can interfere with every aspect of life. *Anxiety disorders* are characterized by excessive anxiety in the absence of true danger. It is normal to be anxious in stressful or threatening situations. It is abnormal to feel strong chronic anxiety without cause.

## There Are Different Types of Anxiety Disorders

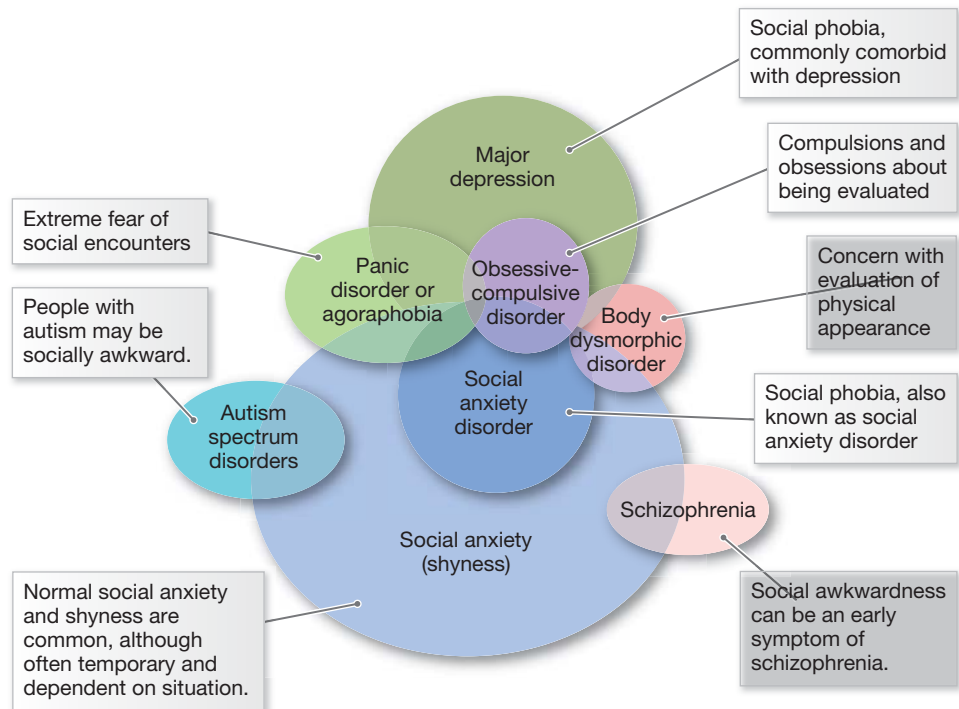
More than 1 in 4 people will have some type of anxiety disorder during their lifetimes (Kessler & Wang, 2008). In a given year, about 9 percent of Canadian men and 16 percent of Canadian women have an anxiety disorder (Health Canada, 2002). Those suffering from anxiety disorders feel tense, anxious, and apprehensive. They are often depressed and irritable because they cannot see any solution to their anxiety. Constant worry can make falling asleep and staying asleep difficult, and attention span and concentration can be impaired. Because of the arousal of the autonomic nervous system, chronic anxiety also causes bodily symptoms such as sweating, dry mouth, rapid pulse, shallow breathing, increased blood pressure, and increased muscular tension. Chronic arousal can also result in hypertension, headaches, and intestinal problems and can even cause illness or tissue damage. Because of their high levels of autonomic arousal, those who suffer from anxiety disorders also exhibit restless and pointless motor behaviours. Exaggerated startle response is typical, and behaviours such as toe tapping and excessive fidgeting are common. Problem solving and judgment may suffer as well. Recent research has shown that chronic stress can produce atrophy in the hippocampus, a brain structure involved in learning and memory (McEwen, 2000). The fact that chronic stress can damage the body and brain indicates the importance of identifying and effectively treating disorders that involve chronic anxiety. Different anxiety disorders share some emotional, cognitive, somatic, and motor symptoms, even though the behavioural manifestations of these disorders are quite different (Barlow, 2002).



**PHOBIC DISORDER** As discussed in Chapter 6, a *phobia* is a fear of a specific object or situation. Fear can be adaptive, as it can lead us to avoid potential dangers, such as poisonous snakes and rickety bridges. In phobias, however, the fear is exaggerated and out of proportion to the actual danger. Phobias are classified based on the object of the fear. *Specific phobias*, which affect about 1 in 8 people, involve particular objects and situations, such as snakes (ophidiophobia), enclosed spaces (claustrophobia), and heights (acrophobia). (TABLE 14.3 lists some unusual

**Table 14.3 Some Unusual Specific Phobias**

- **Arachibutyrophobia:** fear of peanut butter sticking to the roof of one's mouth
- **Automatonophobia:** fear of ventriloquists' dummies
- **Barophobia:** fear of gravity
- **Dextrophobia:** fear of objects at the right side of the body
- **Geliophobia:** fear of laughter
- **Gnomophobia:** fear of garden gnomes
- **Hippopotomonstrosesquippedaliophobia:** fear of long words
- **Ochophobia:** fear of being in a moving automobile
- **Panophobia:** fear of everything
- **Pentheraphobia:** fear of mothers-in-law
- **Triskaidekaphobia:** fear of the number 13



**FIGURE 14.14 Social Phobias** Social phobia is comorbid with many other psychological disorders, all of which need to be considered to make a correct diagnosis.

specific phobias.) A common phobia is fear of flying. Even though the odds of dying in a plane crash, compared with a car crash, are extraordinarily small, some people find flying terrifying. For those who need to travel frequently for their jobs, a fear of flying can cause significant impairment in daily living.

*Social phobia*, a specific phobia that is sometimes called *social anxiety disorder*, is a fear of being negatively evaluated by others. It includes being afraid of public speaking, speaking up in class, meeting new people, and eating in front of others. About 1 in 12 Canadians will experience social phobia at some point in their lifetimes, and around 3 percent are experiencing social phobia at any given time (Shields, 2005). It is one of the earliest forms of mental disorder to develop, often beginning around age 13; and the more social fears a person has, the more likely he or she is to develop other disorders, particularly depression and substance abuse problems. Indeed, assessment must consider the overlap between social phobia and related disorders to make an informed diagnosis (Stein & Stein, 2008; **FIGURE 14.14**).

#### generalized anxiety disorder (GAD)

A diffuse state of constant anxiety not associated with any specific object or event.

## Real World PSYCHOLOGY

**GENERALIZED ANXIETY DISORDER** Whereas the anxiety in phobic disorders has a specific focus, the anxiety in **generalized anxiety disorder (GAD)** is diffuse and always present. People with this disorder are constantly anxious and worry incessantly about even minor matters (Sanderson & Barlow, 1990). They even worry about being worried! Because the anxiety is not focused, it can occur in response to almost anything, so the sufferer is constantly on the alert for problems. This hypervigilance results in distractibility, fatigue, irritability, and sleep problems, as well as headaches, restlessness, light-headedness, and muscle pain. Just under 6 percent of the population is affected by this disorder at some point in their lives, though women are more often diagnosed than men (Kessler et al., 1994; Kessler & Wang, 2008). About 1.1 percent of Canadian adults have GAD in a given year (Health Canada, 2002).

**PANIC DISORDER** Panic disorder affects an estimated 1–2 percent of the Canadian population in a given year, and women are twice as likely to be diagnosed as men

(Ramage-Morin, 2004). **Panic disorder** involves sudden and overwhelming attacks of terror that seemingly come out of nowhere or are cued by external stimuli or internal thought processes. Panic attacks typically last for several minutes, during which the victim begins to sweat and tremble; feels his or her heart racing, feels short of breath, and feels chest pain; and may feel dizzy and light-headed, with numbness and tingling in the hands and feet. People experiencing panic attacks often feel that they are going crazy or that they are dying, and those who suffer from persistent panic attacks attempt suicide much more frequently than those in the general population (Fawcett, 1992; Korn et al., 1992; Noyes, 1991). People who experience panic attacks during adolescence are especially likely to develop other anxiety disorders, such as post-traumatic stress disorder (PTSD) and generalized anxiety disorder, in adulthood (Goodwin et al., 2004).

A related disorder is **agoraphobia**, a fear of being in situations in which escape is difficult or impossible (e.g., being in a crowded shopping mall) to the extent that being in such situations causes panic attacks. People who suffer from agoraphobia avoid going into open spaces or to places where there might be crowds. In extreme cases, sufferers may feel unable to leave their homes, in part because they fear having a panic attack in public:

Ms. Watson began to dread going out of the house alone. She feared that while out she would have an attack and would be stranded and helpless. She stopped riding the subway to work out of fear she might be trapped in a car between stops when an attack struck, preferring instead to walk the 20 blocks between her home and work. She also severely curtailed her social and recreational activities—previously frequent and enjoyed—because an attack might occur, necessitating an abrupt and embarrassing flight from the scene. (Spitzer, Skodol, Gibbon, & Williams, 1983)

This description demonstrates the clear links between panic attacks and agoraphobia. Indeed, agoraphobia without panic is quite rare (Kessler & Wang, 2008).

**OBSESSIVE-COMPULSIVE DISORDER** Affecting 1 percent to 2 percent of the population, **obsessive-compulsive disorder (OCD)** involves frequent intrusive thoughts and compulsive actions (Health Canada, 2002; Kessler & Wang, 2008). It is more common in women than men and generally begins in early adulthood (Robins & Regier, 1991; Weissman et al., 1994). *Obsessions* are recurrent, intrusive, and unwanted thoughts or ideas or mental images; they often include fear of contamination, of accidents, or of one's own aggression (**FIGURE 14.15**). *Compulsions* are particular acts that the OCD patient feels driven to perform over and over again. The most common compulsive behaviours are cleaning, checking, and counting. For instance, a person might continually check to make sure a door is locked, because of an obsession that his or her home might be invaded, or a person might engage in superstitious counting to protect against accidents, such as counting the number of telephone poles while driving. Those with OCD anticipate catastrophe and loss of control. However, as opposed to those who suffer from other anxiety disorders, who fear what might happen to them, those with OCD fear what they might do or might have done, and checking is the only way to calm the anxiety:

While in reality no one is on the road, I'm intruded with the heinous thought that I *might* have hit someone . . . a human being! God knows where such a fantasy comes from . . . I try to make reality chase away this fantasy. I reason, "Well, if I hit someone while driving, I would have *felt* it." This brief trip into reality helps the pain dissipate . . . but only for a second. . . I start ruminating, "Maybe I did hit someone and didn't realize it. . . Oh my God! I might have killed somebody! I have to go back and check." (Rapoport, 1990, pp. 22–27)

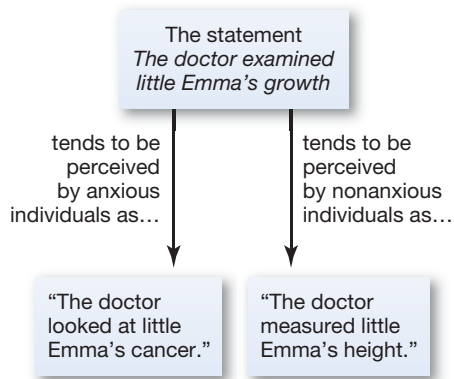
**panic disorder** An anxiety disorder characterized by sudden, overwhelming attacks of terror.

**agoraphobia** An anxiety disorder marked by fear of being in situations in which escape may be difficult or impossible.

**obsessive-compulsive disorder (OCD)** An anxiety disorder characterized by frequent intrusive thoughts and compulsive actions.



**FIGURE 14.15 Howie Mandel** The comedian Howie Mandel is a diagnosed sufferer of obsessive-compulsive disorder. Like many people with OCD, Mandel suffers from mysophobia, or the fear of germs. He has admitted that his trademark shaved head helps him with this problem, as it makes him feel cleaner. Mandel even built a second, sterile house, to which he can retreat if he feels he might be contaminated by anyone around him.



**FIGURE 14.16 Anxiety Disorders**  
Anxious individuals tend to perceive ambiguous situations as threatening.

## Anxiety Disorders Have Cognitive, Situational, and Biological Components

Although the behavioural manifestations of anxiety disorders can be quite different, they share some causal factors (Barlow, 2002). *Cognitive factors* make up one group. For example, research in England has shown that, when presented with ambiguous or neutral situations, anxious individuals tend to perceive them as threatening, whereas nonanxious individuals assume they are nonthreatening (Eysenck, Mogg, May, Richards, & Matthews, 1991; for an example, see **FIGURE 14.16**). Anxious individuals also focus excessive attention on perceived threats (Rinck, Reinecke, Ellwart, Heuer, & Becker, 2005). They thus recall threatening events more easily than nonthreatening events, exaggerating their perceived magnitude and frequency.

In addition to cognitive components, *situational factors* play a role in the development of anxiety disorders. As discussed in Chapter 6, monkeys develop a fear of snakes if they observe other monkeys responding to snakes fearfully. Similarly, a person could develop a fear of flying by observing another person's fearful reaction to the closing of cabin doors. Such a fear might then generalize to other enclosed spaces, resulting in claustrophobia. *Biological factors* also seem important in the development of anxiety disorders; recent investigations have resulted in a number of exciting findings. For instance, as noted in Chapter 13, children who have an inhibited temperamental style are usually shy and tend to avoid unfamiliar people and novel objects. These inhibited children will more likely have anxiety disorders later in life (Fox, Henderson, Marshall, Nichols, & Ghera, 2005) and are especially at risk for developing social phobia (Biederman et al., 2001). In one study, adults who had been categorized as inhibited before age two received brain scans while viewing pictures of familiar faces and of novel faces. Compared with adults who had been categorized as uninhibited before age two, the inhibited group showed greater activation of the amygdala, a brain region involved when people are threatened, while viewing the novel faces (Schwartz, Wright, Shin, Kagan, & Rauch, 2003). This finding suggests that some aspects of childhood temperament are preserved in the adult brain (**FIGURE 14.17**). To understand these factors more fully, we need to examine the causes of obsessive-compulsive disorder.

**FIGURE 14.17 Scientific Method: Inhibition and Social Anxiety**

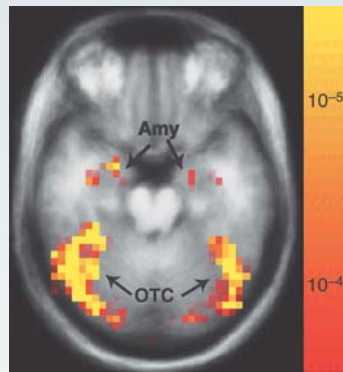
**Hypothesis:** People who had an inhibited temperamental style as children will more likely have anxiety disorders later in life.

**Research Method:**

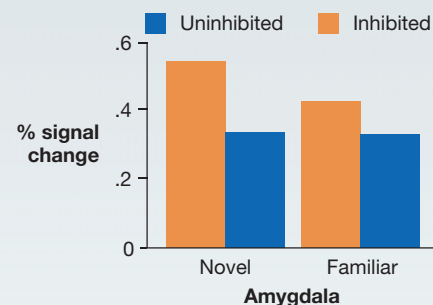
**1** Adults who were categorized as inhibited during their second year of life, and adults who were categorized as uninhibited before age two, received brain scans while viewing pictures of familiar faces and of novel faces.



**2** Two areas of the brain were more activated by novel faces—the amygdala (marked “Amy”) and the occipitotemporal cortex (marked “OTC”), a brain region active when people see faces.



**Results:** When shown the novel faces, the inhibited group showed greater activation of the amygdala, a brain region involved when people are threatened.



**Conclusion:** Biological factors seem to play an important role in the development of anxiety disorders.



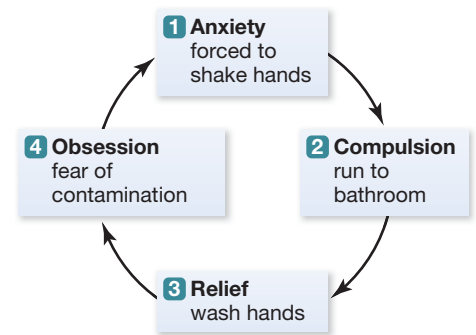
A paradoxical aspect of OCD is that people are aware that their obsessions and compulsions are irrational, yet they are unable to stop them. One explanation is that the disorder results from conditioning. Anxiety is somehow paired to a specific event, probably through classical conditioning, and the person engages in behaviour that reduces anxiety and therefore is reinforced through operant conditioning. This reduction of anxiety is reinforcing and increases the person's chance of engaging in that behaviour again. For example, say you are forced to shake hands with someone who has a bad cold, and you have just seen him wiping his nose with his right hand. Shaking that hand might cause you to be anxious or uncomfortable because you do not want to get sick yourself. As soon as the pleasantries are over, you run to the bathroom and wash your hands. You feel relieved. You have just paired hand washing with a reduction in anxiety, thus increasing the chances of hand washing in the future. (This example is rendered as a flowchart in **FIGURE 14.18**.)

There is good evidence that the etiology of OCD is in part genetic (Crowe, 2000). Indeed, various behavioural genetics methods, such as twin studies, have shown that OCD runs in families. Although the specific mechanism has not been identified, evidence points to genes that control the neurotransmitter glutamate, which (as noted in Chapter 3, "Biological Foundations") is the major excitatory transmitter in the brain, causing increased neural firing (Pauls, 2008).

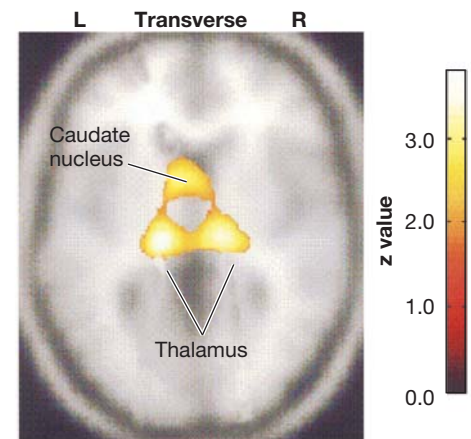
Brain imaging has provided some evidence regarding which brain systems are involved in OCD. The caudate, a brain structure involved in suppressing impulses, is smaller and has structural abnormalities in people with OCD (Baxter, 2000). Moreover, PET studies show abnormal activity in the thalamus and caudate of those with OCD compared to those of controls (Saxena, Maulik, Sharan, Levav, & Saraceno, 2004; **FIGURE 14.19**). In addition, patients with diseases in this area of the brain often have symptoms of OCD. Because this region is involved in impulse suppression, dysfunction in this region may result in the leak of impulses into consciousness. The prefrontal cortex, which is involved in conscious control of behaviour, then becomes overactive in an effort to compensate (Whiteside, Port, & Abramowitz, 2004; Yucel et al., 2007). As discussed in Chapter 15, deep brain electrical stimulation of the caudate has been successful in alleviating the symptoms of OCD, providing additional evidence that this brain structure is involved in OCD (Aouizerate et al., 2004).

Growing evidence also indicates that OCD sometimes can be triggered by environmental factors. In particular, a streptococcal infection apparently can cause a severe form of OCD in some young children. Originally identified in 1998 by Susan Swedo and her colleagues at the U.S. National Institute of Mental Health, this syndrome strikes virtually overnight, as children suddenly display odd symptoms of OCD such as engaging in repetitive behaviours, developing irrational fears and obsessions, and having facial tics. Researchers have speculated that an autoimmune response damages the caudate, thereby producing the symptoms of OCD (Snider & Swedo, 2004). Treatments that enhance the immune system have been found to diminish the symptoms of OCD in children with this syndrome. Why some children are susceptible to this autoimmune response is unknown.

Most likely, biological and cognitive-behavioural factors interact to produce the symptoms of OCD. A dysfunctional caudate allows impulses to enter consciousness, and these impulses may give rise to the obsessions of OCD. The prefrontal cortex becomes overactive in an attempt to compensate, thereby establishing associations between obsessions and behaviours that reduce the anxiety arising from the obsessions. These behaviours thus become compulsions through conditioning.



**FIGURE 14.18 OCD Cycle** Classical conditioning (here, step 1) and operant conditioning (steps 2–3) may contribute to a person's developing OCD (step 4).



This PET scan shows abnormal activity in the thalamus and caudate brain regions of an OCD patient.

**FIGURE 14.19 OCD Brain Scan**



*"Is the Itsy Bitsy Spider obsessive-compulsive?"*

## SUMMING UP

### Can Anxiety Be the Root of Seemingly Different Disorders?

Although anxiety disorders seem to take different forms, they share many emotional, cognitive, somatic, and motor symptoms. All the disorders in this category are associated with anxiety out of proportion with reality. The anxiety may arise from biological factors, but many of the behavioural and cognitive manifestations of the disorders are influenced strongly by psychological and environmental factors.

## MEASURING UP

1. Which of the following symptoms commonly are experienced by people with anxiety disorders?
  - a. exaggerated startle response
  - b. excessive fidgeting
  - c. extreme distractibility
  - d. feelings of apprehension
  - e. impaired ability to concentrate
  - f. muscular tension
  - g. pervasive feelings of sadness
  - h. sleep disruptions
  - i. weight changes
2. Indicate whether each of the following empirical findings supports a cognitive, situational, or biological underpinning of anxiety disorders.
  - a. Adults who were categorized as inhibited versus uninhibited during childhood show differential patterns of amygdala activation when viewing novel faces (Schwartz et al., 2003).
  - b. Anxious individuals tend to focus excessive attention on perceived threats (Rinck et al., 2005).
  - c. Inhibited children are more likely than uninhibited children to develop anxiety disorders later in life (Fox et al., 2005).
  - d. Monkeys tend to develop a fear of snakes if they observe other monkeys responding to snakes fearfully (Mineka et al., 1984).
  - e. When presented with ambiguous or neutral situations, anxious individuals generally perceive them as threatening, whereas nonanxious individuals perceive them as nonthreatening (Eysenck et al., 1991).

### LEARNING OBJECTIVES

Differentiate the symptoms and causes of major depression versus bipolar disorder.

Explain cognition's role in the experience of depression.

## Are Mood Disorders Extreme Manifestations of Normal Moods?

Our moods colour every aspect of our lives. When we are happy, the world seems like a wonderful place, and we are filled with boundless energy. When we are sad, we view the world in a decidedly less rosy light, feeling hopeless and isolated. Few of us, however, experience these symptoms day after day until they disrupt our ability to work, learn, and play. In addition, although it is easy to imagine how periods of sadness can interfere with daily life, periods of excessive elation can be equally devastating.

## Real World PSYCHOLOGY

### There Are Different Types of Mood Disorders

*Mood disorders* reflect extreme emotions: Depressive disorders feature persistent and pervasive feelings of sadness, and bipolar disorders involve radical fluctuations in

mood. Although some of their characteristics overlap, the two categories represent fundamentally different disorders.

**DEPRESSIVE DISORDERS** Depressive disorders can be major or less severe. To be diagnosed with **major depression**, a person must have one of two symptoms: depressed (often irritable) mood or loss of interest in pleasurable activities. In addition, the person must have other symptoms such as appetite and weight changes, sleep disturbances, loss of energy, difficulty concentrating, feelings of self-reproach or guilt, and frequent thoughts of death and suicide. The following excerpt is from a case study of a 56-year-old woman diagnosed with depression:

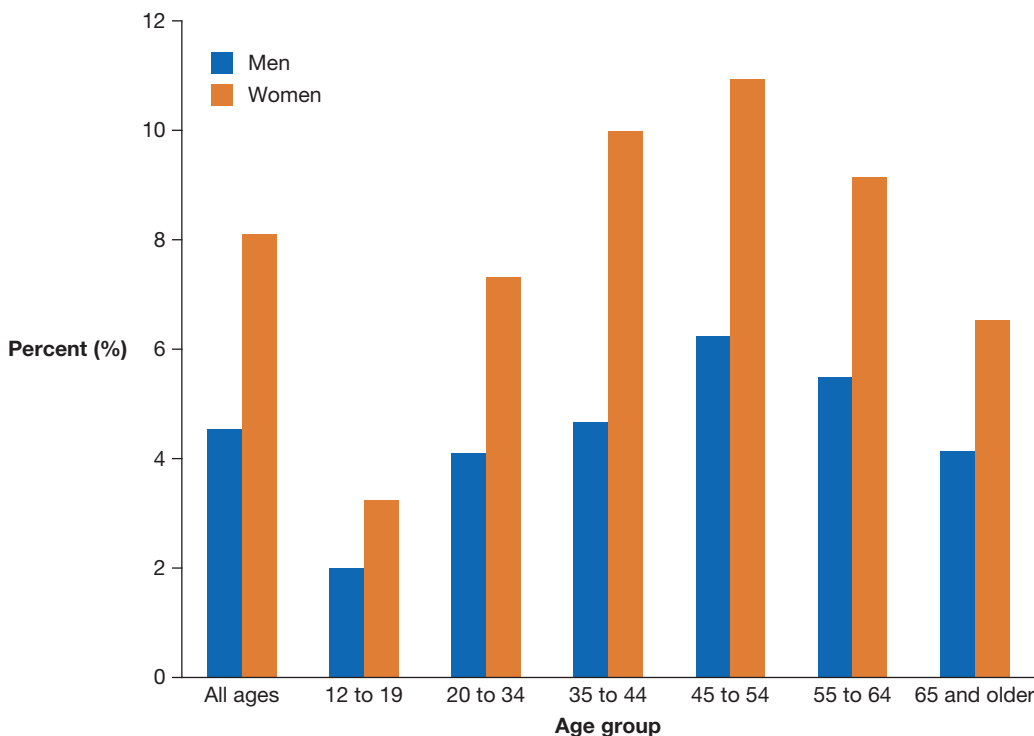
She described herself as overwhelmed with feelings of guilt, worthlessness, and hopelessness. She twisted her hands almost continuously and played nervously with her hair. She stated that her family would be better off without her and that she had considered taking her life by hanging herself. She felt that after death she would go to hell, where she would experience eternal torment, but that this would be a just punishment. (Andreasen, 1984, p. 39)

Although feelings of depression are relatively common, only long-lasting episodes that impair a person's life are diagnosed as mood disorders. Major depression affects about 6 percent to 7 percent of people in a given 12-month period, whereas approximately 16 percent of people will experience major depression at some point in their lives (Kessler & Wang, 2008; Statistics Canada, 2010). Although major depression varies in severity, those who receive a diagnosis are highly impaired by the condition, and it tends to persist over time for them, often lasting for many years (Kessler, Merikangas, & Wang, 2007). Women are nearly twice as likely to be diagnosed with major depression as men are (FIGURE 14.20).

Unlike major depression, **dysthymia** is of mild to moderate severity. Those diagnosed with dysthymia, approximately 2 percent to 3 percent of the population, must

**major depression** A disorder characterized by severe negative moods or a lack of interest in normally pleasurable activities.

**dysthymia** A form of depression that is not severe enough to be diagnosed as major depression.



**FIGURE 14.20 Major Depression** Across all age groups, women are much more likely to be diagnosed with major depression as men are.

have a depressed mood most of the day, more days than not, for at least two years. However, the depression is not severe enough to merit a diagnosis of major depression. Periods of dysthymia last from 2 to 20 or more years, although the typical duration is about 5 to 10 years. Because the depressed mood is so long-lasting, some psychological scientists consider it a personality disorder rather than a mood disorder. The distinction among a depressive personality, dysthymic disorder, and major depression is unclear. In fact, they may be points along a continuum rather than distinct disorders. In support of this view, researchers have found that dysthymia often precedes major depression (Lewinsohn, Allen, Seeley, & Gotlib, 1999; Lewinsohn, Rodhe, Seeley, & Hops, 1991).

Depression is so prevalent that it is sometimes called the common cold of mental disorders. In its most severe form, depression is a leading cause of disability in Canada and worldwide (Worley, 2006). The stigma associated with this disorder has especially dire consequences in developing countries, where people do not take advantage of the treatment options because they do not want to admit to being depressed. Depression is the leading risk factor for suicide, which claims approximately a million lives annually around the world and is among the top causes of death for people from adolescence to middle age (Health Canada, 2002). One way to combat the stigma of mental disorders is to focus attention on their high incidence and to educate more people about effective treatments (see Chapter 15, “Treatment of Psychological Disorders”).

Although many people suffer from depression, twice as many women as men suffer from it across multiple countries and contexts (Ustün, Ayuso-Mateos, Chatterji, Mathers, & Murray, 2004). In fact, suicide is the leading cause of death among young women in India and China (Khan, 2005), and the highest rates of depression are found in women in developing countries, with especially high rates reported for women in rural Pakistan (Mumford, Saeed, Ahmad, Latif, & Mubbashar, 1997).

Why are the rates of depression so much higher for women than men? Some researchers have suggested that women’s multiple roles in most societies as wage earners and family caregivers cause stress that results in increased incidence of depression, but other researchers have pointed out the health benefits of having multiple roles, such as being a wife, mother, and employee (Barnett & Hyde, 2001). Thus it is not multiple roles per se but more likely overwork and lack of support that contribute to the high rate of depression in women. Research in India, Brazil, and Chile shows that low income, lack of education, and difficult family relationships contribute to mental disorders in women (Blue & Harpham, 1996; **FIGURE 14.21**).

Furthermore, men present symptoms in a way that is more in line with the male gender role. For example, when men are distressed they will more likely abuse alcohol and other drugs and engage in violent and risky behaviours, including unsafe sexual practices, because having a disorder can make men feel as though they are admitting to weakness (Doyal, 2001). One theory is that women respond to stressful events by “internalizing” their feelings, which leads to depression and anxiety, whereas men “externalize” with alcohol, drugs, and violence (Holden, 2005).



**FIGURE 14.21 Depression** An elderly woman sells produce on the street in Temuco, Chile.

**bipolar disorder** A mood disorder characterized by alternating periods of depression and mania.

**BIPOLAR DISORDERS** Although we all experience variations in moods, normal fluctuations from sadness to exuberance seem minuscule compared to the extremes experienced by those with **bipolar disorder**. This disorder previously was known as manic depression, because those who are diagnosed with the disorder have periods of major depression but also experience episodes of mania. *Manic episodes* are characterized by elevated mood, increased activity, diminished need for sleep, grandiose ideas, racing thoughts, and extreme distractibility. During episodes

of mania, heightened levels of activity and euphoria often result in excessive involvement in pleasurable but foolish activities—such as sexual indiscretions, buying sprees, and risky business ventures—that the individual comes to regret once the mania has subsided.

Whereas some sufferers of bipolar disorder experience true manic episodes, others may experience less extreme mood elevations (FIGURE 14.22). These *hypo-manic episodes* are often characterized by heightened creativity and productivity and can be extremely pleasurable and rewarding; they are not too disruptive in people's lives. Bipolar disorder is much less common than depression; the lifetime prevalence in Canada for any type is estimated at around 2–3 percent (Wilkins, 2004). In addition, whereas depression is more common in women, the prevalence of bipolar disorder is equal in women and men. Bipolar disorder most commonly emerges during late adolescence or early adulthood. Bipolar disorder is also reported more frequently by Canadians under age 55, who might be somewhat biased toward willingness to report symptoms (Wilkins, 2004).

The psychology professor Kay Redfield Jamison acknowledged her own struggles with manic depression in her award-winning memoir, *An Unquiet Mind* (1995). Her work has helped shape the study of the disorder, and her 1990 textbook on manic-depressive disorder, co-authored with Frederick Goodwin, is considered the standard for the field. In *An Unquiet Mind*, Jamison details how as a child she was intensely emotional and occasionally obsessive. When she was 17, she had her first serious bout of what she describes as psychotic, profoundly suicidal depression. Jamison experienced deepening swings from nearly psychotic exuberance to paralyzing depression throughout her undergraduate years. In 1975, after obtaining her Ph.D. in clinical psychology, she joined the UCLA Department of Psychiatry, where she directed the Affective Disorders Clinic. Within months after she began this job, her condition deteriorated dramatically. She began hallucinating and feared that she was losing her mind. This state so terrified her that she sought out a psychiatrist, who quickly diagnosed her as having manic-depressive disorder and prescribed a drug called lithium. (For more about lithium and other treatments for bipolar disorder, see Chapter 15, “Treatment of Psychological Disorders.”)

One of the unfortunate side effects of lithium is that it blunts positive feelings. Those with bipolar disorder experience profoundly enjoyable highs during their manic phases. Even though patients with bipolar disorder know that lithium helps them, they resent the drug and often refuse to take it. Although lithium has helped Jamison, she also credits the psychological support of her psychiatrist, as well as the support of her family and friends. Jamison has made the point that lithium can rob people of creative energy. In her book *Touched with Fire* (1993), she asks whether lithium would have dampened the genius of those major artists and writers who may have had mood disorders, such as Michelangelo, Vincent van Gogh, Georgia O’Keeffe, Emily Dickinson, and Ernest Hemingway. Jamison demonstrates the strong association between manic depression and artistic genius, and she raises the disturbing question of whether eradicating the disorder would rob society of much great art. Jamison embodies this irony: Her early career benefited from the energy and creativity of her manic phases even as her personal life was threatened by devastating depression.

### Mood Disorders Have Cognitive, Situational, and Biological Components

Mood disorders can be devastating. The sadness, hopelessness, and inability to concentrate that characterize major depression can result in the loss of jobs, of friends, and of family relationships. Because of this disorder's profound effects, particularly



**FIGURE 14.22 Margot Kidder** In 1996, the Canadian actress Margot Kidder, best known for playing Lois Lane in the original Superman movies, was found hiding in a stranger's backyard. Bewildered, dazed, and frightened, she was mistakenly identified as a homeless woman. She was taken to a nearby psychiatric ward, where she was quickly diagnosed as manic depressive, or bipolar.

the danger of suicide, much research has focused on understanding the causes of major depression and treating it. People with bipolar disorder are also at risk for suicide. In addition, errors in judgment during manic episodes can have devastating effects.

Studies of twins, of families, and of adoptions support the notion that depression has a genetic component. Although there is some variability among studies, *concordance rates* (i.e., the percentage of twins who share the same disorder) between identical twins are generally around four times higher than rates between fraternal twins (Gershon, Berrettini, & Goldin, 1989). The genetic contribution to depression is somewhat weaker than the genetic contribution to schizophrenia or to bipolar disorder (Belmaker & Agam, 2008).

Twin studies reveal that the concordance for bipolar disorder in identical twins is more than 70 percent, versus only 20 percent in fraternal, or dizygotic, twins (Nurnberger, Goldin, & Gershon, 1994). In the 1980s, a genetic research study was carried out on the Amish, an ideal population because they keep good genealogical records and few outsiders marry into the community. In addition, substance abuse is virtually nonexistent among Amish adults, so mental disorders are easier to detect. The research results revealed that bipolar disorder ran in a limited number of families and that all of those afflicted had a similar genetic defect (Egeland et al., 1987). However, genetic research suggests that the hereditary nature of bipolar disorder is complex and not linked to just one gene. Current research focuses on identifying genes that may be involved. In addition, it appears that in families with bipolar disorder, successive generations have more severe disorders and earlier age of onset (McInnis et al., 1993; Petronis & Kennedy, 1995). Research on this pattern of transmission may help reveal the genetics of the disorder, but the specific nature of the heritability of bipolar disorder remains to be discovered.

The existence of a genetic component implies that biological factors are involved in depression, and much evidence suggests that major depression involves a deficiency of one or more monoamines. (As discussed in Chapter 3, monoamines are neurotransmitters that regulate emotion and arousal and motivate behaviour.) For instance, psychological scientists know that medications that increase the availability of norepinephrine, a monoamine, alleviate depression, whereas those that decrease levels of this neurotransmitter can cause depression. Medications such as Prozac—a *selective serotonin reuptake inhibitor (SSRI)*—selectively increase another monoamine, serotonin, and there is increased interest in understanding the role of this neurotransmitter in mood disorders (Barton et al., 2008; SSRIs and other medications are discussed in Chapter 15). Studies of brain function have suggested that certain neural structures may be involved in mood disorders. Damage to the left prefrontal cortex can lead to depression, but damage to the right hemisphere does not. The brain waves of depressed people show low activity in these same regions in the left hemisphere. Interestingly, this pattern persists in patients who have been depressed but are currently in remission; it therefore may be a kind of biological marker of predisposition to depression.

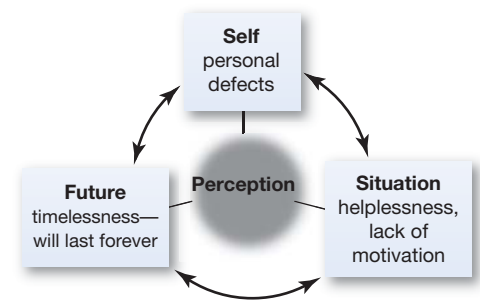
*Biological rhythms* also have been implicated in depression. Depressed patients enter REM sleep more quickly and have more of it. In fact, one symptom of depression is excessive sleeping and tiredness. In addition, many people show a cyclical pattern of depression depending on the season. This disorder, known as *seasonal affective disorder (SAD)*, results in periods of depression corresponding to the shorter days of winter in northern latitudes, such as in Canada.

Although biological factors may play a role in depression, situational factors are also important. A number of studies have implicated life stressors in many cases of depression (Hammen, 2005). Particularly relevant for depression is interpersonal loss, such as the death of a loved one or a divorce (Paykel, 2003). In one classic study,

depression was especially likely in the face of multiple negative events (Brown & Harris, 1978). Another study found that depressed patients had more negative life events during the year before the onset of their depression (Dohrenwend, Shrout, Link, Skodol, & Martin, 1986). How an individual reacts to stress, however, can be influenced by interpersonal relationships, which play an extremely important role in depression (Joiner, Coyne, & Blalock, 1999). Regardless of any other factors, relationships contribute to the development of depression, alter people's experiences when depressed, and ultimately may be damaged by the constant needs of the depressed person. Many people report negative reactions to depressed people, perhaps because of their frequent complaining. Over time, people may avoid interactions with those who are depressed, thus initiating a downward spiral by making the depressed people even more depressed (Dykman, Horowitz, Abramson, & Usher, 1991). By contrast, a person who has a close friend or group of friends is less likely to become depressed when faced with stress. This protective factor is not related to the number of friends but to the quality of the friendships: One good friend is more protective than a large number of casual acquaintances.

Cognitive processes also play a role in depression. The American psychiatrist Aaron Beck has proposed that depressed people think negatively about themselves, their situation, and the future, subjects he groups as the *cognitive triad* (Beck, 1967, 1976; Beck, Brown, Seer, Eidelson, & Riskind, 1987; Beck, Rush, Shaw, & Emery, 1979; **FIGURE 14.23**). Depressed people blame misfortunes on personal defects while seeing positive occurrences as the result of luck. Nondepressed people do the opposite. Beck also notes that depressed people make *errors in logic*, such as overgeneralizing based on single events, magnifying the seriousness of bad events, and taking responsibility for bad events that actually have little to do with them.

A second cognitive model of depression is the **learned helplessness model** (Seligman, 1974, 1975), in which people see themselves as unable to have any effect on events in their lives. Martin Seligman's model is based on years of research demonstrating that animals placed in aversive situations they could not escape eventually became passive and unresponsive, lacking the motivation to try new methods of escape when given the opportunity. People suffering from learned helplessness come to expect that bad things will happen to them and believe they are powerless to avoid negative events. The attributions, or explanations, they make for negative events refer to personal factors that are stable and global, rather than to situational factors that are temporary and specific. This attributional pattern leads people to feel hopeless about making positive changes in their lives (Abramson, Metalsky, & Alloy, 1989). The accumulation of evidence suggests that dysfunctional cognitive patterns are a cause rather than a consequence of depression.



**FIGURE 14.23 Cognitive Triad** According to Beck, depressed people perceive themselves, situations, and the future negatively.

## Real World PSYCHOLOGY

**learned helplessness model** A cognitive model of depression in which people feel unable to control events around them.

### SUMMING UP

#### Are Mood Disorders Extreme Manifestations of Normal Moods?

Although everyone experiences both extreme moods and fluctuations in mood, mood disorders are qualitatively different from normal variations in emotion. Mood disorders disrupt a person's ability to function for significant lengths of time, and they are accompanied by a number of psychological and physiological elements. Depressive and bipolar disorders are included in the same *DSM* category and share some behavioural characteristics, but they are distinctly different disorders. Depressive disorders seem to result from various psychological, cognitive, and biological factors, whereas bipolar disorders seem to arise from predominantly biological factors.



## MEASURING UP

1. Indicate whether each of the symptoms and causes listed below is associated with major depression, bipolar disorder, or both.
  - a. appetite changes
  - b. disorder caused partly by dysfunctional cognitive patterns
  - c. disorder caused partly by life stressors
  - d. excessive involvement in pleasurable activities
  - e. extreme distractibility
  - f. heightened creativity and heightened productivity
  - g. hereditary component
  - h. loss of interest in pleasurable activities
  - i. racing thoughts
  - j. risk factor for suicide
  - k. sleep disturbances
  - l. typified by extreme emotion
2. Which of the following statements represent dysfunctional cognitive patterns believed to cause depression? If a statement is an example of dysfunctional cognition, briefly describe why.
  - a. "I didn't make the soccer team. I fail at everything."
  - b. "I didn't get a raise because I was late to work a number of times over the past quarter."
  - c. "There's nothing I can do about the fact that my boss is so mean to me."
  - d. "This assignment is really hard. I need to go to my instructor's office hours."

### LEARNING OBJECTIVES

Distinguish between positive and negative symptoms of schizophrenia.

Identify biological and environmental factors believed to lead to schizophrenia.

**schizophrenia** A mental disorder characterized by alterations in perceptions, emotions, thoughts, or consciousness.

**positive symptoms** Symptoms of schizophrenia, such as delusions and hallucinations, that are excesses in behaviour.

## What Is Schizophrenia?

**Schizophrenia**, which literally means “splitting of the mind,” refers to a split between thought and emotion (FIGURE 14.24). In popular culture, schizophrenia is often confused with dissociative identity disorder, or split personality, but the two disorders have little in common. Schizophrenia is a *psychotic disorder*, meaning it is characterized by alterations in thoughts, in perceptions, or in consciousness. Current estimates are that between 0.5 percent and 1.0 percent of the population has schizophrenia (Health Canada, 2002; Tandon, Keshavan, & Nasrallah, 2008). A recent meta-analysis of 188 studies from 46 countries found similar rates for men and women, roughly 4 to 7 per 1,000 people (Saha, Chant, Welham, & McGrath, 2006). These researchers also found that the rate of schizophrenia was slightly lower in developing nations. Interestingly, the prognosis is better in developing than in developed cultures (Kulhara & Chakrabarti, 2001), perhaps because there is more tolerance for symptoms or greater sympathy for unusual or different people in developing countries. Not all cases of schizophrenia are identical; the disorder has distinct subtypes. Clinicians and researchers rely on lists of symptoms to diagnose these various subtypes of schizophrenia (TABLE 14.4).

## Schizophrenia Has Positive and Negative Symptoms

For the victim and for the family, schizophrenia is arguably the most devastating mental disorder. It is characterized by a combination of abnormalities—motor, cognitive, behavioural, and perceptual—that result in impaired social, personal, and/or vocational functioning. Some researchers have grouped these characteristics into two categories: **Positive symptoms** are excesses (they are not positive



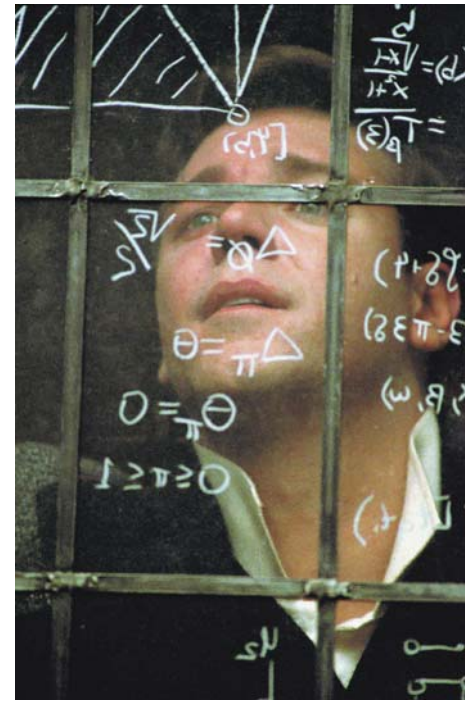
**Table 14.4 DSM-IV-TR Subtypes of Schizophrenia**

SUBTYPE	CHARACTERISTICS
Paranoid type	Preoccupation with delusions or auditory hallucinations. Little or no disorganized speech, disorganized or catatonic behaviour, or inappropriate or flat affect.
Disorganized type	All the following—disorganized speech, disorganized behaviour, and inappropriate or flat affect—are prominent in behaviour, but catatonic-type criteria are not met. Delusions or hallucinations may be present, but only in fragmentary or noncoherent form.
Catatonic type	At least two of the following: extreme motor immobility, purposeless excessive motor activity, extreme negativism (motionless resistance to all instructions) or mutism (refusing to speak), peculiar or bizarre voluntary movement, echolalia.
Undifferentiated type	Does not fit any of the subtypes above, but meets the symptom criteria for schizophrenia.
Residual type	Has experienced at least one episode of schizophrenia, but currently does not have prominent positive symptoms (delusions, hallucinations, disorganized speech or behaviour). However, continues to show negative symptoms and a milder variation of positive symptoms (odd beliefs, eccentric behaviour).

SOURCE: American Psychiatric Association, 2000.

in the sense of being good or desirable), whereas **negative symptoms** are deficits in functioning.

**POSITIVE SYMPTOMS OF SCHIZOPHRENIA** Delusions and hallucinations are the positive (i.e., excessive) symptoms most commonly associated with schizophrenia. **Delusions** are false beliefs based on incorrect inferences about reality (common types of delusions are listed in **TABLE 14.5**). Delusional people persist in their beliefs despite evidence that contradicts those beliefs. Recall Tony Rosato’s delusional belief, discussed in the opening of this chapter, that his wife and child had been replaced by imposters. The persistence of this belief in spite of clear evidence to the contrary is a good example of how people with psychological



**FIGURE 14.24 Schizophrenia** In the 2001 film *A Beautiful Mind*, Russell Crowe plays real-life Princeton mathematics professor and Nobel laureate John Forbes Nash. Nash has suffered from schizophrenia.

**negative symptoms** Symptoms of schizophrenia marked by deficits in functioning such as apathy, lack of emotion, and slowed speech and movement.

**delusions** False personal beliefs based on incorrect inferences about reality.

**Table 14.5 Delusions and Associated Beliefs**

<b>Persecution</b>	Belief that others are persecuting, spying on, or trying to harm them.
<b>Reference</b>	Belief that objects, events, or other people have particular significance to them.
<b>Grandeur</b>	Belief that they have great power, knowledge, or talent.
<b>Identity</b>	Belief that they are someone else, such as Jesus Christ or the president of the United States.
<b>Guilt</b>	Belief that they have committed a terrible sin.
<b>Control</b>	Belief that their thoughts and behaviours are being controlled by external forces.

disorders can deny reality because their cognitive processes misinform them about what is real and what is not.

Although delusions are characteristic of schizophrenia regardless of the culture, the type of delusion can be influenced by cultural factors (Tateyama et al., 1993). When the delusions of German and Japanese patients with schizophrenia were compared, the two groups had similar rates of *delusions of grandeur*, believing themselves much more powerful and important than they really were. However, the two groups differed significantly for other types of delusions. The German patients had delusions involving guilt and sin, particularly as these concepts related to religion. They also suffered from *delusions of persecution*, whereas the Japanese patients had *delusions of harassment*, such as the belief that they were being slandered by others. The types of delusions that people with schizophrenia have can also be affected by current events:

In summer, 1994, mass media in the U.S. reported that North Korea was developing nuclear weapons. At that time, in New York, a middle-age woman with schizophrenia told me that she feared a Korean invasion. In fall, 1995, during a psychiatric interview a young woman with psychotic disorder told me that she had secret connections with the United Nations, the Pope, and O. J. Simpson, and they were helping her. The celebration of the 50th Anniversary of the United Nations, the visit of the Pope to the U.S., and the O. J. Simpson criminal trial were the highly publicized events in the United States at that time. (Sher, 2000, p. 507)

**hallucinations** False sensory perceptions that are experienced without an external source.

**Hallucinations** are frequently auditory, although they can also be visual, olfactory, or somatosensory:

I was afraid to go outside and when I looked out of the window, it seemed that everyone outside was yelling, “kill her, kill her.” . . . Things continued to get worse. I imagined that I had a foul body odor and I sometimes took up to six showers a day. I recall going to the grocery store one day, and I imagined that the people in the store were saying “Get saved, Jesus is the answer.” (O’Neal, 1984, pp. 109–110)

Auditory hallucinations are often voices that are accusatory, telling the person he or she is evil or inept, or that command the person to do dangerous things. Sometimes the person hears a cacophony of sounds with voices intermingled. Although the cause of hallucinations remains unclear, neuroimaging studies suggest hallucinations are associated with activation in cortical areas that process external sensory stimuli. For example, auditory hallucinations accompany increased activation in brain areas activated in normal subjects when they engage in inner speech (Stein & Richardson, 1999). This finding has led to speculation that auditory hallucinations might be caused by a difficulty in distinguishing normal inner speech (i.e., the type we all engage in) from external sounds. People with schizophrenia need to learn to ignore the voices in their heads, but doing so is extremely difficult and sometimes impossible.

**loosening of associations** A speech pattern among patients with schizophrenia in which their thoughts are disorganized or meaningless.

**Loosening of associations**, another characteristic associated with schizophrenia, occurs when an individual shifts between seemingly unrelated topics as he or she speaks, making it difficult or impossible for a listener to follow the speaker’s train of thought:

They’re destroying too many cattle and oil just to make soap. If we need soap when you can jump into a pool of water, and then when you go to buy your gasoline, my folks always thought they could get pop, but the best thing to get is motor oil, and money. May as well go there and trade in some pop caps and, uh, tires, and tractors to car garages, so they can pull cars away from wrecks, is what I believed in. (Andreasen, 1984, p. 115)

More-extreme cases involve *clang associations*—the stringing together of words that rhyme but have no other apparent link. Such strange speaking patterns make it very difficult for people with schizophrenia to communicate (Docherty, 2005).

Another common symptom of schizophrenia is **disorganized behaviour**, such as wearing multiple layers of clothes even on hot summer days. Those with schizophrenia may walk along muttering to themselves, alternating between anger and laughter, or they might pace, wringing their hands as if extremely worried. Those who have *catatonic schizophrenia* might mindlessly repeat words they hear, a behaviour called *echolalia*; or they might remain immobilized in one position for hours, with a rigid, masklike facial expression and eyes staring into the distance. Catatonic behaviour may be an extreme fear response—akin to how animals respond to sudden dangers—in which the person is literally “scared stiff” (Moskowitz, 2004).

**disorganized behaviour** Acting in strange or unusual ways, including strange movement of limbs, bizarre speech, and inappropriate self-care, such as failing to dress properly or bathe.

**NEGATIVE SYMPTOMS OF SCHIZOPHRENIA** A number of behavioural deficits associated with schizophrenia result in patients’ becoming isolated and withdrawn. People with schizophrenia often avoid eye contact and seem apathetic; they do not express emotion even when discussing emotional subjects; and they use slowed speech, reduced speech output, and a monotonous tone of voice. Their speech may be characterized by long pauses before answering, failure to respond to a question, or inability to complete an utterance after initiating it. There is often a similar reduction in overt behaviour: Patients’ movements may be slowed and their overall amount of movement reduced, with little initiation of behaviour and no interest in social participation. These symptoms, though less dramatic than delusions and hallucinations, can be equally serious. Negative symptoms are more common in men than women (Raesaenen, Pakaslahti, Syvaelahti, Jones, & Isohanni, 2000) and are associated with a poorer prognosis.

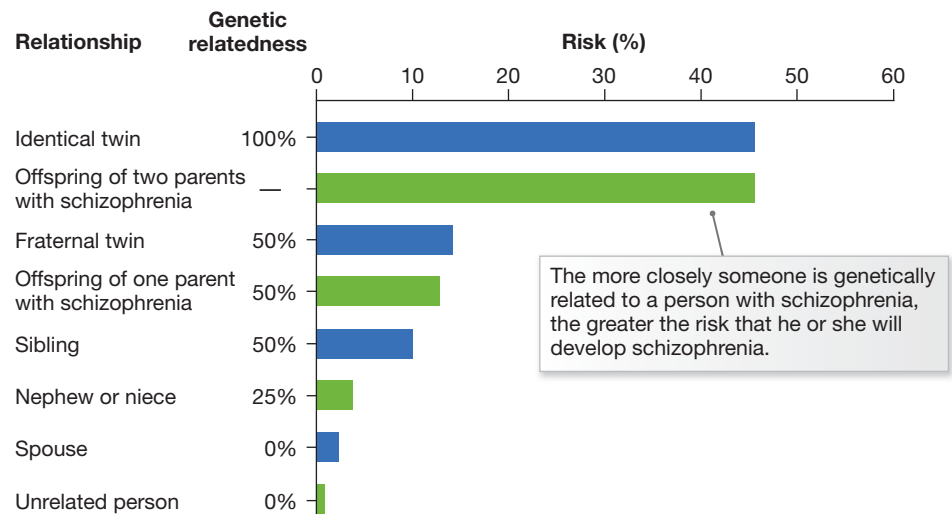
Although the positive symptoms of schizophrenia can be dramatically reduced or eliminated with antipsychotic medications, the negative symptoms often persist. The fact that negative symptoms are more resistant to medications has led researchers to speculate that positive and negative symptoms have different organic causes. Since positive symptoms respond to a class of medications (known as *antipsychotics*) that act on neurotransmitter systems, these symptoms are thought to result from neurotransmitter dysfunction. In contrast, negative symptoms may be associated with abnormal brain anatomy, since structural brain deficits are not affected by changes in neurochemistry. Some researchers believe that schizophrenia with negative symptoms is a separate disorder from schizophrenia with positive symptoms (Messias et al., 2004).

## Schizophrenia Is Primarily a Brain Disorder

Although schizophrenia runs in families, the etiology of the disorder is complex and not well understood. Early theories attributed this disorder to the patients’ mothers, who were described as simultaneously accepting and rejecting their children. According to these theories, the mothers’ contradictory behaviour caused their children to develop schizophrenia. However, genetics plays a role in the development of schizophrenia (**FIGURE 14.25**). If one twin develops schizophrenia, the likelihood of the other’s also succumbing is almost 50 percent if the twins are identical but only 14 percent if the twins are fraternal. If one parent has schizophrenia, the risk of a child’s developing the disease is 13 percent. If, however, both parents have schizophrenia, the risk jumps to almost 50 percent (Gottesman, 1991). Yet the genetic component of schizophrenia represents a predisposition rather than destiny. If schizophrenia were caused solely by genetics, concordance in identical twins would approach 100 percent.

Recent research indicates that those with schizophrenia have rare mutations of their DNA about three to four times more often than do healthy individuals, especially in genes related to brain development and to neurological function (Walsh

**FIGURE 14.25** Genetics and Schizophrenia



et al., 2008). These mutations may result in abnormal brain development, which might lead to schizophrenia. No single gene causes schizophrenia, but rather multiple genes likely contribute in subtle ways to the expression of the disorder. Indeed, each of at least two dozen candidate genes might modestly influence the development of schizophrenia (Gottesman & Hanson, 2005).

Schizophrenia is primarily a brain disorder (Walker, Kestler, Bollini, & Hochman, 2004). The advent of techniques that image both the structure and the function of the brain have documented consistent abnormalities among those with schizophrenia. As seen in structural brain imaging studies, the ventricles in people with schizophrenia are enlarged, meaning that actual brain tissue is reduced (see Figure 14.9). Moreover, greater reductions in brain tissue are associated with more negative outcomes (Mitelman, Shihabuddin, Brickman, Hazlett, & Buchsbaum, 2005), and longitudinal studies show continued reductions over time (Ho et al., 2003). This reduction of tissue occurs in many regions of the brain, especially the frontal lobes and medial temporal lobes. Moreover, in functional brain imaging studies, typical results indicate reduced activity in frontal and temporal regions (Barch, Sheline, Csernansky, & Snyder, 2003).

Given that abnormalities occur throughout many brain regions in people with schizophrenia, some researchers have speculated that schizophrenia is more likely a problem of connection between brain regions than the result of diminished or changed functions of any particular brain region (Walker et al., 2004). One possibility is that schizophrenia results from abnormality in neurotransmitters. Since the 1950s, scientists have believed that dopamine may play an important role; drugs that block dopamine activity decrease symptoms, whereas drugs that increase the activity of dopamine neurons increase symptoms. However, evidence from the past two decades has implicated a number of other neurotransmitter systems. More recently, researchers have suggested that schizophrenia might involve abnormalities in the glial cells that make up the myelin sheath (Davis et al., 2003; Moises & Gottesman, 2004). Such abnormalities would impair neurotransmission throughout the brain.

If schizophrenia is a brain disorder, when do these brain abnormalities emerge? Because schizophrenia is most often diagnosed when people are in their twenties or thirties, it is hard to assess whether brain impairments occur earlier in life. New evidence suggests that some neurological signs of schizophrenia can be observed long before the disorder is diagnosed. Elaine Walker and her colleagues have analyzed home movies taken by parents whose children later developed schizophrenia.

Compared with their siblings, those who developed the disorder displayed unusual social behaviours, more severe negative emotions, and motor disturbances, all of which often went unnoticed during their childhoods (Walker et al., 2004). One study followed a group of children at risk for developing psychopathology because their parents suffered from a mental disorder. Adults who developed schizophrenia were much more likely to have displayed behavioural problems as children, such as fighting or not getting along with others, than those who developed mood disorders or drug abuse problems or did not develop any disorders in adulthood (Amminger et al., 1999). Children at risk for schizophrenia display increasingly abnormal motor movements, such as strange facial expressions, as they progress through adolescence (Mittal, Neumann, Saczawa, & Walker, 2008).

In another study, Walker and her colleagues followed a group of high-risk children, age 11 to 13, who were videotaped eating lunch in 1972. Those who later developed schizophrenia showed greater impairments in social behaviour and motor functioning than those who developed other mental disorders or those who developed no problems (Schiffman et al., 2004). Another team of researchers conducted a large study of 291 high-risk youths (average age 16) and followed them longitudinally over 2.5 years. These psychological scientists determined that five factors predicted the onset of psychotic disorders: a family history of schizophrenia, greater social impairment, higher levels of suspicion/paranoia, a history of substance abuse, and higher levels of unusual thoughts. When youths had two or three of the first three factors, nearly 80 percent of them developed full-blown psychosis (Cannon et al., 2008). These studies suggest that schizophrenia develops over the life course but that obvious symptoms often emerge by late adolescence, and that hints of future problems may be evident even among young children.

## Environmental Factors Influence Schizophrenia

Since genetics does not account fully for the onset and severity of schizophrenia, other factors must also be at work. In those at risk for schizophrenia, environmental stress seems to contribute to its development (Walker et al., 2004). A study of adopted children whose biological mothers were diagnosed with schizophrenia found that if the adoptive families were psychologically healthy, none of the children became psychotic, but if the adoptive families were severely disturbed, 11 percent of the children became psychotic and 41 percent had severe psychological disorders (Tienari et al., 1990, 1994).

Some researchers have theorized that the increased stress of urban environments can trigger the onset of the disorder, since being born or raised in an urban area approximately doubles the risk of developing schizophrenia later in life (Torrey, 1999). Others have speculated that some kind of *schizovirus* exists and that living in the close quarters of a big city increases the likelihood of the virus spreading. In support of the virus hypothesis, some researchers have reported finding antibodies in the blood of people with schizophrenia that are not found in those without the disorder (Waltrip et al., 1997). Moreover, those diagnosed with schizophrenia are more likely to have been born during late winter and early spring (Mednick, Huttunen, & Machon, 1994; Torrey, Torrey, & Peterson, 1977). Mothers of children born in late winter and early spring were in their second trimester of pregnancy during flu season; retrospective studies suggest that the mothers of those with schizophrenia are more likely than other mothers to have contracted influenza during this critical period. During the second trimester, a great deal of fetal brain development occurs, so at that time trauma or pathogens can interfere with the organization of brain regions.

## SUMMING UP

### What Is Schizophrenia?

Schizophrenia consists of negative and positive symptoms, and it is largely a biological disorder. Twin and adoption studies have highlighted the critical role of genetics in the development of schizophrenia, and recent advances in genetic analysis have yielded more insights into the complexities of this disorder. In addition, research suggests the presence of chemical and anatomical abnormalities in the brains of those afflicted with schizophrenia. Despite all this evidence, however, the specific ways in which genetics, neurochemistry, and brain anatomy contribute to this disorder remain unclear. Also, most researchers agree that environmental factors play a role, but little is known about how environment interacts with biological factors.

## MEASURING UP

1. Indicate whether each of the following phenomena is a negative or a positive symptom of schizophrenia.
  - a. social withdrawal
  - b. flat affect
  - c. delusions
  - d. hallucinations
  - e. slowed motor movement
  - f. loosening of associations
2. Indicate whether each of the following phenomena is a biological or an environmental factor contributing to schizophrenia.
  - a. abnormalities in brain function
  - b. abnormalities in brain structure
  - c. family members' mental health
  - d. hereditary predisposition
  - e. stress

## Are Personality Disorders Truly Mental Disorders?

### LEARNING OBJECTIVE

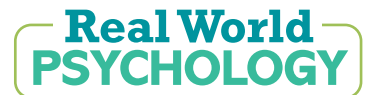
Explain why borderline personality disorder and anti-social personality disorder are classified as personality disorders.

Personality reflects each person's unique response to environment. Although people change somewhat over time (see Chapter 13, "Personality"), the ways they interact with the world and cope with events are fairly fixed by the end of adolescence. Some people interact with the world in maladaptive and inflexible ways; when this style of interaction is long-lasting and causes problems in work and in social situations, it becomes a *personality disorder*. All of us at some point likely have exhibited certain symptoms of personality disorders. We might be indecisive, self-absorbed, or emotionally unstable. Indeed, personality disorders are relatively common, affecting just under 1 in 10 people (Lenzenweger, Lane, Loranger, & Kessler, 2007); but those with true personality disorders consistently behave in maladaptive ways, show a more extreme level of maladaptive behaviour, and experience more personal distress and more problems as a result of their behaviour.

## Personality Disorders Are Maladaptive Ways of Relating to the World

Whereas the other disorders discussed in this chapter are classified on Axis I of Table 14.1, personality disorders are classified on Axis II, along with mental retardation. Personality disorders and mental retardation are grouped together because they usually last throughout the lifespan with no expectation of significant change.

The personality disorders generally are divided into three groups, as listed in **TABLE 14.6**. People with the first group of disorders display odd or eccentric behaviour. *Paranoid*, *schizoid*, and *schizotypal* personality disorders are included in this group. Such individuals are often reclusive and suspicious, and they have difficulty forming personal relationships because of their strange behaviour and aloofness. The second group—*histrionic*, *narcissistic*, *borderline*, and *anti-social* personality disorders—is characterized by dramatic, emotional, and erratic behaviours. Borderline and anti-social personality disorders have been the focus of much research, and they are considered in more detail in the following sections. The third group of personality disorders—*avoidant*, *dependent*, and *obsessive-compulsive*—involves anxious or fearful behaviours. Although this group shares some characteristics of anxiety disorders, these personality disorders refer more to a general way of interacting with others and of responding to events. For instance, a person with an obsessive-compulsive personality disorder may be excessively neat and orderly, always eating the same food at precisely the same time, perhaps reading a newspaper



**Table 14.6 Personality Disorders and Associated Characteristics**

Odd or Eccentric Behaviour	
Paranoid	Tense, guarded, suspicious; holds grudges.
Schizoid	Socially isolated, with restricted emotional expression.
Schizotypal	Peculiarities of thought, appearance, and behaviour that are disconcerting to others; emotionally detached and isolated.
Dramatic, Emotional, or Erratic Behaviour	
Histrionic	Seductive behaviour; needs immediate gratification and constant reassurance; rapidly changing moods; shallow emotions.
Narcissistic	Self-absorbed; expects special treatment and adulation; envious of attention to others.
Borderline	Cannot stand to be alone; intense, unstable moods and personal relationships; chronic anger; drug and alcohol abuse.
Anti-social	Manipulative, exploitive; dishonest; disloyal; lacking in guilt; habitually breaks social rules; childhood history of such behaviour; often in trouble with the law.
Anxious or Fearful Behaviour	
Avoidant	Easily hurt and embarrassed; few close friends; sticks to routines to avoid new and possibly stressful experiences.
Dependent	Wants others to make decisions; needs constant advice and reassurance; fears being abandoned.
Obsessive-compulsive	Perfectionistic; overconscientious; indecisive; preoccupied with details; stiff; unable to express affection.

in a particular order each time. This pattern becomes problematic only when it interferes with the person's life, as in making it impossible to travel or to maintain relationships.

Personality disorders remain controversial in modern clinical practice for several reasons. First, personality disorders appear to be extreme versions of normal personality traits, again demonstrating the continuum between what is considered normal versus abnormal. For example, indecisiveness is characteristic of obsessive-compulsive personality disorder, but the *DSM* does not define the degree to which someone must be indecisive to be diagnosed as obsessive-compulsive. Second, there is overlap among the traits listed as characteristic of different personality disorders, so the majority of people diagnosed with one personality disorder also meet the criteria for another (Clark, 2007). This overlap suggests that the categories may not be mutually exclusive and that fewer types of personality disorders may exist than are listed in the *DSM*. Also, some aspects of personality disorders are less stable over time than has been assumed.

Personality disorders may not seem to affect daily life as much as do some of the Axis I disorders (clinical diagnoses) discussed in this chapter, such as schizophrenia or bipolar disorder. However, although people with personality disorders do not hallucinate or experience radical mood swings, their ways of interacting with the world can have serious consequences. The following in-depth consideration of borderline personality disorder and anti-social personality disorder illustrates the devastating effect of these disorders on the individual, family and friends, and society.

## Borderline Personality Disorder Is Associated with Poor Self-Control

### borderline personality disorder

A personality disorder characterized by identity, affective, and impulse disturbances.

**Borderline personality disorder**, characterized by disturbances in identity, in affect, and in impulse control, was officially recognized as a diagnosis in 1980. The term *borderline* was initially used because these patients were considered on the border between normal and psychotic (Knight, 1953). The wide variety of clinical features of this disorder reflects its complexity (see **TABLE 14.7**). Approximately 1 percent to 2 percent of adults meet the criteria for borderline personality disorder (Lenzenweger et al., 2007; Swartz, Blazer, George, & Winfield, 1990; Torgerson, Kringlen, & Cramer, 2001); it is more than twice as common in women as in men.

People with borderline personality disorder seem to lack a strong sense of self. They cannot tolerate being alone and have an intense fear of abandonment. Because they desperately need an exclusive and dependent relationship with another person, they can be very manipulative in their attempts to control relationships, as shown in the following example:

A borderline patient periodically rented a motel room and, with a stockpile of pills nearby, would call her therapist's home with an urgent message. He would respond by engaging in long conversations in which he "talked her down." Even as he told her that she could not count on his always being available, he became more wary of going out evenings without detailed instructions about how he could be reached. One night the patient couldn't reach him due to a bad phone connection. She fatally overdosed from what was probably a miscalculated manipulation. (Gunderson, 1984, p. 93)

In addition to problems with identity, borderline individuals have affective disturbances. Emotional instability is paramount, with sudden episodes—of depression, anxiety, anger, and irritability—that can last from a few hours to a few days.



**Table 14.7 Clinical Features of Borderline Personality Disorder**

A person having at least five of these characteristics might be considered to have borderline personality disorder.

1. Employment of frantic efforts to avoid real or imagined abandonment.
2. Unstable and intense interpersonal relationships.
3. Persistent and markedly disturbed, distorted, or unstable sense of self (e.g., a feeling that one doesn't exist or that one embodies evil).
4. Impulsiveness in such areas as sex, substance use, crime, and reckless driving.
5. Recurrent suicidal thoughts, gestures, or behaviour.
6. Emotional instability, with periods of extreme depression, irritability, or anxiety.
7. Chronic feelings of emptiness.
8. Inappropriate intense anger or lack of control of anger (e.g., loss of temper, recurrent physical fights).
9. Transient, stress-related paranoid thoughts or severe dissociative symptoms.

SOURCE: American Psychiatric Association, 2000.

Shifts from one mood to another usually occur with no obvious precipitating cause, as is evident in the therapist Molly Layton's description of her patient Vicki:

She had chronic and debilitating feelings of emptiness and paralyzing numbness, during which she could only crawl under the covers of her bed and hide. On these days, she was sometimes driven to mutilate her thighs with scissors. Although highly accomplished as a medical student and researcher, who had garnered many grants and fellowships, she would sometimes panic and shut down in the middle of a project, creating unbearable pressures on herself to finish the work. While she longed for intimacy and friendship, she was disablingly shy around men. (Layton, 1995, p. 36)

The third hallmark of borderline personality disorder is impulsivity, which can include sexual promiscuity, physical fighting, and binge eating and purging. As was the case with Vicki, however, self-mutilation is most commonly associated with this disorder. Cutting and burning of the skin are typical, as well as a high risk for suicide. Some evidence indicates that those with borderline personality disorder have diminished capacity in the frontal lobes, which normally help control behaviour (Silbersweig et al., 2007).

Evidence from twin studies strongly suggests that borderline personality disorder has a genetic component (Skodol et al., 2002). Rates of mood disorders in the families of borderline patients also tend to be high, and these patients often show sleep abnormalities characteristic of depression. One possible reason that borderline personality disorder and affective disorders such as depression may be linked is that both appear to involve the neurotransmitter serotonin. Evidence has linked low serotonin levels to the impulsive behaviour seen in borderline personality disorder (Skodol et al., 2002).

Borderline personality disorder may also have an environmental component, as a strong relationship exists between the disorder and trauma or abuse (Lieb, Zanarini, Schmahl, Linehan, & Bohus, 2004). Some studies have reported that 70 percent to 80 percent of patients with borderline personality disorder have experienced physical

or sexual abuse or observed some kind of extreme violence. Other theories implicate early interactions with caretakers. Borderline patients may have had caretakers who did not accept them or were unreliable or unavailable. The constant rejection and criticism made it difficult for the individuals to learn to regulate emotions and understand emotional reactions to events (Linehan, 1987). An alternative theory is that caregivers encouraged dependence and therefore borderline patients did not adequately develop a sense of self. They become extremely sensitive to others' reactions, and if they are rejected, they reject themselves.

### Anti-social Personality Disorder Is Associated with a Lack of Empathy

In the 1800s, the term *psychopath* was coined to describe people who seem willing to take advantage of and to hurt others without any evidence of concern or of remorse (Koch, 1891). In his classic 1941 book the *Mask of Sanity*, the American psychiatrist Hervey Cleckley described characteristics of psychopathic individuals from his clinical experience, such as that they could be superficially charming and rational; be insincere, unsocial, and incapable of love; lack insight; and be shameless. In 1980, the *DSM* dropped the label *psychopath*, which was seen as pejorative, and adopted **anti-social personality disorder (APD)**. This change has led to confusion because the two terms are overlapping but not identical. APD is the catch-all diagnosis for individuals who behave in socially undesirable ways, such as breaking the law, being deceitful and irresponsible, and feeling a lack of remorse for their behaviour. Those with this disorder tend to be hedonistic, seeking immediate gratification of wants and needs without any thought of others.

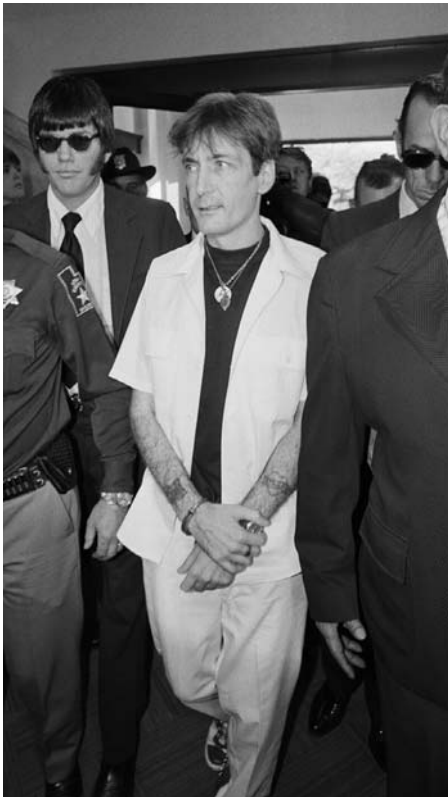
Psychopaths display the extreme version of APD. They are pathological in their degree of callousness and are particularly dangerous. For instance, one study of murderers conducted by researchers at Dalhousie University found that those with psychopathic tendencies nearly always killed intentionally—to gain something they wanted, such as money, sex, or drugs—whereas those without psychopathic tendencies were much more likely to commit murder impulsively, when provoked or angry (Woodworth & Porter, 2002). Psychopaths fit the stereotype of cold-blooded killers, such as William Pickton, Dennis Rader (the BTK strangler), and Gary Gilmore (FIGURE 14.26), who was executed for the murder he describes here:

I went in and told the guy to give me the money. I told him to lay on the floor and then I shot him. I then walked out and was carrying the cash drawer with me. I took the money and threw the cash drawer in a bush and I tried to push the gun in the bush, too. But as I was pushing it in the bush, it went off and that's how come I was shot in the arm. It seems like things have always gone bad for me. It seems like I've always done dumb things that just caused trouble for me. I remember when I was a boy I would feel like I had to do things like sit on a railroad track until just before the train came and then I would dash off. Or I would put my finger over the end of a BB gun and pull the trigger to see if a BB was really in it. Sometimes I would stick my finger in water and then put my finger in a light socket to see if it would really shock me. (Spitzer et al., 1983, pp. 66–68)

**ASSESSMENT AND CONSEQUENCES** Anti-social personality disorder is much more common in men than in women (Robins & Regier, 1991), with estimates varying from 1 percent to 4 percent of the population, and with those displaying psychopathic traits being more infrequent (Compton, Conway, Stinson, Colliver, & Grant, 2005; Lenzenwegger et al., 2007). Much of what psychologists know about traits associated with anti-social personality disorder was discovered

#### anti-social personality disorder (APD)

A personality disorder marked by a lack of empathy and remorse.



**FIGURE 14.26 Gary Gilmore after His Arrest** Under the *DSM-IV-TR*, Gilmore would have been given a diagnosis of anti-social personality disorder.

The *Juvenile Delinquents Act* of 1908 was based on the idea that children who commit crimes should not be dealt with as offenders. Instead, they should be viewed as delinquents who need help and guidance to avoid becoming offenders in the future. Canadian law dealing with young offenders has changed many times over the last century, as lawmakers have tried to balance children's rights with society's need to hold individuals responsible for their crimes and be protected from violent offenders. The *Young Offenders Act* of 1984 went too far in the latter direction, leading Canada to incarcerate more of its youth than did any other nation in the Western world, including the United States. Thus in 2003 the *Youth Criminal Justice Act* was enacted to provide greater opportunities for diverting youth from jail and into programs aimed at crime prevention. For serious crimes or for repeat offences, juveniles may still be given adult sentences by youth court judges. When giving an adult sentence to a juvenile, the judge must estimate the likelihood of the offender's committing violence or other serious crimes in the future. But how can a judge predict which juveniles will be repeat offenders and which can be rehabilitated?

Among adults, one robust predictor of criminal violence is psychopathy (Salekin, Rogers, & Sewell, 1996), and psychopaths are more likely to commit additional violent offences after release from incarceration (Harris, Rice, & Cormier, 1991; Heilbrun et al., 1998); the same seems to be true among adolescents. Psychopathy in both childhood (psychopathic tendencies) and adulthood involves both callous-unemotional traits—such as lack of empathy, lack of guilt, and shallow emotions—and overt anti-social behaviour (Blair, 2001). Children who show anti-social behaviour early on are at great risk for anti-social and criminal behaviour in adulthood (Moffitt, 2003). Callous-unemotional traits may be a risk factor that makes children vulnerable for long-term persistent serious anti-social behaviour (Frick, 1998) that is often predatory in nature (Hart & Hare, 1997).

One problem for diagnosis is that normal adolescent behaviour shares some characteristics with psychopathy—such as impulsivity and sensation seeking, as well as deficits in judgment, in long-range planning, in perspective taking, and in empathy—but the traits that indicate adolescent psychopathy are more serious variants or more extreme ones. A normal adolescent may score high on one or two traits, but those who fall into the psychopathy range score high on several traits at once. The leading measure of adult psychopathy is the *Psychopathy Checklist-Revised (PCL-R)*, developed by Robert Hare (2003),

and a version of this test for youths, the *PCL-YV*, has also been developed. While normally developing youths typically score less than 5 on the *PCL-YV*, the average score of a young offender is at least 20 (Forth, Kosson, & Hare, 2003). In fact, the *PCL-YV* has been shown to be good at predicting general and violent recidivism in the short term, and a 10-year retrospective study showed that high scores were associated with an increased likelihood of violent offenses and a shorter time between testing and the first violent offense (Gretton, Hare, & Catchpole, 2004).

Do all children with psychopathic traits turn into adult psychopaths? How stable are these traits over time? A study that examined the link between childhood psychopathy and adult psychopathy found that boys who were high in psychopathy at age 13 tended to remain high at age 24, and no moderating factors the researchers investigated appeared to reduce future psychopathy among those at high risk. However, boys who were low in psychopathy at age 13 were influenced by environmental factors: Those who had grown up in wealthier families, had fewer anti-social peers, and had less physical punishment remained low in psychopathy, while those who had grown up poorer, had anti-social friends, and had more physical punishment became more psychopathic over time (Lynam, Loeber, & Stouthamer-Loeber, 2008). A three-year study of moderately aggressive 9-year-olds also found a relatively stable pattern, except that the children with better social functioning had decreased psychopathic characteristics over time. Apparently, some children have stable psychopathic traits that carry on into adulthood, but others do not, and further research may improve psychologists' ability to distinguish the two types of children.

If we can identify psychopathic adolescents, can they be prevented from committing crimes? One study has shown modest success over a two-year period in an intensive treatment program of repeat offenders, which resulted in relatively slower and lower rates of repeated crimes, although the level was still high (Caldwell, Skeem, Salekin, & Van Rybroek, 2006).

Is it ethical to screen children with conduct disorders for psychopathy, given that they may be receptive to treatment and that certain environmental factors can improve or worsen the disorder? Should children with psychopathic tendencies be watched more closely? If so, by whom? Should their parents receive special counselling and training? Finally, should scores on the *PCL-YV* be used to determine the sentences for adolescents who commit violent crimes, such that those with high scores would be tried through the adult rather than the juvenile criminal justice system?

by University of British Columbia psychologist Robert Hare (1993), who also developed many of the assessment tools to identify those with psychopathic tendencies. Hare and his colleagues have shown that the disorder is most apparent in late adolescence and early adulthood, and it generally improves around age 40 (Hare, McPherson, & Forth, 1988), at least for those without psychopathic traits. According to the diagnostic criteria, APD cannot be diagnosed before age 18, but the person must have displayed anti-social conduct before age 15. This stipulation ensures that only those with a lifetime history of anti-social behaviours can be diagnosed with anti-social personality disorder. They also must meet criteria such as repeatedly performing illegal acts, repeatedly lying or using aliases, and showing reckless disregard for their own safety or others' safety. Because many such individuals are quite bright and highly verbal, they can talk their way out of bad situations. In any event, punishment seems to have very little effect on them (Lykken, 1957, 1995), and they often repeat the problem behaviours a short time later.

Perhaps as much as 50 percent of the prison population meets criteria for anti-social personality disorder (Hare, 1993; Widiger & Corbitt, 1995). Because of the prevalence of the disorder in the prison population, much of the research on anti-social personality disorder has been conducted in this setting. One researcher, however, came up with an ingenious way of finding research participants outside of prison. She put the following advertisement in a counterculture newspaper: "Wanted: charming, aggressive, carefree people who are impulsively irresponsible but are good at handling people and at looking after number one. Send name, address, phone, and short biography proving how interesting you are to . . ." (Widom, 1978, p. 72). Seventy-three people responded, about one-third of whom met the criteria for anti-social personality disorder. These individuals were then interviewed and given a battery of psychological tests. Their characteristics proved very similar to those of prisoners diagnosed with anti-social personality disorder, except that the group that responded to the ad had avoided imprisonment. Indeed, these findings fit Cleckley's view of those with psychopathic traits as often being charming and intelligent. Lacking remorse, willing to lie or cheat, and lacking empathy, some psychopaths manage to be successful professionals and to elude detection for crimes they may commit. Their psychopathic traits may even provide advantages in some occupations, such as business and politics.

**THE CAUSES OF ANTI-SOCIAL PERSONALITY DISORDER** In 1957, David Lykken reported that psychopaths do not become anxious when subjected to aversive stimuli. He and other investigators have continued this line of work, showing that such individuals do not seem to feel fear or anxiety (Lykken, 1995). Electroencephalograph (EEG) examinations have demonstrated that criminals who meet the criteria for anti-social personality disorder have slower alpha-wave activity (Raine, 1989). This finding indicates a lower overall level of arousal and may explain why these people engage in sensation-seeking behaviour, as well as why they do not learn from punishment—because of their low arousal, they do not experience punishment as particularly aversive. This pattern of reduced psychophysiological response in the face of punishment also occurs in adolescents at risk for developing psychopathy (Fung et al., 2005). In addition, there is evidence of amygdala abnormalities in those with anti-social tendencies, such as having a smaller amygdala and being less responsive to negative stimuli (Blair, 2003). Deficits in frontal-lobe functioning have also been found and may account for the lack of forethought and the inability to consider the implications of actions characteristic of anti-social personality disorder (Seguin, 2004).

Evidence indicates that genetic and environmental factors are important for anti-social personality disorder, although genetics may be more important for psychopathy. Identical twins have a higher concordance of criminal behaviour than do fraternal twins (Lykken, 1995), although the research just cited did not rule out the role of shared environment. A large study of 14,000 adoptions in Denmark (Mednick, Gabrielli, & Hutchings, 1987) found that adopted male children had a higher rate of crime if their biological fathers had criminal records. In addition, the greater the criminal record of the biological father, the more likely that the adopted son engaged in criminal behaviour. Although genes may be at the root of anti-social behaviours and psychopathy, factors such as low socio-economic status, dysfunctional families, and childhood abuse may also be important. Indeed, malnutrition at age 3 has been found to predict anti-social behaviour at age 17 (Liu, Raine, Venables, & Mednick, 2004). An enrichment program for children in Mauritius that included a structured nutrition component was associated with less criminal and anti-social behaviour 20 years later (Raine, Mellingen, Liu, Venables, & Mednick, 2003). This finding raises the possibility that malnutrition or other, similar environmental factors might contribute to the development of anti-social personality disorder.

### SUMMING UP

#### Are Personality Disorders Truly Mental Disorders?

Personality disorders are diagnosed along a different axis from that of the other mental disorders discussed thus far. Personality disorders are not considered clinical disorders, yet they can have devastating effects on the individual, the family, and society. Borderline personality disorder is characterized by disturbances in identity, in affect, and in impulse control. Those with the disorder often have a history of abuse or rejection by caregivers. Those with anti-social personality disorder are hedonistic and sensation seeking, and lack empathy for others. Although the outward symptoms of these disorders are not as severe as those of some clinical disorders, they are highly resistant to change and can cause significant personal and societal problems.

### MEASURING UP

The *DSM-IV-TR* groups together seemingly different disorders—such as borderline personality disorder, anti-social personality disorder, and mental retardation. What features of these disorders justify this grouping? Check all that apply.

- They last throughout the lifespan.
- They likely will change with appropriate intervention.
- There is no expectation of significant change.
- These are all clinical disorders.

## Should Childhood Disorders Be Considered a Unique Category?

In his classic text on the classification of mental disorders, published in 1883, Emil Kraepelin did not mention childhood disorders. The first edition of the *DSM*, published 70 years later, essentially considered children small versions of adults, and

### LEARNING OBJECTIVES

Identify three categories of deficits exhibited by children with autism.

Describe differences in brain structure and brain function among people with and without attention deficit hyperactivity disorder.

**Table 14.8 Childhood Disorders**

DISORDER	DESCRIPTION
Attention deficit hyperactivity	A pattern of hyperactive, inattentive, and impulsive behaviour that causes social or academic impairment.
Autism	Characterized by unresponsiveness; impaired language, social, and cognitive development; and restricted and repetitive behaviour.
Elimination disorders	The repeated passing of feces or urination in inappropriate places by children from whom continence should be expected.
Learning disorders	Marked by substantially low performance in reading, mathematics, or written expression with regard to what is expected for age, amount of education, and intelligence.
Mental retardation	Characterized by below-average intellectual functioning (IQ lower than 70) and limited adaptive functioning that begins before age 18.
Rumination disorder	The repeated regurgitation and rechewing of partially digested food, not related to nausea or gastrointestinal disorder.
Selective mutism	Failure to speak in certain social situations, despite the ability to speak in other situations; interferes with social or academic achievement.
Tourette's disorder	Recurrent motor and vocal tics that cause marked distress or impairment and are not related to a general medical condition.

consequently it did not consider childhood disorders separately from adulthood disorders. Currently, in response to the belief that cognitive, emotional, and social abilities should be considered in the context of the individual's developmental state, the *DSM* has a category in Axis I called "disorders usually first diagnosed in infancy, childhood, or adolescence." This category includes a wide range of disorders, from those affecting only circumscribed areas of a child's world, such as reading disorders and stuttering, to those affecting every aspect of a child's life, such as autism, attention deficit hyperactivity disorder, and others listed in **TABLE 14.8**. Despite the variety of disorders in this category, they should all be considered within the context of knowledge about normal childhood development. Some symptoms of childhood mental disorders are extreme manifestations of normal behaviour or are actually normal behaviours for children at an earlier developmental stage. Bedwetting, for example, is normal for two-year-olds but not for 10-year-olds. Other behaviours, however, deviate significantly from normal development. Two disorders of childhood, autism and attention deficit hyperactivity disorder, are explored here as illustrations.

### Autism Is a Lack of Awareness of Others

**autism** A developmental disorder involving deficits in social interaction, impaired communication, and restricted interests.

**Autism** is characterized by deficits in social interaction, by impaired communication, and by restricted interests (Volkmar, Chawarska, & Klin, 2005). Autism was first described in 1943 by the Austrian psychiatrist Leo Kanner, who was struck

by the profound isolation of some children and coined the term *early infantile autism*. Approximately 3 to 6 children out of 1,000 show signs of autism, and males with autism outnumber females with autism 3 to 1 (Muhle, Trentacoste, & Rapin, 2004). From 1991 to 1997, there was a dramatic increase of 556 percent in the number of children diagnosed with autism (Stokstad, 2001), likely due to a greater awareness of symptoms by parents and physicians and a willingness to apply the diagnosis to a wider spectrum of behaviours (Rutter, 2005). In other words, the notion that autism is epidemic overstates reality. In fact, the American psychological scientist Morton Ann Gernsbacher and her colleagues have identified several serious problems with studies that claim huge increases in cases of autism (Gernsbacher, Dawson, & Goldsmith, 2005). A study of all children born between 1983 and 1999 in Western Australia found that the apparent increase in the diagnosis of autism was due to changes in how autism was diagnosed as well as an increase in funding for psychological services for children showing signs of autism (Nassar et al., 2009). Recognizing how changing criteria may alter diagnosis rates underscores the value of critical thinking in understanding important health issues.

Autism varies in severity, from mild social impairments to severe social and intellectual impairments. *Asperger's syndrome* is high-functioning autism, in which children of normal intelligence have deficits in social interaction, reflecting an underdeveloped theory of mind. As discussed in Chapter 11, theory of mind is both the understanding that other people have mental states and the ability to predict their behaviour accordingly. Perhaps the most famous person with Asperger's is Temple Grandin, an accomplished scientist who now designs humane slaughterhouse facilities (Grandin, 1995). Although extremely intelligent, she has great difficulty understanding the subtle social motives and the behaviours of other humans, and she finds it easier to relate to animals. Grandin understands the environment from an animal's point of view, which allows her to design facilities that are calming.

**CORE SYMPTOMS OF AUTISM** Children with severe autism are seemingly unaware of others. As babies, they do not smile at their caregivers, do not respond to vocalizations, and may actively reject physical contact with others. Children with autism do not establish eye contact and do not use their gazes to gain or direct the attention of those around them. One group of researchers had participants view video footage of the first birthdays of children with autism to see if characteristics of autism could be detected before the children were diagnosed (Osterling & Dawson, 1994). By considering only the number of times a child looked at another person's face, the participants correctly classified the children as autistic or normal 77 percent of the time (FIGURE 14.27). Thus, as with schizophrenia, early signs of autism may be overlooked, probably because they are within the broad bounds of what is normal at a young age.

Deficits in communication are the second major cluster of behaviours characteristic of autism. Such deficits are evident by 14 months of age among children who subsequently are diagnosed with autism (Landa, Homan, & Garrett-Mayer, 2007). Children with autism show severe impairments in verbal and nonverbal communication. Even if they vocalize, it is often not with any intent to communicate. Children with autism who develop language usually exhibit odd speech patterns, such as echolalia and *pronoun reversal*. Echolalia, mentioned earlier as a symptom of catatonia, involves the repetition of words or phrases, sometimes including an imitation of the intonation and sometimes using a high-pitched monotone. Pronoun reversal, in which children with autism replace "I" with "you," may be



(a)



(b)

**FIGURE 14.27** Scenes from Videotapes of Children's Birthday Parties (a) This child focused more on objects than on people and was later diagnosed with autism. (b) This child developed normally.



**FIGURE 14.28 Toddler Viewer with Autism** A two-year-old with autism focuses on the unimportant details in the scene rather than on the social interaction.

related to echolalia, but normal children also reverse pronouns as they learn language. For example, a preschooler might say “pick you up” when he wants to be picked up. Even if children with autism cease being echolalic, their pronoun confusion often persists beyond the years of basic language-learning. Those who develop functional language also often interpret words literally, use language inappropriately, and lack verbal spontaneity.

A third category of deficits includes restricted activities and interests. Although children with autism appear oblivious to people around them, they are acutely aware of their surroundings. Although most children automatically pay attention to the social aspects of a situation,

those with autism may focus on seemingly inconsequential details (Klin, Jones, Schultz, & Volkmar, 2003; **FIGURE 14.28**). Any changes in daily routine or in the placement of furniture or of toys are very upsetting and can result in extreme agitation and tantrums. Also, the play of children with autism tends to be repetitive and obsessive, with a focus on objects’ sensory aspects. They may smell and taste objects, or spin and flick them for visual stimulation. Similarly, their own behaviour tends to be repetitive, with strange hand movements, body rocking, and hand flapping. Self-injury is common, and some children must be forcibly restrained to keep them from hurting themselves.

### CRITICAL THINKING SKILL

## Recognizing and Resisting Hindsight Bias

As the saying goes, hindsight is 20/20, because we can see clearly how events occurred after they happen. Indeed, after an event occurs, we frequently have an inflated idea of the extent to which we “saw it coming.” This tendency is *hindsight bias*, also called the “I knew it all along” bias (Christensen-Szalanski & Wilham, 1991; Fischhoff, 1975). Once we know something is true, we feel we knew it all along—or that someone else should have.

Hindsight bias operates in all sorts of contexts. For example, if you break up with your girlfriend or boyfriend, your close friends may tell you they saw it coming. If you learn that a neighbour’s child has been diagnosed as autistic, you might look back at the child’s infant behaviours and conclude that the problem should have been recognized much earlier.

Hindsight bias can operate on a larger scale as well. In newspaper commentaries after a disaster, such as a bridge collapse or a landslide after a heavy rain, experts and laypeople alike point out that they knew this would happen—and, by extension, that the government authorities were negligent because they did not act before the disaster to prevent it. Whenever you hear people discussing the causes of an event after it happened and how obvious the conclusion should have been, remember to recognize the limits of what was known or could have been known before the event occurred. You will judge your own behaviours more accurately and those of others more charitably if you take this perspective after events occur (**FIGURE 14.29**).

### Risky Business: Investors and Hindsight

WHEN THE DEEPWATER HORIZON rig sank into the Gulf of Mexico on April 22, something remarkable happened: Millions of Americans became retrospective experts on deepwater oil exploration. Of course, an accident like this was just around the corner. Of course it couldn't be fixed with a containment dome (those darn frozen hydrocarbons). Of course a “top kill” and a “junk shot” were doomed to fail! Golf balls? Golf balls?

And when the spill is eventually sealed off with an underground nuclear explosion, and when that (inevitably) wakes Godzilla, who proceeds to demolish what's left of New Orleans before heading up the Mississippi River to spawn, no doubt there will be one man, one working-class hero standing atop a stack of nuclear-lizard eggs, turning to the newly minted radiological expert next to him, holding forth on how he just knew something like this was bound to happen.

We don't like to be surprised. Our lives are based around the idea that the world is a fairly orderly place and that we have a pretty good idea what's coming next. So, when something goes wrong, we tell ourselves a convenient lie: We saw it coming.

The phenomenon is called hindsight bias, and since psychologists started studying it in the mid-1970s, it's been found to be pervasive in our minds and in our lives.



**FIGURE 14.29 Think Critically: Recognizing and Resisting Hindsight Bias** When we already know the outcome of an event, it is important to recognize the limits of what was known or could have been known before the event.



**AUTISM IS PRIMARILY A BIOLOGICAL DISORDER** Kanner, one of the first scientists to study autism, believed it was an innate disorder exacerbated by cold and unresponsive mothers, whom he called “ice box mothers” or “refrigerator mothers.” He described the parents of children with autism as insensitive, meticulous, introverted, and highly intellectual. This view is given little credence today, as it is now well established that autism is the result of undetermined biological factors. Genetic studies of autism have been hampered by the rarity of the disorder and by the fact that people with autism rarely marry and almost never have children. Despite the limited genetic research, there are indications that the disorder has a strong hereditary component (Muhle et al., 2004). If one child in a family is autistic, the probability of a second also being diagnosed is anywhere from 2 percent to 9 percent (Jorde et al., 1990; Szatmari et al., 1993). Although this probability is relatively low, it is significantly higher than the estimated 0.4 percent prevalence of the disorder in the population at large. If two siblings are autistic, the chance of a third sharing the same diagnosis jumps to 35 percent. A number of studies have found concordance rates in twins to be 70 percent to 90 percent for identical twins and 10 percent for fraternal twins (Bailey et al., 1995; Steffenburg et al., 1989). An international study led by researchers at the Hospital for Sick Children, in Toronto, compared 996 children with autism to 1,287 control children and found a number of rare gene abnormalities (Pinto et al., 2010).

Research into the causes of autism points to prenatal and/or neonatal events that may result in brain dysfunction. The brains of children with autism grow unusually large during the first two years of life, and then growth slows until age five (Courchesne et al., 2007; Courchesne, Redcay, & Kennedy, 2004). Susan Bryson—a leading autism researcher, at Dalhousie University—followed nine at-risk children from infancy and found that six of them showed striking decreases in measures of intelligence between 12 and 24 months of age, a finding that indicates abnormal brain development (Bryson et al., 2007). Their brains also do not develop normally during adolescence (Amaral, Schumann, & Nordahl, 2008). Researchers are investigating genetic and nongenetic factors that might explain this overgrowth/undergrowth pattern. That some mothers of children with autism have bled significantly during the second trimester of pregnancy suggests trauma during the critical period for brain development. Children with autism also have a higher rate of neonatal complications such as apnea (periods when breathing stops or is reduced), seizures, and delay in breathing. Moreover, children with autism are more likely to have minor physical anomalies, such as digestive problems and unusually shaped ears; to be the product of a first pregnancy; and to be born to an older mother (Gilberg, 1980).

Three exciting new developments may help focus future autism research. A deficit in oxytocin, a neuropeptide involved in social behaviour, may be related to some of the behavioural manifestations of autism. Mice lacking oxytocin behave normally, except that they cannot recognize other mice or their mother’s scent; a single dose of oxytocin cures them (Ferguson et al., 2000). In one study, adults with autism who received injections of oxytocin showed a dramatic improvement in their symptoms (Novotny et al., 2000). Such injections seem particularly useful for reducing repetitive behaviours (e.g., repeating the same phrase), questioning, inappropriate touching, and self-injury (Hollander et al., 2003). A second recent finding suggests that levels of four proteins in the blood are elevated in 97 percent of children with autism and in 92 percent of retarded children, but in none of the healthy controls. These elevated protein levels were found in blood samples taken at birth, and all four proteins are involved in brain development (Nelson et al., 2001). These proteins may be involved in the pattern of overgrowth and undergrowth of the brain

for those with autism. However, whether these proteins are influenced by genetic or environmental factors and what role they play in the development of autism are matters for future research.

In recent research, investigators found abnormal antibodies in the blood of the mothers of 11 percent of children with autism but not in a large sample of mothers with healthy children or mothers of children with other developmental disorders (Braunschweig et al., 2008). Following up on this study, the psychological scientist David Amaral and his colleagues injected four pregnant rhesus monkeys with the antibodies from the mothers of children with autism. All the offspring of these monkeys demonstrated unusual behaviours characteristic of autism, such as repetitive movements and hyperactive limb movements (Martin et al., 2008). None of the offspring of monkeys injected with normal antibodies from mothers of healthy children showed this unusual behaviour.

## Attention Deficit Hyperactivity Disorder Is a Disruptive Impulse Control Disorder

A hyperactive child's mother might report that he has difficulty remembering not to trail his dirty hand along the clean wall as he runs from the front door to the kitchen. His peers may find that he spontaneously changes the rules while playing Monopoly or soccer. His teacher notes that he asks what he is supposed to do immediately after detailed instructions were presented to the entire class. He may make warbling noises or other strange sounds that inadvertently disturb anyone nearby. He may seem to have more than his share of accidents—knocking over the tower his classmates are erecting, spilling his cranberry juice on the linen tablecloth, or tripping over the television cord while retrieving the family cat—and thereby disconnecting the set in the middle of the Super Bowl game. (Whalen, 1989)

Although these symptoms can seem humorous in the retelling, the reality is a different story. Children with **attention deficit hyperactivity disorder (ADHD)** are restless, inattentive, and impulsive. They need to have directions repeated and rules explained over and over. Although these children are often friendly and talkative, they can have trouble making and keeping friends because they miss subtle social cues and make unintentional social mistakes. Many of these symptoms are exaggerations of typical toddler behaviour; thus the line between normal and abnormal behaviour is hard to draw, and as many as 50 percent of mothers of four-year-old boys believe their sons are hyperactive (Varley, 1984).

**attention deficit hyperactivity disorder (ADHD)** A disorder characterized by restless, inattentive, and impulsive behaviours.

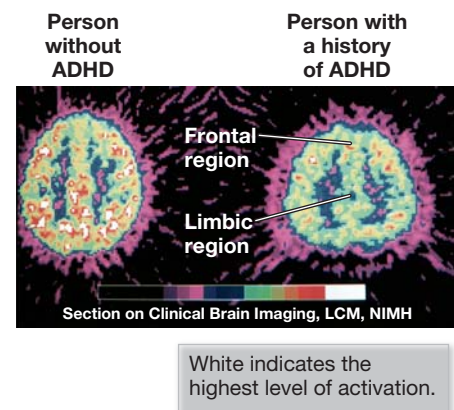
### Real World PSYCHOLOGY

**THE ETIOLOGY OF ADHD** Estimates vary widely, but the available evidence for children in Canada indicates that 9 percent to 23 percent of boys and 5 percent to 17 percent of girls show signs of ADHD (Romano, Baillargeon, & Tremblay, 2002). It is likely, however, that the true prevalence is between 5 percent and 10 percent (Scahill & Schwab-Stone, 2000). The causes of the disorder are unknown; one of the difficulties in pinpointing the etiology is that ADHD is most likely a heterogeneous disorder. In other words, the behavioural profiles of children with ADHD vary, so the causes of the disorder most likely vary as well. Children with ADHD may be more likely than other children to come from disturbed families. Factors such as poor parenting and social disadvantage may contribute to the onset of symptoms, as is true for all mental disorders.

ADHD clearly has a genetic component: Concordance is estimated at 55 percent in identical twins and 32 percent in fraternal twins (Goodman & Stevenson, 1989; Sherman, McGue, & Iacono, 1997). In an imaging study, Zametkin and his colleagues (1990) found that adults who had been diagnosed with ADHD in childhood had reduced metabolism in brain regions involved in self-regulation of motor functions and of attentional systems (FIGURE 14.30). These researchers postulated that the connection between the frontal lobes and the limbic system is impaired in ADHD patients. The symptoms of ADHD are similar to those seen in patients with frontal-lobe damage: problems with planning, sustaining concentration, using feedback, and thinking flexibly. Other imaging studies have found prefrontal abnormalities when adolescents with ADHD perform tasks that require inhibiting motor responses. Greater impairments in performance on the tasks are associated with abnormal activation of these prefrontal regions (Schulz et al., 2004). Current research continues to focus on the frontal lobes (Barkley, 1997; Neidemeyer & Naidu, 1997) but also implicates subcortical structures. In particular, researchers have demonstrated differences in the basal ganglia in the brains of some ADHD patients (Aylward, Reiss, Reader, & Singer, 1996; Castellanos, Giedd, Eckberg, & Marsh, 1998; Fillipek et al., 1997). Because this region is involved in regulating motor behaviour and impulse control, dysfunction in these structures could contribute to the hyperactivity characteristic of ADHD (FIGURE 14.31).

**ADHD ACROSS THE LIFESPAN** Children generally are not given diagnoses of ADHD until they enter structured settings in which they must conform to rules, get along with peers, and sit in seats for long periods. In the past, these things happened when children entered school, between ages five and seven. Now, with the increasing prevalence of structured daycare settings, the demands on children to conform are occurring much earlier. Although it is reasonable to expect a six-year-old to sit quietly and share crayons, it is probably unrealistic to expect the same of a three-year-old. Many preschoolers considered inattentive and overactive by their parents and teachers are simply going through a normal developmental stage that will not become the persistent pattern of ADHD. Certain characteristics distinguish children who go on to develop ADHD from those who do not. For example, infants who are later diagnosed with ADHD have difficulty establishing regular patterns for eating and sleeping (Ross & Ross, 1982). Toddlers exhibit excessive activity and temperamental behaviour quite early in life (Hartsough & Lambert, 1985). They are very curious and engage in vigorous play, and consequently they are quite accident prone. Older children generally do not demonstrate excess motor activity but are instead restless and fidgety (Pelham & Bender, 1982).

It previously was thought that children outgrow ADHD by the time they enter adulthood. Recent longitudinal studies, however, dispute this notion (McGough & Barkley, 2004). Between 30 percent and 80 percent of those with ADHD in childhood continue to show symptoms of the disorder in adulthood (Weiss & Hechtman, 1993). Adults with ADHD symptoms, about 4 percent of the population (Kessler et al., 2006), may struggle academically and vocationally. They generally reach a lower-than-expected socio-economic level and change jobs more frequently than other adults (Bellak & Black, 1992; Mannuzza et al., 1991). The impact of ADHD on society is apparently greater than previously believed. However, some ADHD patients learn to adapt and are successful in their personal and vocational lives.



**FIGURE 14.30 ADHD and the Brain** The brain image of a person with a history of ADHD shows lesser overall activation (at the red and white levels), especially in the frontal and limbic regions.



**FIGURE 14.31 Living with ADHD** Paula Luper, of North Carolina, was diagnosed with ADHD in elementary school. Here, as a senior in high school, she is taking a quiz in the teachers' lounge to avoid distraction.



## SUMMING UP

### Should Childhood Disorders Be Considered a Unique Category?

Until recently, children were considered small versions of adults, and mental disorders in children were classified according to adult categories. Currently, disorders in children are considered in the context of normal development. In some cases, mental disorders identified in childhood have lasting impacts on the individual, and the problems apparent early in life continue throughout maturation. This outcome is clearly the case for autism, in which the social and cognitive characteristics of the disorder deviate significantly from normal childhood development and continue to have a major impact throughout the lifespan. The impact of childhood ADHD on adult functioning is less certain.



## MEASURING UP

1. Children with autism exhibit deficits in which of the following categories?
  - a. awareness of other people
  - b. communication
  - c. craving for frequent changes in environment
  - d. impulsivity
  - e. restricted activities and interests
2. Compared with people without ADHD, people with ADHD show \_\_\_\_\_ activation in the \_\_\_\_\_ of the brain.
  - a. less; frontal lobes and limbic regions
  - b. less; temporal lobes and Broca's area
  - c. more; frontal lobes and limbic regions
  - d. more; temporal lobes and Broca's area

## CONCLUSION

This book emphasizes the adaptive nature of the human mind, in that the mind solves problems of survival and performs complex functions such as perceiving and remembering. But sometimes the mind fails to work properly, producing maladaptive thoughts, emotions, and behaviours. For instance, people can become too afraid to leave their houses, too depressed to get out of their beds, or so manic that they take dangerous risks. Others hear voices or believe family members are trying to poison them. Sometimes people are incapable of interacting with others.

This chapter has explored the nature and causes of psychopathology. From Freud's time, most mental disorders were viewed as arising from mistreatment by mothers; for instance, autism was (falsely) believed to be the result of cold, uncaring mothers. We now know that biology plays an important role. Indeed, the biological revolution has provided compelling evidence that many mental disorders involve genetic predispositions, abnormalities in neurotransmitter systems, or brains that do not function normally. At the same time, psychological and social factors are implicated in the development and course of most mental disorders. An obvious example is the distorted thought patterns that afflict those with major depression and other mood disorders.

Various environmental factors also contribute to psychopathology. Parental maltreatment can damage children, as is the case with those who display multiple identities, but these effects work in conjunction with biological propensities. Prenatal and early childhood factors, such as malnutrition, exposure to toxins and to viruses, and poverty, seem to increase the risk of psychopathology. In addition, the experience of loss or trauma can produce mood disorders among otherwise mentally healthy adults. To understand psychopathology thoroughly, we need to recognize the effects of social, psychological, and biological factors in those who are susceptible. Crossing levels of analysis to understand the causes of mental disorders is especially useful for determining the best ways to treat them, which are discussed in Chapter 15.

## CHAPTER SUMMARY

### How Are Psychological Disorders Conceptualized and Classified?

- **Psychological Disorders Are Classified into Categories:** The *Diagnostic and Statistical Manual of Mental Disorders* is a multi-axial system for diagnosing groups of symptoms in the contexts of related factors.
- **Psychological Disorders Must Be Assessed:** Assessment is the process of examining a person's mental functions and psychological health to make a diagnosis. Assessment is accomplished through interviews, behavioural evaluations, and psychological testing.
- **Dissociative Identity Disorder Is a Controversial Diagnosis:** Also called multiple personality disorder, dissociative identity disorder involves two or more distinct identities within one person. It is a controversial diagnosis because people may fake its symptoms.
- **Psychological Disorders Have Many Causes:** Disorders may arise from psychological factors, such as family dynamics or socio-cultural context. They may be the result of learned, maladaptive cognitions. Biological factors also underlie mental illness. The diathesis-stress model looks at mental disorders as an interaction among multiple factors. In this model, stressful circumstances may trigger a disorder in an individual with underlying vulnerabilities.

### Can Anxiety Be the Root of Seemingly Different Disorders?

- **There Are Different Types of Anxiety Disorders:** Phobias are exaggerated fears of specific stimuli. Generalized anxiety disorder is diffuse and omnipresent. Panic attacks cause sudden overwhelming terror and may lead to agoraphobia. Obsessive-compulsive disorders involve anxiety-related thoughts and behaviours.
- **Anxiety Disorders Have Cognitive, Situational, and Biological Components:** The etiology of OCD involves genetics as well as brain dysfunction. The irrational thoughts that accompany panic attacks may lead to agoraphobia through cognitive-behavioural connections.

### Are Mood Disorders Extreme Manifestations of Normal Moods?

- **There Are Different Types of Mood Disorders:** Depressive disorders may be major or bipolar and are more severe than dysthymia.
- **Mood Disorders Have Cognitive, Situational, and Biological Components:** The biological factors of depression include genetics, frontal-lobe functioning, and serotonin modulation, as well as biological rhythms. Negative thinking and poor interpersonal relations also contribute to depression.

### What Is Schizophrenia?

- **Schizophrenia Has Positive and Negative Symptoms:** Positive symptoms include excesses, such as delusions and hallucinations. Negative symptoms are deficits in functioning, such as social withdrawal and reduced bodily movement.
- **Schizophrenia Is Primarily a Brain Disorder:** The brains of people with schizophrenia have larger ventricles and less brain mass, with reduced frontal- and temporal-lobe activation. A variety of neurochemical and neural structural abnormalities exist as well.
- **Environmental Factors Influence Schizophrenia:** Urban environments may trigger the onset of schizophrenia. Trauma or pathogens encountered by pregnant women may increase the likelihood of the disorder in their children.

### Are Personality Disorders Truly Mental Disorders?

- **Personality Disorders Are Maladaptive Ways of Relating to the World:** Odd behaviours, extreme emotions, and fearful behaviours are characteristic of personality disorders. Whether some of these extremes are true psychopathologies is controversial.
- **Borderline Personality Disorder Is Associated with Poor Self-Control:** Borderline personality disorder involves disturbances in identity, in affect, and in impulse control. A strong relationship exists between the disorder and both trauma and abuse.
- **Anti-social Personality Disorder Is Associated with a Lack of Empathy:** Anti-social personality disorder is marked by a lack of both empathy and remorse and by a tendency to be manipulative. Both genetics and environment seem to be contributing factors.

### Should Childhood Disorders Be Considered a Unique Category?

- **Autism Is a Lack of Awareness of Others:** Autism, a biological disorder, emerges in infancy and is marked by avoidance of eye contact and impairment in verbal and nonverbal communication. Asperger's syndrome is a high-functioning variation of autism. The biological factors involved in autism may include abnormalities in oxytocin, in brain growth, and in blood proteins.
- **Attention Deficit Hyperactivity Disorder Is a Disruptive Impulse Control Disorder:** Children with ADHD are restless, inattentive, and impulsive. The causes of ADHD may include environmental factors such as poor parenting and social disadvantages; genetic factors; and brain abnormalities, particularly with regard to activation of the frontal lobes and subcortical basal ganglia. ADHD continues into adulthood, presenting challenges to academic work and to career pursuits.

## KEY TERMS

agoraphobia, p. 645	borderline personality disorder, p. 662	dissociative identity disorder (DID), p. 636	hallucinations, p. 656	obsessive-compulsive disorder (OCD), p. 645
anti-social personality disorder (APD), p. 664	cognitive-behavioural approach, p. 639	dysthymia, p. 649	learned helplessness model, p. 653	panic disorder, p. 645
assessment, p. 633	delusions, p. 655	etiology, p. 632	loosening of associations, p. 656	positive symptoms, p. 654
attention deficit hyperactivity disorder (ADHD), p. 672	diathesis-stress model, p. 637	family systems model, p. 638	major depression, p. 649	psychopathology, p. 630
autism, p. 668	disorganized behaviour, p. 657	generalized anxiety disorder (GAD), p. 644	multiaxial system, p. 632	schizophrenia, p. 654
bipolar disorder, p. 650			negative symptoms, p. 655	socio-cultural model, p. 639

## PRACTICE TEST

- Which of the following questions would a clinician ask to determine whether a behaviour represents psychopathology? Select all that apply.
  - Does the behaviour deviate from cultural norms?
  - Is the behaviour causing the individual personal distress?
  - Is the behaviour maladaptive?
  - Is the behaviour unusual?
  - Is the behaviour upsetting to members of the client's social network?
- Two students visit the campus health centre. Student A describes feeling constantly fearful and anxious. Student B describes feeling persistently agitated and often exhibiting violent outbursts. Student A's symptoms are consistent with an \_\_\_\_\_ disorder, which is more common in \_\_\_\_; student B's symptoms are consistent with an \_\_\_\_\_ disorder, which is more common in \_\_\_\_\_. Choose from the following pairs of words to fill in the blanks.
  - externalizing, females; internalizing, males
  - externalizing, males; internalizing, females
  - internalizing, females; externalizing, males
  - internalizing, males; externalizing, females
- Indicate whether each of the following constellations of symptoms is best described as phobic disorder, generalized anxiety disorder, panic disorder, or obsessive-compulsive disorder.
  - Harlow is hypervigilant, constantly on the lookout for problems. For example, he tried calling his parents, but the line was busy. He tried again an hour later, but the line was still busy. Harlow jumped to the conclusion that his father must have been home alone, had a heart attack, and tried to dial 911. Although Harlow recognizes that his intense worry over a busy phone line is irrational, he cannot shake the worry.
  - While hiking a looped path, Susan comes across a snake sunning itself. She considers turning around, but decides not to out of fear she will find another snake and will end up being trapped between two snakes.
- Indicate whether each of the following constellations of symptoms is best described as major depression, dysthymia, or bipolar disorder.
  - Claudia has felt a sense of sadness for the past couple years. She seems to function well enough in her daily life, but she always feels glum.
  - Lorenzo's mother died about a year ago. Since then, he has not found any satisfaction in his hobbies, spends most nights lying awake in bed, and has lost nearly 10 pounds.
- Match each of the following statements with the correct label for that symptom of schizophrenia: delusion of grandeur, delusion of persecution, flat affect, hallucination, loosening of associations, social withdrawal. Not all labels will be used.
  - "I sat on the rock dock clock clock clock."
  - "People from the Canadian Security Intelligence Service are following me; they are out to get me. You and I will need to talk in the elevator so they can't listen in on our conversation."
  - "The bugs keep crawling on my skin; I wipe them off, but they keep coming."
- Which of the following statements describe key objections to categorizing personality disorders as true mental disorders? Check all that apply.
  - If environmental factors contribute to the expression of personality disorders, it makes more sense to label the environment as disordered rather than the person.
  - Overlap in the characteristics of different disorders suggests that the categories may not be conceptually clear cut.
  - Some features of personality disorders are not as stable as researchers once thought.
  - The features of personality disorders are merely extreme versions of normal personality traits.
- Royce takes swimming lessons at the community pool. He often arrives without all the things he needs for practice, such as his towel, a change of clothes, and goggles. As the teacher instructs the class, Royce often blows bubbles at the water's surface. And although he listens to what the teacher tells him about how to modify his swim strokes, he has difficulty using the suggestions. Based on this description, which of the following disorders does Royce most likely have?
  - agoraphobia
  - attention deficit hyperactivity disorder
  - autism
  - obsessive-compulsive disorder
- Are females or males more likely to be diagnosed with each of the following disorders?
  - anti-social personality disorder
  - attention deficit hyperactivity disorder
  - autism
  - borderline personality disorder
  - depression
  - generalized anxiety disorder
  - obsessive-compulsive disorder
  - panic disorder

## PSYCHOLOGY AND SOCIETY

- Of the disorders discussed in this chapter, which one do you think would be most difficult to live with, and why? Which one would be most difficult from a family member's perspective? Why?
- After reading this chapter, (1) identify three things you learned that you find particularly interesting, and explain why; (2) identify your previous misconceptions about mental illness; and (3) describe how a more complete understanding of mental illness will inform your beliefs about and actions toward people with mental illnesses.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.







# Treatment of Psychological Disorders

DENNIS WAS A 31-YEAR-OLD INSURANCE SALESMAN. One day, while shopping in a mall with his fiancée, Dennis suddenly felt very sick. His hands began to shake, his vision became blurred, and he felt a great deal of pressure in his chest. He began to gasp and felt weak all over. All of this was accompanied by a feeling of overwhelming terror. Without stopping to tell his fiancée what was happening, he ran from the store and sought refuge in the car. He opened the windows and lay down, and he started to feel better in about 10 minutes. Later, Dennis explained to his fiancée what had happened and revealed that he had experienced this sort of attack before. Because of this, he would often avoid places like shopping malls. At the urging of his fiancée, Dennis agreed to see a psychologist. During his first several treatment sessions, Dennis downplayed his problems, clearly concerned that others might think him crazy. He was also reluctant to rely on medications because of the stigma

## How Are Psychological Disorders Treated?

- Psychotherapy Is Based on Psychological Principles
- Culture Can Affect the Therapeutic Process
- Medication Is Effective for Certain Disorders
- Alternative Biological Treatments Are Used in Extreme Cases
- Therapies Not Supported by Scientific Evidence Can Be Dangerous

## What Are the Most Effective Treatments?

- Treatments That Focus on Behaviour and on Cognition Are Superior for Anxiety Disorders

- Many Effective Treatments Are Available for Depression
- Lithium Is Most Effective for Bipolar Disorder
- Pharmacological Treatments Are Superior for Schizophrenia
- There Are Important Considerations in Selecting a Psychotherapist
- Critical Thinking Skill: Avoiding the Sunk Costs Fallacy

## Can Personality Disorders Be Treated?

- Dialectical Behaviour Therapy Is Most Successful for Borderline Personality Disorder

- Anti-social Personality Disorder Is Difficult to Treat

## How Should Childhood and Adolescent Disorders Be Treated?

- The Use of Medication to Treat Adolescent Depression Is Controversial
- Children with ADHD Can Benefit from Various Approaches
- Critical Thinking Skill: Evaluating Alternatives in Decision Making
- Children with Autism Benefit from a Structured Treatment Approach

attached. He had read about cognitive-behavioural therapy and was interested in trying this approach to address his problem.

The therapist explained that Dennis was experiencing panic attacks combined with agoraphobia. The therapist believed Dennis's problems were the result of vulnerability to stress combined with thoughts and behaviours that exacerbated anxiety. The first step in treatment was therefore relaxation training, to give Dennis a strategy to use when he became anxious and tense. The next step was to modify his maladaptive thought patterns. Dennis kept a diary for several weeks to identify situations in which his distorted thoughts might be producing anxiety, such as meeting with prospective clients. Before meeting with a client, Dennis would become extremely anxious because he felt it would be catastrophic if he was unable to make the sale. With his therapist's help, Dennis came to recognize that being turned down by a client was difficult but manageable and that it was unlikely to have a long-term impact on his career. The final phase of treatment was to address Dennis's avoidance of situations that he associated with panic attacks (FIGURE 15.1). Dennis and his therapist constructed a hierarchy of increasingly stressful situations. The first was an easy situation, involving a short visit to a department store on a not-too-crowded weekday morning. Dennis's fiancée accompanied him so that he would feel less vulnerable. After completing this task, he moved on to increasingly difficult situations, using relaxation techniques as necessary to control his anxiety. After six months, therapy was discontinued. Dennis's anxiety levels were significantly reduced, and he was able to make himself relax when he did become tense. In addition, he had not experienced a panic attack during that period and was no longer avoiding situations he previously had found stressful (Oltmans, Neale, & Davison, 1999).



**FIGURE 15.1 Panic Attacks** The stress of being in a crowd can bring on a panic attack in someone who has an anxiety disorder.

Chapter 14 discussed various psychological disorders, including ones like Dennis's. At this time, there are no instant cures for mental disorders. They need to be managed over time through treatment that helps alleviate symptoms so people can function in their daily lives. Scientific research has produced tremendous advances in ways of treating many psychological disorders. The choice of treatment depends on the type and severity of symptoms, as well as the diagnosis. As you will learn throughout this chapter, some treatments are more effective than others for certain symptoms. Dennis's case illustrates the effectiveness of cognitive-behavioural therapy, a form of psychotherapy that is extremely effective and long-lasting for many mental disorders. Other disorders, such as schizophrenia and bipolar disorder, respond best to medications and show little improvement with psychotherapy alone. This chapter explores the basic principles of therapy and describes the various treatment approaches to specific mental disorders.

## How Are Psychological Disorders Treated?

Research shows that most mental disorders can be treated in more than one way, although often a particular method is most successful for a specific disorder. Psychologists use two basic categories of techniques to treat mental disorders: psychological and biological. The generic name given to formal psychological treatment is **psychotherapy**, but the particular techniques used may depend on the practitioner's training. All forms of psychotherapy involve interactions between practitioner and client aimed at helping the client understand his or her symptoms and problems and providing solutions for them. **Biological therapies** reflect medical approaches to illness and to disease. They are based on the notion that mental disorders result from abnormalities in neural and bodily processes—imbalances in specific neurotransmitters, for example, or malfunctions in certain brain regions.

### LEARNING OBJECTIVES

Recognize different styles of psychotherapy.

Describe the uses, mechanisms, and side effects of common psychotropic medications.

**psychotherapy** The generic name given to formal psychological treatment.

**biological therapies** Treatment based on medical approaches to illness and to disease.

Treatments range from drugs to electrical stimulation of brain regions to surgical interventions. In particular, *psychopharmacology*, the use of medications that affect brain or body functions, has proved to be effective, at least on a short-term basis. However, one limitation of biological therapies is that long-term success may require the person to continue treatment, sometimes indefinitely. Moreover, sometimes nonbiological treatments are more effective. For many disorders, the recent focus has been on combining biological therapies with other approaches to optimize treatment for each patient.

As outlined in Chapter 14, a number of theories have been proposed to account for psychopathology. These approaches propose treatment strategies based on assumptions about the causes of mental disorders. However, gaining a better understanding of the etiology (i.e., the cause) of a mental disorder does not always provide further insights into how best to treat it. For example, autism clearly is caused by biological factors, but this knowledge has not led to any significant advances in therapies for the disorder. In fact, the best available treatment, as you will discover later in this chapter, is based on behavioural, not biological, principles. Likewise, in a situation where the patient's loss of a parent has led to clinical depression, drugs might be useful for treatment, even though the depression was caused by the situation, not by biological factors.

## Psychotherapy Is Based on Psychological Principles

Psychotherapy, regardless of the treatment provider's theoretical perspective, generally is aimed at changing patterns of thought or of behaviour. However, the ways in which such changes are effected can differ dramatically—it has been estimated that there are more than 400 approaches to treatment (Kazdin, 1994). The following discussion highlights the major components of the most common approaches and describes how therapists use these methods to treat specific mental disorders. Today, many practitioners use a mix of techniques based on what they believe is best for each client's particular condition. One factor known to affect the outcome of therapy is the relationship between the therapist and the client, in part because a good relationship can foster an expectation of receiving help (Miller, 2000; Talley, Strupp, & Morey, 1990). Most people in the mental health field use the curative power of client expectation to help their patients achieve success in therapy. This approach is not limited to mental disorders, however—a good relationship with a service provider is important for any aspect of physical or mental health.

**PSYCHODYNAMIC THERAPY FOCUSES ON INSIGHT** Among the first people to develop psychological treatments for mental disorders was Sigmund Freud, who believed that such disorders were caused by prior experiences, particularly early traumatic experiences. Along with the Austrian physician Josef Breuer, he pioneered the method of psychoanalysis. In early forms of psychoanalysis, the client would lie on a couch while the therapist sat out of view, to reduce the client's inhibitions and allow freer access to unconscious thought processes (FIGURE 15.2). Treatment involved uncovering unconscious feelings and drives that, Freud believed, gave rise to maladaptive thoughts and behaviours. Techniques included *free association*, in which the client would say whatever came to mind, and *dream analysis*, in which the therapist would interpret the hidden meaning of the client's dreams. The general goal of psychoanalysis is to increase clients' awareness of these unconscious processes and how they affect daily functioning. With this **insight**, or personal understanding of their own psychological processes (a different use of the term from the one in Chapter 8, where it refers to the sudden solution of a

**insight** A goal of some types of therapy; a patient's understanding of his or her own psychological processes.



**FIGURE 15.2 Psychoanalysis** As part of the treatment process, Freud sat behind his desk while his clients lay on the couch facing away from him.



problem), clients are freed from these unconscious influences, and symptoms disappear. Some of Freud's ideas have since been reformulated; these later adaptations collectively are known as *psychodynamic therapy*. Psychologists who use this approach help people understand why they are distressed by examining their needs, defences, and motives. Although most proponents of the psychodynamic perspective today have replaced the couch with a chair, they continue to embrace Freud's "talking therapy," though in a more conversational format.

During the past few decades, the use of psychodynamic therapy has become increasingly controversial. Traditional psychodynamic therapy is expensive and time consuming, sometimes continuing for many years. Some psychological scientists question whether psychodynamic treatments are effective for treating serious forms of psychopathology. Some evidence indicates that psychodynamic theory has promise

for certain disorders, such as borderline personality disorder (Gibbons, Crits-Christoph, & Hearon, 2008), but evidence for its effectiveness in treating most mental disorders is weak or absent. A new approach to psychodynamic therapy consists of offering fewer sessions and focusing more on current relationships than on early childhood experiences. Proponents argue that this short-term psychodynamic therapy can be useful for treating psychological disorders including depression, eating disorders, and substance abuse (Leichsenring, Rabung, & Leibing, 2004), although the dropout rates in these studies are extremely high (Winfried & Hofmann, 2008) and it is not clear whether the psychodynamic aspects are superior to other brief forms of therapy, such as simply talking to a caring therapist.

**HUMANISTIC THERAPIES FOCUS ON THE WHOLE PERSON** As noted in Chapter 13, the humanistic approach to personality emphasizes personal experience and belief systems and the phenomenology of individuals. The goal of humanistic therapy is to treat the person as a whole, not as a collection of behaviours or a repository of repressed thoughts. One of the best-known humanistic therapies is **client-centred therapy**, developed by the psychologist Carl Rogers, which encourages people to fulfill their individual potentials for personal growth through greater self-understanding. A key ingredient of client-centred therapy is to create a safe and comforting setting for clients to access their true feelings. Therapists strive to be empathic, to take the client's perspective, and to accept the client through unconditional positive regard. Instead of directing the client's behaviour or passing judgment on the client's actions or thoughts, the therapist helps the client focus on his or her subjective experience, often by using *reflective listening*, in which the therapist repeats the client's concerns to help the person clarify his or her feelings. One current treatment for problem drinkers, known as *motivational interviewing*, uses a client-centred approach over a very short period (such as one or two interviews). Motivational interviewing has proven a valuable treatment for drug and alcohol abuse, as well as for increasing both healthy eating habits and exercise (Burke, Arkowitz, & Menchola, 2003). The American psychologist William Miller (2000) attributes the outstanding success of this brief form of empathic therapy to the warmth expressed by the therapist toward the client. Although relatively few practitioners follow the tenets of humanistic theory strictly, many techniques advocated by Rogers are used currently to establish a good therapeutic relationship between practitioner and client.

**client-centred therapy** An empathic approach to therapy; it encourages personal growth through greater self-understanding.

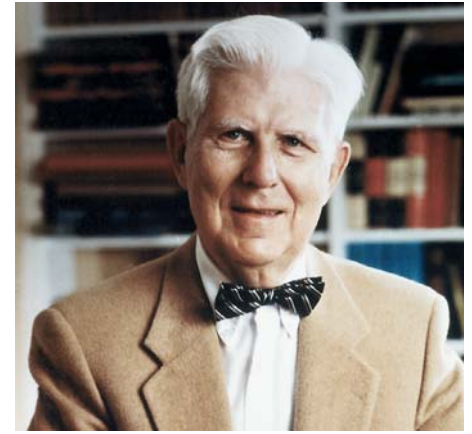
## COGNITIVE-BEHAVIOURAL THERAPY TARGETS THOUGHTS AND BEHAVIOURS

Many of the most successful therapies involve trying to change people's behaviour and cognition directly. Whereas insight-based therapies consider maladaptive behaviour the result of an underlying problem, behavioural and cognitive therapies treat the thoughts and behaviours as the problem and directly target them in therapy. For behavioural therapy, the premise is that behaviour is learned and therefore can be unlearned using the principles of classical and operant conditioning (see Chapter 6, "Learning"). Behaviour modification, based on operant conditioning, rewards desired behaviours and ignores or punishes unwanted behaviours; however, for desired behaviour to be rewarded, the client first must exhibit the behaviour. *Social-skills training* is an effective way to elicit desired behaviour. When a client has particular interpersonal difficulties, such as with initiating a conversation, he or she learns appropriate ways to act in specific social situations. The first step is often *modelling*, in which the therapist acts out an appropriate behaviour. The client is encouraged to imitate this behaviour, rehearse it in therapy, and later apply the learned behaviour to real-world situations.

**Cognitive therapy** is based on the theory that distorted thoughts can produce maladaptive behaviours and emotions. Treatment strategies that modify these thought patterns should eliminate the maladaptive behaviours and emotions. A number of approaches to cognitive therapy have been proposed. Aaron T. Beck has advocated **cognitive restructuring**, in which clinicians help their clients recognize maladaptive thought patterns and replace them with ways of viewing the world that are more in tune with reality (FIGURES 15.3 and 15.4). The American psychologist Albert Ellis, another major thinker in this area, has introduced *rational-emotive therapy*, in which therapists act as teachers who explain and demonstrate more-adaptive ways of thinking and behaving. In both types of therapies, maladaptive behaviour is assumed to result from individual belief systems and ways of thinking rather than from objective conditions. An approach that integrates insight therapy with cognitive therapy is *interpersonal therapy* (Markowitz & Weissman, 1995), which focuses on relationships the client attempts to avoid. Because interpersonal functioning is seen as critical to psychological adjustment, treatment focuses on helping clients express their emotions and explore interpersonal experiences (Blagys & Hilsenroth, 2000).

Perhaps the most widely used version of psychotherapy is **cognitive-behavioural therapy (CBT)**, which incorporates techniques from both behavioural therapy and cognitive therapy. CBT tries to correct faulty cognitions and to train the client to engage in new behaviours. For instance, a person with social phobia, who fears negative evaluation, might be taught social skills. At the same time, the therapist helps the client understand how the client's appraisals of other peoples' reactions to him or her might be inaccurate. CBT is one of the most effective forms of psychotherapy for many types of mental disorders, especially anxiety disorders and mood disorders (Deacon & Abromowitz, 2004; Hollon, Thase, & Markowitz, 2002).

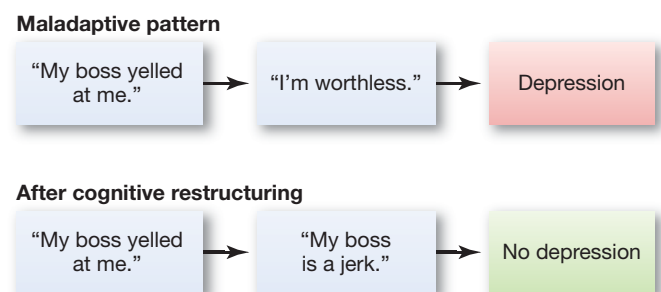
Many cognitive-behavioural therapies for phobia include **exposure**, in which the client is exposed repeatedly to the anxiety-producing stimulus or situation. The theory, based on classical conditioning, is that when individuals avoid feared stimuli or situations, they experience reductions in anxiety that reinforce avoidance behaviour. Repeated exposure to a feared stimulus increases the client's anxiety, but if the client is not permitted to avoid the stimulus, the avoidance response



**FIGURE 15.3 Aaron T. Beck** Beck is one of the pioneers of cognitive therapy for mental disorders, especially depression.

**cognitive therapy** Treatment based on the idea that distorted thoughts produce maladaptive behaviours and emotions.

**cognitive restructuring** A therapy that strives to help patients recognize maladaptive thought patterns and replace them with ways of viewing the world that are more in tune with reality.



**FIGURE 15.4 Cognitive Restructuring** Cognitive restructuring involves replacing maladaptive thought patterns with more realistic, positive ones.

**cognitive-behavioural therapy (CBT)** A therapy that incorporates techniques from behavioural therapy and cognitive therapy to correct faulty thinking and change maladaptive behaviours.

**exposure** A behavioural therapy technique that involves repeated exposure to an anxiety-producing stimulus or situation.

1 The little girl in the white shirt (on the right) has a phobia about dogs.



2 She is encouraged to approach a dog that scares her.



3 From this mild form of exposure she learns that the dog is not dangerous, and she overcomes her fear.



**FIGURE 15.5 Exposure** Exposure is a common feature of many cognitive-behavioural therapies for phobia.

**expressed emotion** A pattern of interactions that includes emotional over-involvement, critical comments, and hostility directed toward a patient by family members.

is eventually extinguished. (FIGURE 15.5 shows a girl gradually overcoming her fear of dogs by slowly increasing her level of exposure to a dog.) This treatment is reliable for many phobias and can be tried at home for mild cases, as long as the person with the phobia can control how quickly and how close he or she comes to the feared object.

**GROUP THERAPY BUILDS SOCIAL SUPPORT** Group therapy rose in popularity after World War II, when there were more people needing therapy than there were therapists available to treat them. Subsequently, therapists realized that in some instances group therapy offers advantages over individual therapy. The most obvious benefit is cost, since group therapy is often significantly less expensive than individual treatment. In addition, the group setting provides an opportunity for members to improve their social skills and learn from one another's experiences. Group therapies vary widely in the types of clients enrolled in the group, the duration of treatment, the theoretical perspective of the therapist running the group, and the group size—although some practitioners believe eight clients is the ideal number. Many groups are organized around a particular type of problem (e.g., sexual abuse) or around a particular type of client (e.g., adolescents). Often, groups continue over long periods, with some members leaving and others joining the group at various intervals. Depending on the approach favoured by the therapist, the group may be highly structured, or it may be a more loosely organized forum for discussion. Behavioural and cognitive-behavioural groups usually are highly structured, with specific goals and techniques designed to modify the thought and behaviour patterns of group members. This type of group has been effective for disorders such as bulimia and obsessive-compulsive disorder. In contrast, less structured groups usually focus on increasing insight and providing social support. In fact, the social support that group members can provide each other is one of the most beneficial aspects of this type of therapy, and it often is used to augment individual psychotherapy.

**FAMILY THERAPY FOCUSES ON THE FAMILY CONTEXT** Although the therapy a client receives is an important element in treating a mental disorder, the client's family often plays an almost equally important role. According to a *systems approach*, an individual is part of a larger context, and any change in individual behaviour will affect the whole system. This effect is often clearest at the family level. Within the family context, each person plays a particular role and interacts with the other members in specific ways (FIGURE 15.6). Over the course of therapy, the way the individual thinks, behaves, and interacts with others may change, and this change can profoundly affect the family dynamics.

Because family attitudes are often critical to long-term prognoses, some therapists insist that family members be involved in therapy. Indeed, evidence suggests that helping families provide appropriate social support leads to better therapy outcomes and reduces relapses. The key is the type of family involvement. For instance, studies have documented the importance of attitudes expressed by family members toward people with schizophrenia. Negative **expressed emotion** includes making critical comments about the client, being hostile toward the client, and being emotionally overinvolved (e.g., being overprotective or crying excessively). Families' levels of negative expressed emotion correspond to the relapse rate for patients with schizophrenia (Hooley & Gotlib, 2000), and relapse rates are highest if the client has a great deal of contact with the family. The British researcher Jill Hooley (2007) notes that expressed emotion predicts relapse in countries ranging from Australia to Denmark to China to Iran, although the patterns of expressed emotion that affect relapse differ across those countries and cultures, in part because behaviours such as

emotional overinvolvement are more acceptable in some cultures. In turn, culture affects the relationship between expressed emotion and relapse; schizophrenia relapse is more common in hostile families in India than in Japan, whereas relapse is more common in emotionally overinvolved families in Japan than in India.

**CONFESSION IS GOOD FOR THE SPIRIT** Irrespective of type of therapist or type of treatment, might simply talking to someone about personal problems make a person feel better? The ancient Greek philosopher Aristotle coined the term *catharsis* to describe the way certain messages evoke powerful emotional reactions and subsequent relief. Freud later incorporated this idea into his psychoanalytic approach to the treatment of mental disorders. He believed that uncovering unconscious material and talking about it would bring about catharsis and subsequent relief from symptoms. Although other approaches do not rely on this process explicitly, the opportunity to talk about one's problems to someone who will listen plays a role in all therapeutic relationships. Indeed, just the act of telling someone about your problems can have healing power. As discussed in Chapter 10, James Pennebaker has explored this theory extensively. He finds that when people reveal intimate and highly emotional material, they go into an almost trancelike state. The pitch of their voices goes down, their rate of speech speeds up, and they lose track of both time and place. Subsequent research has revealed that talking or writing about emotionally charged events reduces blood pressure, muscle tension, and skin conduction during the disclosure and immediately thereafter (Pennebaker, 1990, 1995). Even writing about emotional topics via email produces positive health outcomes (Sheese, Brown, & Graziano, 2004). In addition to these short-term benefits, evidence indicates that writing about emotional events improves immune function, even in people with HIV (Petrie, Fontanilla, Thomas, Booth, & Pennebaker, 2004). Other research has shown that such “confessional” therapies can lead to better performance in work and school and can improve memory and cognition. In addition, talking about troubling events may help individuals reinterpret the events in less threatening ways, and such reinterpretation is a central component of many cognitive therapies.



**FIGURE 15.6 Family Therapy** Family members' actions, reactions, and interactions can become important topics during therapy.

## Culture Can Affect the Therapeutic Process

Societal definitions of both mental health and mental disorders are central to the treatments used in psychotherapy. As discussed above, for example, people with schizophrenia relapse more often if they come from emotionally overinvolved Japanese families than if they come from emotionally overinvolved Indian families. Culture has multiple influences on the way mental disorders are expressed, which people with mental disorders are likely to recover, and people's willingness to seek help. Depression, anxiety, alcoholism, and other mental disorders can be debilitating for anyone, but when a stigma is associated with any of these disorders, the problems are exacerbated because people will often then suffer in silence, failing to get the psychotherapy that can help them. Psychotherapy is accepted to different extents in different countries. Some countries, such as China, have relatively few psychotherapists, but many of those countries are seeing a growing demand, as the last two decades or so of economic expansion have brought increasingly stressful lifestyles and an awareness of the mental health problems that come with them.

**Real World  
PSYCHOLOGY**



**FIGURE 15.7 Cultural Effects on Therapy** A psychologist counsels a young victim of the massive earthquake in the Sichuan province in China, 2008.

In 2008, the massive earthquake in China's Sichuan province demonstrated a new acceptance of psychotherapy in that region. At first, mental health workers rushed in to assist the survivors. But it is critical to understand cultural beliefs about psychotherapy to deliver it effectively, and few of the displaced and grieving Chinese showed up for mental health services offered under the banner "Earthquake Psychological Health Station." Because of traditional cultural beliefs, many Chinese distrust emotional expression and avoid seeking help for depression, anger, or grief (Magnier, 2008). Despite such cultural stigmas against getting help for mental disorders, the Chinese government then sent large numbers of psychotherapists into the region to provide culturally sensitive assistance

for coping with the earthquake's aftermath (FIGURE 15.7). (You will learn later in this chapter that simply encouraging venting following disasters can backfire and cause a worsening of emotional problems.)

The Indian government is recognizing that mental disorders, such as depression, can be as debilitating as malaria and other physical diseases and that the economic consequences of mental disorders are enormous. In one program in India, a corps of health counsellors is being trained to screen for mental disorders whenever someone enters a medical office. Because of the stigma of mental disorders, terms such as *mental illness*, *depression*, and *anxiety* are avoided; instead, terms such as *tension* and *strain* are used to communicate mental health problems (Kohn, 2008).

Culture also plays a critical role in determining the availability, use, and effectiveness of different types of psychotherapy for various cultural and ethnic groups living within any country. Psychotherapy and definitions of mental health are based on the dominant cultural paradigm. Beverly Greene (2007) describes the problem this way: "Women, people of colour, people with disabilities, members of sexual minority groups, and people who are poor have all been unfairly stigmatized and have suffered to a greater or lesser extent because of the way psychology has defined what is normal" (p. 47). She urges psychotherapists not to gloss over or deny differences in the life experiences of people from different racial, ethnic, and cultural backgrounds, such as how they are affected by discrimination. Anderson Franklin (2007) makes a similar point in terms of black men. Early in psychotherapy, most clients and therapists avoid the complex issues at the intersection of race and gender, acting as though the mental disorders of black men are no different from those of white men. But Franklin cautions that black men's experiences differ in multiple ways that have a cumulative effect on mental disorders, and these differences must be addressed early in therapy.

Another study explored the way Muslims' religious beliefs can influence the outcomes of psychotherapy. Religious minorities in any society need to find healthy ways to reaffirm their faith and deal with discrimination. Psychotherapy can be helpful in this regard if therapists have a fundamental understanding of their clients' culture and can modify their own style and type of therapy to be more culturally appropriate (Ali, Liu, & Humedian, 2004).

## Medication Is Effective for Certain Disorders

Drugs have proved effective for treating some mental disorders. Those that affect mental processes are called **psychotropic medications**. They act by changing brain neurochemistry—for example, by inhibiting action potentials or by altering synaptic transmission to increase or decrease the action of particular neurotransmitters (see Chapter 3, "Biological Foundations").

**psychotropic medications** Drugs that affect mental processes.



The success of medication in the treatment of mental disorders is largely responsible for the era of deinstitutionalization, in which scores of patients were discharged from mental hospitals and treated with drugs as outpatients. In Canada in 1950, there were more than 66,000 patients in psychiatric hospitals, a larger number than were in nonpsychiatric hospitals (Greenland, Griffin, & Hoffman, 2001). In 1964, the Royal Commission on Health Service recommended brief stays for psychiatric patients, with the goal of returning patients to the community and their families. This guideline led to the closing of many major hospitals and a dramatic reduction in hospital beds for patients. This smaller number of inpatients enabled the remaining institutions to provide better treatment for those still under their care.

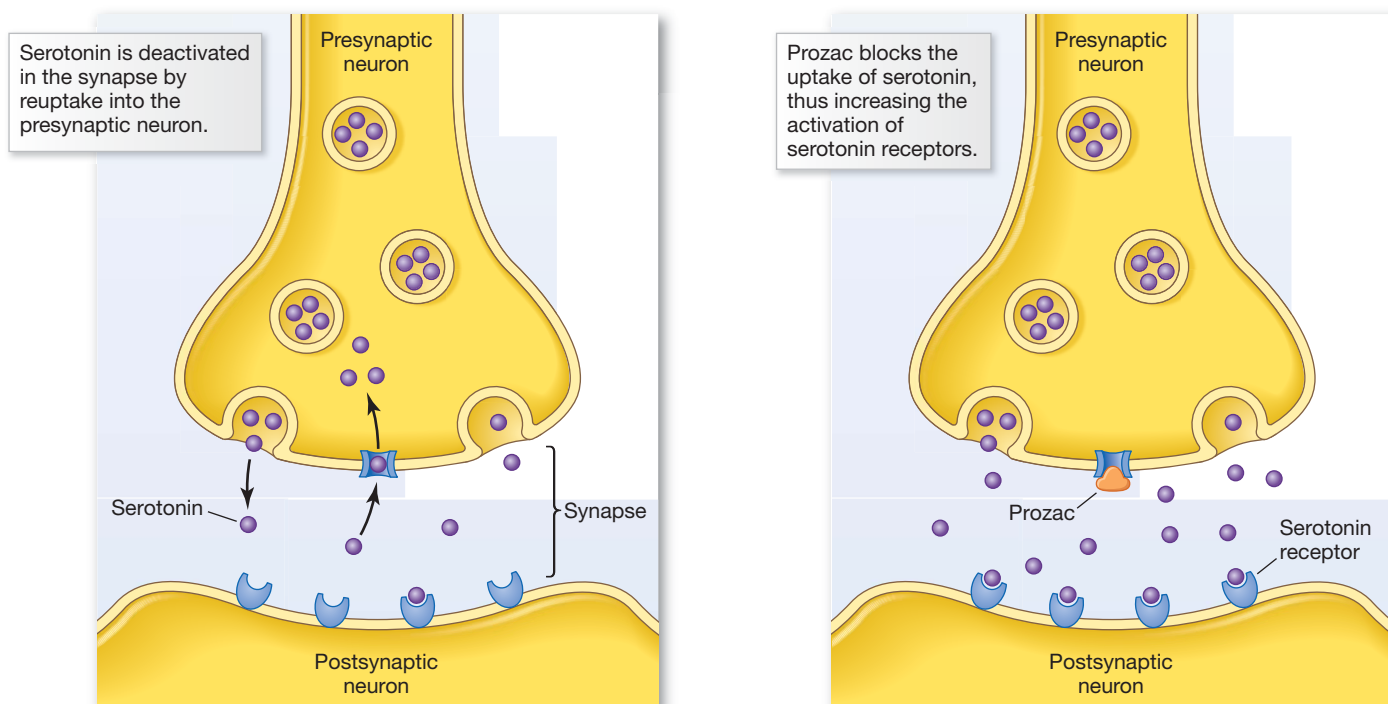
Although numerous drugs are available, most psychotropic medications fall into three categories: anti-anxiety drugs, antidepressants, and antipsychotics. **Anti-anxiety drugs**, commonly called *tranquilizers*, are used for the short-term treatment of anxiety. Benzodiazepines (such as Xanax and Ativan) increase the activity of GABA, an inhibitory neurotransmitter. Although these drugs reduce anxiety and promote relaxation, they also induce drowsiness and are highly addictive; they should therefore be used sparingly.

A second class of psychotropic medications is the **antidepressants**, which are used to treat depression. Monoamine oxidase (MAO) inhibitors were the first antidepressants to be discovered. *Monoamine oxidase* is an enzyme that converts serotonin into another chemical form. *MAO inhibitors* therefore result in more serotonin being available in the brain synapses. These drugs also raise levels of norepinephrine and dopamine. A second category of antidepressant medications is the *tricyclic antidepressants*, named after their core molecular structure of three rings. These drugs inhibit the reuptake of certain neurotransmitters, resulting in more of each neurotransmitter being available in the synapse. More recently, *selective serotonin reuptake inhibitors* (SSRIs) have been introduced; the best-known is Prozac. These drugs inhibit the reuptake of serotonin, but they also act on other neurotransmitters to a significantly lesser extent. (FIGURE 15.8 depicts the way SSRIs work.) Some critics have charged that SSRIs are too often used to treat people who are sad

**anti-anxiety drugs** A class of psychotropic medications used for the treatment of anxiety.

**antidepressants** A class of psychotropic medications used to treat depression.

**FIGURE 15.8 Selective Serotonin Reuptake Inhibitors** SSRIs, such as Prozac, work by blocking reuptake into the presynaptic neuron, thereby allowing serotonin to remain in the synapse, where its effects on postsynaptic receptors are prolonged.



**antipsychotics** A class of drugs used to treat schizophrenia and other disorders that involve psychosis.

and have low self-esteem but who are not clinically depressed. Such widespread prescribing of SSRIs is a problem because, like all drugs, SSRIs have side effects, one of which is sexual dysfunction. At the same time, SSRIs have been valuable for a variety of disorders, not just for depression. Indeed, they are often used to treat anxiety disorders.

**Antipsychotics**, also known as *neuroleptics*, are used to treat schizophrenia and other disorders that involve psychosis. These drugs reduce symptoms such as delusions and hallucinations. Traditional antipsychotics bind to dopamine receptors, thus blocking the effects of dopamine. Antipsychotics are not always effective, however, and they have significant side effects that can be irreversible—such as *tardive dyskinesia*, the involuntary twitching of muscles, especially in the neck and face. Moreover, these drugs are not useful for treating the negative symptoms of schizophrenia, such as apathy and social withdrawal (see Chapter 14, “Psychological Disorders”). Clozapine, one of the newer antipsychotics, is significantly different in that it acts not only on dopamine receptors but also on serotonin, norepinephrine, acetylcholine, and histamine. Many patients who do not respond to the other antipsychotics improve on clozapine. Newer drugs, such as Risperdal and Zyprexa, are used widely because they are safer than clozapine. However, as discussed below, they can cause serious problems with white blood cells, and they may not be as effective as clozapine.

Other drugs used to treat mental disorders do not fall into traditional categories. *Lithium* is the most effective treatment for bipolar disorder, although the neural mechanisms of how it works are unknown. Drugs that prevent seizures, called *anti-convulsants*, can also regulate moods in bipolar disorder.

## Alternative Biological Treatments Are Used in Extreme Cases

Not all people are treated successfully with psychotherapy or medication. To alleviate their disorders, these individuals may attempt alternative biological methods, including brain surgery, the use of magnetic fields, or electrical stimulation, all to alter brain function. These treatments often are used as last resorts because they are more likely to have serious side effects than either psychotherapy or medication would. Although many early efforts reflected crude attempts to control disruptive behaviour, more recent approaches reflect a growing understanding of the brain mechanisms that underlie various mental disorders.

As discussed in Chapter 1, for many centuries humans have recognized that the brain is involved with the mind, including the mind’s abnormalities. From locations as varied as France and Peru, scientists have found numerous prehistoric skulls with man-made holes in them (**FIGURE 15.9**). Many of the holes were healed over to some extent, indicating that the recipients survived for years after their procedures. Such surgery, *trepanning*, may have been used to let out evil spirits believed to be causing unusual behaviour. In parts of Africa and the Pacific, various groups still practice trepanning as a treatment for epilepsy, headaches, and, most notably, insanity.

Early in the twentieth century, medical researchers went beyond cutting holes in the skull to manipulating the brain. One of the earliest formal procedures used on patients with severe mental illness was *psychosurgery*, in which areas of the frontal cortex were selectively damaged. These prefrontal lobotomies were used to treat severe mental disorders including schizophrenia, major depression, and anxiety disorders. To understand such drastic measures, we need to appreciate that treatment for mental disorders had made almost no progress before the 1950s; patients were simply restrained and warehoused in institutions for their entire lives. In this climate of medical desper-



**FIGURE 15.9 Prehistoric Skull with Man-Made Holes** A skull at the Archaeological Museum in Cuzco, Peru, bears the marks of a cranial surgical operation performed by the Incas.

ation, various risky procedures were explored. Although some brain surgeries were performed as early as the 1880s, the Portuguese neurologist Egas Moniz generally is credited with bringing the practice to the attention of the medical world in the 1930s. His surgical procedure, later known as prefrontal lobotomy, involved severing nerve-fibre pathways in the prefrontal cortex. Patients who received lobotomies were often listless and had flat affect (on a similar state, see the discussion of Elliot in Chapter 9, “Motivation and Emotion”). Moreover, the procedure often impaired many important mental functions, such as abstract thought, planning, motivation, and social interaction. With the development of effective pharmacological treatments in the 1950s, the use of lobotomy was discontinued. Nowadays some brain surgery is used for mental disorders, but it involves small regions of the brain and typically is performed only as a last resort.

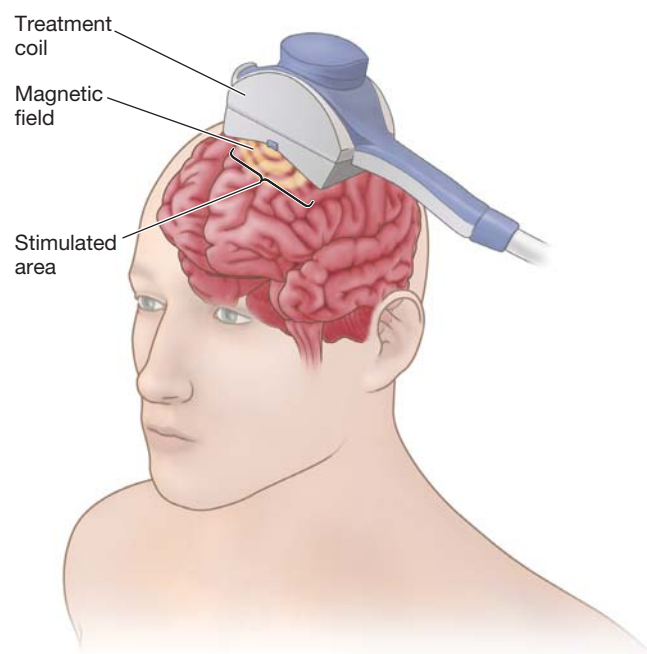
**ELECTROCONVULSIVE THERAPY** Electroconvulsive therapy (ECT) was developed in Europe in the 1930s and tried on the first human in 1938. ECT involves placing electrodes on a patient’s head and administering an electrical current strong enough to produce a seizure (FIGURE 15.10). The procedure was common in the 1950s and 1960s to treat mental disorders including schizophrenia and depression. The general public views ECT in a predominately negative manner. Ken Kesey’s 1962 novel *One Flew Over the Cuckoo’s Nest*, as well as the award-winning 1975 film version, did a great deal to expose the abuses in mental health care and graphically depicted ECT as well as the tragic effects of lobotomy. Although care for the mentally ill is still far from perfect, many reforms have been implemented. ECT now generally occurs under anaesthesia with powerful muscle relaxants to eliminate motor convulsions and confine the seizure to the brain. As you will learn, ECT is particularly effective for some cases of severe depression, although there are some risks to its use.

**TRANSCRANIAL MAGNETIC STIMULATION** During *transcranial magnetic stimulation (TMS)*, as discussed in Chapter 2, a powerful electrical current produces a magnetic field (about 40,000 times earth’s magnetic field) that, when rapidly switched on and off, induces an electrical current in the brain region directly below the coil, thereby interrupting neural function in that region (FIGURE 15.11). In *single-pulse TMS*, the disruption of brain activity occurs only during the brief period of stimulation. For instance, a pulse given over a motor region might interfere with a person’s ability to reach smoothly toward a target object, whereas a pulse given over the speech region may disrupt speaking momentarily. If multiple pulses of TMS occur over extended time (known as *repeated TMS*), the disruption can last beyond the period of direct stimulation. Recently, researchers have begun investigating the therapeutic potential of TMS in treating mental disorders; as noted later in this chapter, it may be especially useful for depression (Loo & Mitchell, 2005).

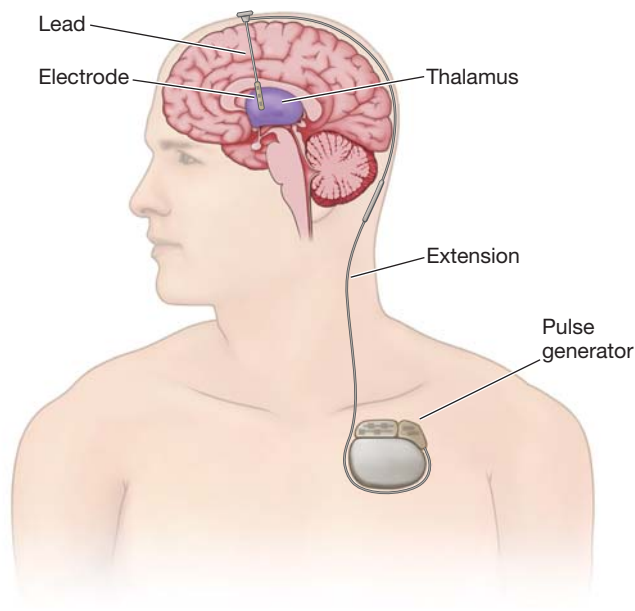
**electroconvulsive therapy (ECT)** A procedure used to treat depression; it involves administering a strong electrical current to the patient’s brain.



**FIGURE 15.10 Electroconvulsive Therapy** A woman being prepared for electroconvulsive therapy has a soft object placed between her teeth, to prevent her from swallowing her tongue.



**FIGURE 15.11 Transcranial Magnetic Stimulation** In TMS, current flows through a wire coil placed over the scalp area to be stimulated.



**FIGURE 15.12 Deep Brain Stimulation**  
 In DBS, an electrical generator placed just under the skin below the collarbone sends out continuous stimulation to the implanted electrodes.

**DEEP BRAIN STIMULATION** One of the most dramatic new techniques for treating severe mental disorders involves surgically implanting electrodes deep within the brain and then using mild electricity to stimulate the brain at an optimal frequency and intensity, much the way a pacemaker stimulates the heart (**FIGURE 15.12**). *Deep brain stimulation (DBS)* was first widely used to treat the symptoms of Parkinson’s disease, which (as discussed in Chapter 3) is a disorder of the dopamine system that causes problems with movement. Electrodes implanted into motor regions of the brains of Parkinson’s patients reverse many of the movement problems associated with the disease (DeLong & Wichmann, 2008). The success of DBS for Parkinson’s is so great that it is now the treatment of choice for many patients, in part because the drugs used to treat Parkinson’s often cause undesirable side effects, such as increased involuntary movements. By contrast, DBS has few side effects and a low complication rate, as is typical of any minor surgical procedure. Given DBS’s tremendous success in treating Parkinson’s, it is being tested for treating other disorders, including mental disorders. As you will learn, DBS might be especially valuable for treating severe OCD and depression.

### Therapies Not Supported by Scientific Evidence Can Be Dangerous

Just as people need to use critical thinking to recognize and avoid flawed science, they also need to recognize and avoid therapies with no scientific basis to confirm they are effective. As the next section will discuss, most psychologists recommend treatments that careful empirical research has proved to be effective (Kazdin, 2008). Unfortunately, many available therapies have no scientific basis—such as those (not discussed in this book) in which people re-enact their own births, scream, or have their body parts manipulated.

### Real World PSYCHOLOGY

Some treatments widely believed to be effective are actually counterproductive. These programs include encouraging people to describe their experiences following major trauma such as an earthquake, scaring adolescents into going straight by exposing them to prisoners or tough treatments, having police officers run drug education programs such as DARE, and using hypnosis to recover painful memories. These methods not only lack adequate evidence but also may produce results opposite to those intended (Hines, 2003; Lilienfeld, 2007). That is, people debriefed following natural disasters are slightly more likely to develop post-traumatic stress disorder than those who are not debriefed, teens in “scared straight” programs show an increase in conduct problems, children in DARE programs are more likely to drink alcohol and smoke cigarettes than children who do not attend such programs, and hypnosis can produce false memories (as discussed in Chapter 7).

In addition, many self-help books make questionable claims, such as *Make Anyone Fall in Love with You in 5 Minutes* or *Three Easy Steps for Having High Self-Esteem*. It is important to recognize the difference between evidence-based psychotherapies and “alternative” or “fringe” therapies because the latter can prevent people from getting effective treatment and may even be dangerous. In one tragic case, a 10-year-old girl died from suffocation after being wrapped in a blanket for 70 minutes during a supposed therapy session to simulate her own birth, an unproven

and unscientific method being used to correct the child's unruly behaviour (Lowe, 2001). The people conducting the session were unlicensed, which means they had not passed the tests that certify knowledge about psychotherapy.

## **SUMMING UP**

### **How Are Psychological Disorders Treated?**

There are many ways to treat mental disorders. Psychotherapy uses psychological methods based on the practitioner's theoretical orientation. Some therapies help people gain insight into the ways they think, behave, and interact. Other methods are more concerned with action than with insight and try to correct faulty or biased thinking or to teach new behaviours. An individual's cultural background can be an important determinant of whether he or she will seek therapy and what type of therapy will most likely be effective. Psychopharmacology is based on the idea that maladaptive behaviour results from neurological dysfunction, and psychotropic medications therefore are aimed at correcting imbalances of neurotransmitters in the brain. When traditional treatments fail, alternative biological methods such as ECT, TMS, and DBS sometimes are used. Therapies not supported by empirical research can be ineffective and sometimes dangerous.

## **MEASURING UP**

1. Identify the psychotherapeutic orientation each of the following scenarios typifies. Response options include client-centred therapy, cognitive-behavioural therapy, group therapy, and psychodynamic therapy.
  - a. Allen seeks therapy to help him cope with social anxiety and panic attacks. During a review of Allen's thought records from the previous week, Allen's therapist says, "Allen, I see you had one panic attack last week during one of your attempts to socialize. On a scale of 0 to 10 in severity, you rated the panic attack as an 8. Tell me about the thoughts you had just before and during the attack. This will help us understand what triggered your panic attack."
  - b. During a therapy session, Carlos's therapist says, "Carlos, you've described feeling angry toward your wife when she asks how you're dealing with your father's death. I sensed frustration and anger toward me when I asked you about his death just a moment ago. Usually anger covers more uncomfortable feelings, like hurt, pain, and anguish. If you put your anger aside for a moment, what emotion comes to the surface?"
  - c. Following Parin's expression of despair that his girlfriend broke up with him, his therapist responds empathically by saying, "Parin, you feel devastated knowing your love for her was not enough to keep the two of you together. I am sorry you are experiencing so much pain."
2. Identify the disorder most commonly treated with each medication. Response options are anxiety, depression, and schizophrenia.
  - a. antipsychotics
  - b. selective serotonin reuptake inhibitors
  - c. tranquilizers

### LEARNING OBJECTIVE

Identify the therapies most effective for treating specific disorders.



## What Are the Most Effective Treatments?

Research over the past three decades has shown that certain types of treatments are particularly effective for specific types of mental disorders (Barlow, 2004). Because outcomes are influenced by the interaction of client and therapist, it is difficult to make comparisons across disorders and therapists. Nonetheless, some treatments have empirical support for use with specific disorders and others do not. Moreover, the scientific study of treatment indicates that although some mental disorders are quite easily treated, others are not. For instance, highly effective treatments exist for anxiety disorders, mood disorders, and sexual dysfunction, but few treatments for alcoholism are superior to the natural course of recovery that many people undergo without psychological treatment (Seligman, Walker, & Rosenhan, 2001). People who experience depression following the death of a loved one usually feel better with the passage of time. That is, people often resolve personal problems on their own without psychological treatment. Because people tend to enter therapy when they experience crises, they often show improvements no matter what therapy they receive.

As in all other areas of psychological science, the only way to know whether a treatment is valid is to conduct empirical research that compares the treatment to a control condition, such as receiving helpful information or having supportive listeners (Kazdin, 2008). David Barlow, a leading American researcher in anxiety disorders, points out that findings from medical studies often lead to dramatic changes in treatment practice (Barlow, 2004). He provides the example of the sharp downturn in the use of hormone replacement therapy in postmenopausal women following evidence that this treatment causes cardiovascular and neurological problems. Similarly, within a year after evidence emerged that arthroscopic knee surgery did not produce better outcomes than sham surgery (in which there was no actual procedure), use of the knee surgery declined dramatically. Such developments reflect the increasing importance of *evidence-based treatments* in medicine. Barlow argues that psychological disorders should always be treated in ways that scientific research has shown to be effective; he prefers the term *psychological treatments* to distinguish evidence-based treatment from the more generic term *psychotherapy*, which refers to any form of therapy.

Although there is some debate regarding the most appropriate methods and criteria used to assess clinical research (e.g., Benjamin, 2005; Westen, Novotny, & Thompson-Brenner, 2004), according to Barlow three features characterize psychological treatments. First, they vary according to the particular mental disorder and the client's specific psychological symptoms. Just as treatment for asthma differs from that for psoriasis, treatments for panic disorder will likely differ from those for bulimia nervosa. Second, the techniques used in these treatments have been developed in the laboratory by psychological scientists, especially behavioural, cognitive, and social psychologists. Third, no overall grand theory guides treatment; rather, treatment is based on evidence of its effectiveness. The following section examines the evidence to find out the treatment of choice for some of the most common mental disorders.

### Treatments That Focus on Behaviour and on Cognition Are Superior for Anxiety Disorders

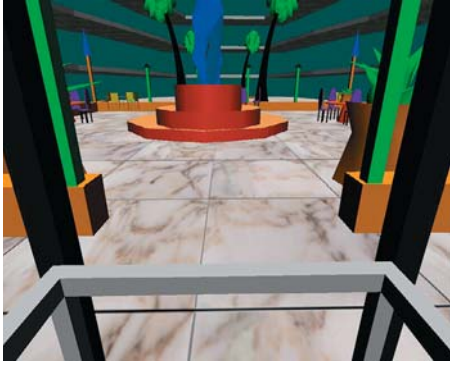
Over the years, treatment approaches to anxiety disorders have had mixed success. In the era when Freudian psychoanalytic theory governed the classification of mental disorders, anxiety disorders were thought to result from repressed sexual and

aggressive impulses; this underlying cause, rather than specific symptoms, was of interest to the therapist. Ultimately, psychoanalytic theory did not prove useful for treating anxiety disorders. The accumulated evidence suggests that cognitive-behavioural therapy works best to treat most adult anxiety disorders (Hofmann & Smits, 2008). Anxiety-reducing drugs are also beneficial in some cases, although there are risks of side effects and, after drug treatment is terminated, the risk of relapse. For instance, tranquilizers work in the short term for generalized anxiety disorder, but they do little to alleviate the source of anxiety and are addictive; therefore, they are not used much today. Antidepressant drugs that block the reuptake of both serotonin and norepinephrine, such as Effexor and Cymbalta, have been effective for treating generalized anxiety disorder (Hartford et al., 2007; Nicolini et al., 2008), but as with all drugs, the effects may be limited to the period during which the drug is taken. By contrast, the effects of cognitive-behavioural therapy persist long after treatment (Hollon, Stewart, & Strunk, 2006).

**SPECIFIC PHOBIAS** Specific phobias are characterized by the fear and avoidance of particular stimuli, such as heights, blood, and spiders. Learning theory suggests these fears are acquired either through experiencing a trauma or by observing similar fear in others. As discussed in Chapter 14, however, most phobias apparently develop in the absence of any particular precipitating event. Although learning theory cannot completely explain the development of phobias, behavioural techniques are the treatment of choice. In one of the classic methods used to treat phobias, systematic desensitization therapy, the client first makes a *fear hierarchy*, a list of situations in which fear is aroused, in ascending order. The example in **TABLE 15.1** is from a client's therapy to conquer a fear of heights in order to go mountain climbing. The next step is relaxation training, in which the client learns to alternate muscular tension with muscular relaxation and to use relaxation techniques. Exposure therapy is often the next step. While the client is relaxed, he or she is asked to imagine or enact scenarios that become progressively more upsetting. New scenarios are not presented until the client is able to maintain relaxation at the previous levels. The theory behind this technique is that the relaxation response competes with and eventually replaces the fear response. Evidence indicates that it is exposure to the feared object rather than the relaxation that extinguishes the phobic response. Thus many contemporary practitioners leave out the relaxation component. One way to expose people without putting them in danger is to use *virtual environments*, sometimes called *virtual reality*. Computers can simulate the environments and the feared objects, such as by having a person *virtually* stand on the edge of a very tall building or fly in an aircraft (**FIGURE 15.13**). Substantial evidence indicates that exposure to these virtual environments can reduce fear responses (Rothbaum et al., 1999).

**Table 15.1 Anxiety Hierarchy**

Degree of fear	Situation
5	I'm standing on the balcony of the top floor of an apartment tower.
10	I'm standing on a stepladder in the kitchen to change a lightbulb.
15	I'm walking on a ridge. The edge is hidden by shrubs and treetops.
20	I'm sitting on the slope of a mountain, looking out over the horizon.
25	I'm crossing a bridge 2 metres above a creek. The bridge consists of a 46-centimetre-wide board with a handrail on one side.
30	I'm riding a ski lift 2.5 metres above the ground.
35	I'm crossing a shallow, wide creek on a 46-centimetre-wide board, 1 metre above water level.
40	I'm climbing a ladder outside the house to reach a second-storey window.
45	I'm pulling myself up a 30-degree wet, slippery slope on a steel cable.
50	I'm scrambling up a rock, 2.5 metres high.
55	I'm walking 3 metres on a resilient, 46-centimetre-wide board, which spans a 2.5-metre-deep gulch.
60	I'm walking on a wide plateau, 60 centimetres from the edge of a cliff.
65	I'm skiing an intermediate hill. The snow is packed.
70	I'm walking over a railway trestle.
75	I'm walking on the side of an embankment. The patch slopes to the outside.
80	I'm riding a chair lift 4.5 metres above the ground.
85	I'm walking up a long, steep slope.
90	I'm walking up (or down) a 15-degree slope on a 1-metre-wide trail. On one side of the trail the terrain drops down sharply; on the other side is a steep upward slope.
95	I'm walking on a 1-metre-wide ridge. The trail slopes on one side are more than 25 degrees steep.
100	I'm walking on a 60-centimetre-wide ridge. The trail slopes on either side are more than 25 degrees.



**FIGURE 15.13 Using Virtual Environments to Conquer Fear** Computer-generated images can simulate feared environments, such as heights, flying, or social interactions. Clients can conquer these virtual environments before taking on the feared situations in real life.

Used along with the behavioural methods, some cognitive strategies have also proved useful for the treatment of phobia. If the client is not aware that the particular fear is irrational, therapy will likely begin by increasing his or her awareness of the thought processes that maintain the fear of the stimulus. Brain imaging data indicate that successful treatment with cognitive-behavioural therapy alters the way the brain processes the fear stimulus. In one study, research participants suffering from severe spider phobia received brain scans while looking at pictures of spiders (Paquette et al., 2003). Those whose treatment had been successful showed decreased activation in a frontal brain region involved in emotion regulation. These findings suggest that psychotherapy effectively “rewires” the brain and, therefore, that both psychotherapy and medication affect the underlying biology of mental disorders.

Pharmacological treatments for phobias include tranquilizers, which can help people handle immediate fear; but as soon as the drugs wear off, the fears return. Recent studies have suggested that SSRIs might be useful for social phobia. Indeed, in the most comprehensive study conducted to date, researchers found that both Prozac and cognitive-behavioural therapy were effective in treating social phobia (Davidson et al., 2004). After fourteen weeks, symptoms exhibited by participants in the study did not differ. However, those taking Prozac had more physical complaints, such as a lack of sexual interest. Evidence indicates that cognitive-behavioural therapies are the treatments of choice for phobia.

**PANIC DISORDER** Although many of us at some point experience symptoms of a panic attack, we react to these symptoms in different ways. Some shrug off the symptoms, while others interpret heart palpitations as the beginnings of a heart attack or hyperventilation as a sign of suffocation. Panic disorder has multiple components, each of which may require a different treatment approach. This clinical observation is supported by the finding that imipramine, a tricyclic antidepressant, prevents panic attacks but does not reduce the anticipatory anxiety that occurs when people fear they might have an attack. To break the learned association between the physical symptoms and the feeling of impending doom, cognitive-behavioural therapy can be effective, as this chapter’s opening case study illustrated.

The most important psychotherapeutic methods for treating panic disorder are based on cognitive therapy. When people feel anxious, they tend to overestimate the probability of danger, potentially contributing to their rising feelings of panic. Cognitive restructuring addresses ways of reacting to the symptoms of a panic attack. First, clients identify their specific fears, such as having a heart attack or fainting. Clients then estimate how many panic attacks they have had. The therapist helps them assign percentages to specific fears and then compare these numbers with the actual number of times the fears have been realized. For example, a client might estimate that she fears having a heart attack during 90 percent of her panic attacks and fainting during 85 percent of her attacks. The therapist can then point out that the actual rate of occurrence was zero. In fact, people do not faint during panic attacks; the physical symptoms of a panic attack, such as having a racing heart, are the opposite of fainting.

Even if clients recognize the irrationality of their fears, they often still suffer panic attacks. From a cognitive-behavioural perspective, the attacks continue because of a conditioned response to the trigger (e.g., shortness of breath). The goal of therapy is to break the connection between the trigger symptom and the resulting panic. This break can be made by exposure treatment, which induces feelings of panic—perhaps by having the client breathe in and out through a straw to induce hyperventilation or by spinning the client rapidly in a chair. Whatever the method,



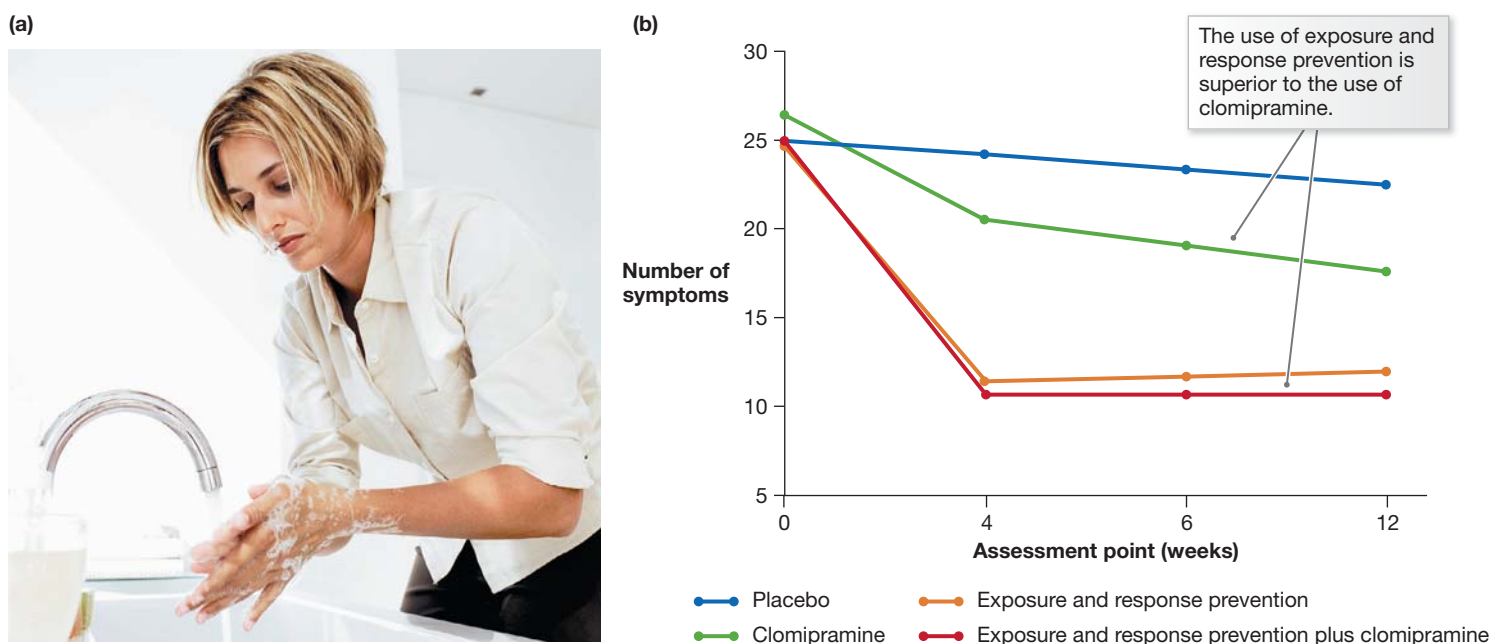
it is done repeatedly to induce habituation and then extinction. Cognitive-behavioural therapy appears to be as effective as or more effective than medication in the treatment of panic attacks.

David Barlow and his colleagues (2000) have found that in the short term, cognitive-behavioural therapy alone and imipramine alone were more effective than placebo for treating panic disorder and that they did not differ in results. However, six months after treatment had ended, those who received psychotherapy were less likely to relapse than those who had taken medication. Thus cognitive-behavioural therapy is the treatment of choice for panic disorder. For those who have panic disorder with agoraphobia, the combination of CBT and drugs is better than either treatment alone (Starcevic, Linden, Uhlenhuth, Kolar, & Latas, 2004).

**OBSESSIVE-COMPULSIVE DISORDER** Obsessive-compulsive disorder (OCD) is a combination of recurrent intrusive thoughts (obsessions) and behaviours that an individual feels compelled to perform over and over (compulsions; **FIGURE 15.14A**). Evidence that OCD is partly genetic and appears to be related to Tourette’s syndrome, a neurological disorder characterized by motor and vocal tics, convinced many practitioners that people with OCD would respond to drug treatment. However, traditional anti-anxiety drugs are completely ineffective for OCD. When SSRIs were introduced to treat depression, they were particularly effective in reducing the obsessive components of some depressions—for example, constant feelings of worthlessness. Therefore, SSRIs were tried with patients suffering from OCD and were found to be effective (Rapoport, 1989, 1991). The drug of choice for OCD is the potent serotonin reuptake inhibitor clomipramine. It is not a true SSRI, since it blocks reuptake of other neurotransmitters as well, but its strong enhancement of the effects of serotonin appears to make it effective for OCD.

Cognitive-behavioural therapy is also effective for OCD and is especially valuable for those who do not benefit from or who do not want to rely on medication. The two most important components of behavioural therapy for OCD are exposure and response prevention. The client is directly exposed to the stimuli that trigger compulsive behaviour but is prevented from engaging in the behaviour. This treatment derives from the theory that a particular stimulus triggers anxiety and

**FIGURE 15.14 Obsessive-Compulsive Disorder** (a) Hand washing is one OCD ritual. (b) Treatments for OCD can include the drug clomipramine, exposure, and response prevention, with varying rates of success.



that performing the compulsive behaviour reduces the anxiety. For example, a client might compulsively wash his hands after touching a doorknob, using a public telephone, or shaking hands with someone. In exposure and response-prevention therapy, the client would be required to touch a doorknob and then would be instructed not to wash his hands afterward. As with exposure therapy for panic disorder, the goal is to break the conditioned link between a particular stimulus and a compulsive behaviour. Some cognitive therapies are also useful for OCD, such as helping the client recognize that most people occasionally experience unwanted thoughts and compulsions and that they are a normal part of human experience.

In the 1990s, researchers imaged the brains of patients with OCD who were being treated either with Prozac or with cognitive-behavioural therapy. Patients in both treatment groups showed the same changes in neural activity (Baxter et al., 1992; Schwartz, Stoessel, Baxter, Martin, & Phelps, 1996). Recall the findings, discussed above, that the treatment for a spider phobia led to changes in brain activity; these studies provide further evidence that psychotherapies in which people reinterpret their fears and change their behaviours can in fact change the way their brains function. How does drug treatment compare with cognitive-behavioural therapy for OCD? In one recent study, the use of exposure and response prevention proved superior to the use of clomipramine, the drug of choice for OCD, although both were better than a placebo (Foa et al., 2005; **FIGURE 15.14B**). Cognitive-behavioural therapy may thus be a more effective way of treating OCD than medication, especially over the long term (Foa et al., 2005). At a minimum, evidence suggests that adding CBT to SSRI treatment improves outcomes (Simpson et al., 2008).

One exciting possibility is that deep brain stimulation (DBS) may be an effective treatment for those with OCD who have not found relief from CBT or medications. Early studies used psychosurgery to remove brain regions thought to contribute to OCD. Although there were promising outcomes and these surgical interventions involved much less damage than earlier methods such as lobotomy, brain surgery is inherently a risky therapy because it is irreversible. However, deep brain stimulation offers new hope. Consider the case of Mr. A., a 56-year-old French man suffering from a severely debilitating case of OCD that had lasted for more than four decades. Mr. A. had a number of obsessions about body parts and about gastrointestinal functioning, and his compulsions included repetitive movements and dietary restrictions. Researchers implanted DBS electrodes into the caudate, an area of the brain abnormal among those with OCD. DBS was very effective for Mr. A., who showed significant remission from symptoms after six months of treatment. After more than two years, Mr. A. continued to have stunning improvements in psychological functioning and the quality of his daily living (Aouizerate et al., 2004).

Since 2000, four separate research teams from North America and Europe, including the group who treated Mr. A., have been exploring the use of DBS for severe cases of OCD. These teams are targeting brain regions identified as problematic in OCD, such as the caudate and surrounding regions. DBS leads to a clinically significant reduction of symptoms and increased daily functioning in about two-thirds of those receiving treatment (Greenberg et al., 2008). Although this method remains exploratory, it holds great promise for helping those who have not benefited from other forms of treatment.

## Many Effective Treatments Are Available for Depression

Depression, characterized by low mood or loss of interest in pleasurable activities, is one of the most widespread mental disorders among adolescents and adults, and it has become more common over the past few decades (Hollon et al., 2002).

Fortunately, scientific research has validated a number of effective treatments. There is no “best” way to treat depression; many approaches are available, and ongoing research is determining which type of therapy works best for individuals.

**PHARMACOLOGICAL TREATMENT** In the 1950s, tuberculosis was a major health problem in North America, particularly in urban areas. A common treatment was iproniazid, a drug that reduced tubercle bacilli in patients’ sputum. It also stimulated patients’ appetites, increased their energy levels, and gave them an overall sense of well-being. In 1957, researchers who had noted the drug’s effect on mood reported preliminary success in using it to treat depression. In the following year, nearly half a million depressed patients were given iproniazid, an MAO inhibitor. Although they can relieve depression, MAO inhibitors can be toxic because of their effects on various physiological systems. Patients taking these drugs must avoid ingesting any substances containing tyramine, including red wine and aged cheeses, because they can experience severe, sometimes lethal elevations in blood pressure. Interactions with both prescription and over-the-counter medications can also be fatal, so MAO inhibitors are generally reserved for patients who do not respond to other antidepressants.

*Tricyclics*, another type of antidepressant, were also identified in the 1950s. One of these—*imipramine*, developed as an antihistamine—was found effective in relieving clinical depression. This drug and others like it act on neurotransmitters as well as on the histamine system. Tricyclics are extremely effective antidepressants. However, as a result of their broad-based action they have a number of unpleasant side effects, such as drowsiness, weight gain, sweating, constipation, heart palpitations, and dry mouth.

The discovery of these early antidepressants was largely serendipitous, but subsequently researchers began to search for antidepressants that did not affect multiple physiological and neurological systems and so would not have such troublesome side effects. In the 1980s, researchers developed Prozac, an SSRI. Because this drug does not affect histamine or acetylcholine, it has none of the side effects associated with the tricyclic antidepressants, although it occasionally causes insomnia, headache, weight loss, and sexual dysfunction. Because they have fewer serious side effects than MAO inhibitors, Prozac and other SSRIs began to be prescribed more frequently. A number of other drug treatments for depression have also been validated, such as bupropion (brand name Wellbutrin), which affects many neurotransmitter systems but has fewer side effects for most people than other drugs. For instance, unlike most antidepressants, bupropion does not cause sexual dysfunction. Interestingly, unlike SSRIs, bupropion is an ineffective treatment for panic disorder and OCD.

Approximately 60 percent to 70 percent of patients who take antidepressants experience relief from their symptoms, compared with about 30 percent who respond to placebos. Such findings indicate that these drugs are quite effective, since placebo effects are a component of all therapeutic outcomes. Indeed, recent evidence indicates that placebo treatment for depression leads to changes in brain activity (Leuchter, Cook, Witte, Morgan, & Abrams, 2002). In this study, 38 percent of participants receiving placebos showed improvement in depressive symptoms and increased activity in the prefrontal cortex, a different pattern of brain activation from that observed for participants receiving antidepressants. Such evidence suggests



*“Before Prozac, she loathed company.”*

that placebo treatments are associated with changes in neurochemistry and alleviate symptoms for some people. Placebos may work by giving people hope that they will feel better, a positive expectancy that may alter brain activity.

Despite attempts to predict individual patients' responses to antidepressants, physicians often must resort to a trial-and-error approach in treating depressed patients. No single drug stands out as being most effective. Some evidence suggests that tricyclics might be beneficial for the most serious forms of depression, especially for hospitalized patients (Anderson, 2000), but SSRIs are generally considered first-line medications because they have the fewest serious side effects (Olsson et al., 2002). Often the decision of which drug to use depends on the patient's overall medical health and the possible side effects of each medication. Once the depressive episode has ended, should patients continue taking medication? Research has shown that those who continue taking medication for at least a year have only a 20 percent relapse rate, whereas those who remain on a placebo have an 80 percent relapse rate (Frank et al., 1990).

**COGNITIVE-BEHAVIOURAL TREATMENT OF DEPRESSION** Despite the success of antidepressant medications, not all patients benefit from these drugs. Moreover, others cannot or will not tolerate the side effects. Fortunately, evidence indicates that cognitive-behavioural therapy is just as effective as biological therapies in treating depression (Hollon et al., 2002). From a cognitive perspective, people who become depressed do so because of automatic, irrational thoughts. According to the cognitive distortion model developed by Aaron Beck, depression is the result of a cognitive triad of negative thoughts about oneself, the situation, and the future (see Figure 14.23). Depressed patients' thought patterns differ from those of people with anxiety disorders. Whereas people with anxiety disorders worry about the future, depressed people think about how they have failed in the past, how poorly they are dealing with the present situation, and how terrible the future will be.

The goal of the cognitive-behavioural treatment of depression is to help the client think more adaptively, a change intended to improve mood and behaviour. Although the specific treatment is adapted to the individual client, some general principles apply to this type of therapy. Clients may be asked to recognize and record negative thoughts (**FIGURE 15.15**). Thinking about situations in a negative manner can become automatic, and recognizing these thought patterns can be difficult. Once the patterns are identified and monitored, the clinician can help the client recognize other ways of viewing the same situation that are not so dysfunctional.

Although cognitive-behavioural therapy can be effective on its own, combining it with antidepressant medication is often more effective than either one of these approaches alone (McCullough, 2000). In addition, the response rates and remission rates of the combined-treatment approach are extremely good (Keller et al., 2000; Kocsis et al., 2003). The issue is not drugs versus psychotherapy but rather which treatments provide relief for individual clients. For instance, for clients who are suicidal, in acute distress, or unable to commit to regular attendance with a therapist, drug treatment may be most effective. For many others, especially those who have physical problems such as liver impairment or cardiac problems, psychotherapy may be the treatment of choice because it is long-lasting and does not have the side effects associated with medications (Hollon et al., 2006). As with other mental disorders, treatment of depression with psychotherapy leads to changes in brain activation similar to those observed for drug treatments (Brody et al., 2001). However, one study found that although psychotherapy and drugs involved the same brain regions, activity in those regions was quite different during the two treatments, a finding that suggests they operate through different mechanisms (Goldapple et al., 2004).

**FIGURE 15.15 Try for Yourself: Recording Thoughts**

Patients in cognitive-behavioural therapy may be asked to keep a record of their automatic thoughts. This example comes from a person suffering from depression.

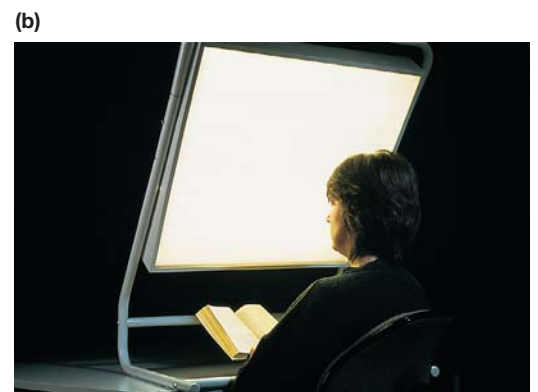
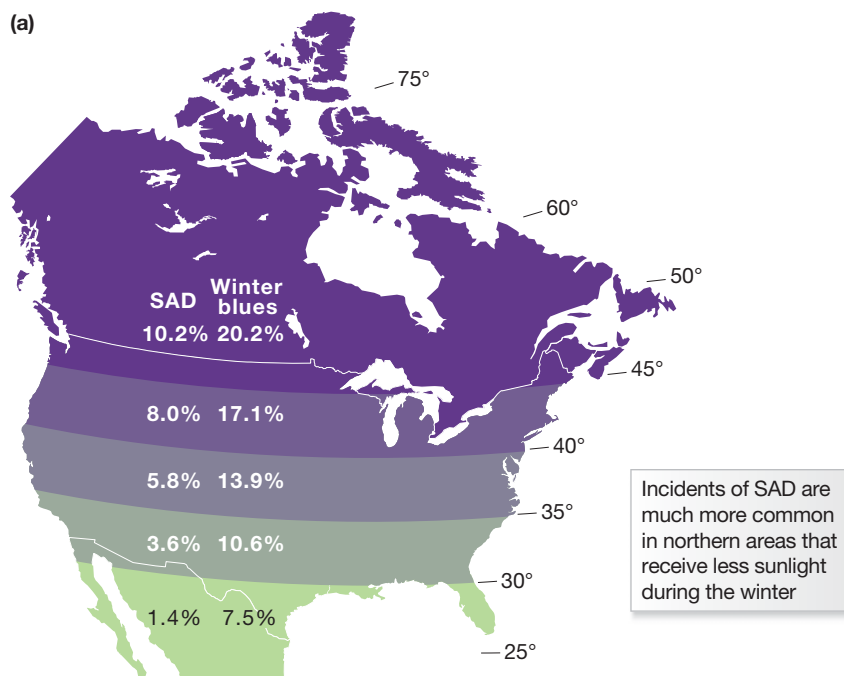
Date	Event	Emotion	Automatic thoughts
April 4	Boss seemed annoyed.	Sad, anxious, worried	Oh, what have I done now? If I keep making him angry, I'm going to get fired.
April 5	Husband didn't want to make love.	Sad	I'm so fat and ugly.
April 7	Boss yelled at another employee.	Anxious	I'm next.
April 9	Husband said he's taking a long business trip next month.	Sad, defeated	He's probably got a mistress somewhere. My marriage is falling apart.
April 10	Neighbour brought over some cookies.	A little happy, mostly sad	She probably thinks I can't cook. I look like such a mess all the time. And my house was a disaster when she came in!

A log of such events and reactions to those events can help identify patterns in thinking.

Try keeping a log of your own reactions to certain situations, and see if you can identify patterns in your thinking.

**ALTERNATIVE TREATMENTS** In patients with seasonal affective disorder (SAD), episodes of depression will more likely occur during winter. A milder form of SAD has been called the winter blues. The rate of these disorders increases with latitude (**FIGURE 15.16**). Many of these patients respond favourably to *phototherapy*, which involves exposure to a high-intensity light source for part of each day.

For some depressed patients, regular aerobic exercise can reduce depression and prevent recurrence (Pollock, 2004). Aerobic exercise may reduce depression because



**FIGURE 15.16 Seasonal Affective Disorder** (a) Incidence of SAD varies by latitude. (b) One treatment is phototherapy, where a patient sits in front of strong lighting for several hours each day to reduce symptoms.

it releases endorphins, which are chemically related to norepinephrine, a neurotransmitter implicated in depression. Release of endorphins can cause an overall feeling of well-being (a feeling marathoners sometimes experience as “runner’s high”). Aerobic exercise may also regularize bodily rhythms, improve self-esteem, and provide social support if people exercise with others. Depressed patients, however, may have difficulty finding the energy and motivation to begin an exercise regime.

In addition to these somewhat benign interventions, electroconvulsive therapy (ECT) has been effective for some people with major depression. Although ECT frequently results in a reduction of depressed mood, the mechanism by which this occurs is unknown (Fink, 2001). ECT may affect neurotransmitters or the neuroendocrine system; it has been shown to increase levels of acetylcholine, and drugs that block the action of acetylcholine reverse its beneficial effects. Regardless of how it works, ECT is a very effective treatment for those who are severely depressed and do not respond to conventional treatments (Hollon et al., 2002).

For a number of reasons, ECT might be preferable to other treatments for depression. Antidepressants can take weeks to be effective, whereas ECT works quickly. For a suicidal patient, waiting several weeks for relief can literally be deadly. In addition, ECT may be the treatment of choice for depression in pregnant women, since no evidence indicates that the seizures harm the developing fetus. Many psychotropic medications, in contrast, can cause birth defects. Most important, ECT has proved effective in patients for whom other treatments have failed.

ECT does, however, have some serious limitations, including a high relapse rate, (often necessitating repeated treatments), and memory impairments (Fink, 2001). In most cases, memory loss is limited to the day of ECT treatment. Some patients, however, experience substantial permanent memory loss (Donahue, 2000). Some centres perform unilateral ECT over only the hemisphere not dominant for language, a treatment that seems to reduce memory disruption (Papadimitriou, Zervas, & Papakostas, 2001). New research suggests the degree of memory and cognitive impairment resulting from ECT may be related to levels of cortisol, a hormone released in response to physical and psychological stress (see Chapter 10, “Health and Well-Being”). Depressed patients with higher levels of cortisol show greater impairments in memory and in cognition (Neylan et al., 2001). This research may help identify patients at risk for the loss of memory and of cognition due to ECT, and these potentially serious side effects can be weighed against the benefits of the treatment.

Recently, research has explored whether transcranial magnetic stimulation (TMS) can reduce depressive symptoms. A series of studies has demonstrated that TMS over the left frontal regions results in a significant reduction in depression (Chistyakov et al., 2004; George, Lisanby, & Sackheim, 1999; George et al., 1995; Pascual-Leone, Catala, & Pascual-Leone, 1996). Because TMS does not involve anaesthesia or have any major side effects (other than headache), it can be administered outside hospital settings. It is not likely, however, that TMS will ever completely replace ECT, since the two methods may act via different mechanisms and may therefore be appropriate for different types of patients. The long-term value of TMS is that it is effective even for those who have not responded to treatment with antidepressants (Fitzgerald et al., 2003).

**DEEP BRAIN STIMULATION** As with OCD, recent case studies indicate that DBS might be valuable for treating severe depression when all other treatments have failed. Helen Mayberg and her colleagues at the Rotman Research Institute, in Toronto, were the first to try out this novel treatment, in 2003. Mayberg’s earlier research had pointed to an area of the prefrontal cortex as abnormal in depression; following the logic of using DBS for Parkinson’s, neurosurgeons inserted electrodes

into this brain region in six severely depressed patients (Mayberg et al., 2005; McNeely, Mayberg, Lozano, & Kennedy, 2008). The results were stunning for four of the patients, some of whom felt relief as soon as the switch was turned on. For them, it was as if a horrible noise had stopped and a weight had been lifted, as if they had emerged into a more beautiful world (Dobbs, 2006; Ressler & Mayberg, 2007; **FIGURE 15.17**). DBS differs from other treatments in that researchers can relatively straightforwardly alter the electrical current, without the patients knowing, to demonstrate that the DBS is responsible for improvements in psychological functioning. Research using DBS to treat severe depression is now under way at a number of sites around the globe. In France, researchers used DBS in two patients who had both OCD and major depression. Stimulation of electrodes placed in the caudate relieved symptoms of OCD but not depression, whereas stimulation of electrodes in the nucleus accumbens alleviated symptoms of depression but not OCD (Aouizerate et al., 2009).

**GENDER ISSUES IN TREATING DEPRESSION** As noted in Chapter 14, women are twice as likely to be diagnosed with depression as men are. Some portion of this difference relates to high rates of domestic and other violence against women, reduced economic resources, and inequities at work (American Psychological Association, 2007). Women are also the primary consumers of psychotherapy. The American Psychological Association therefore has published *Guidelines for Psychological Practice with Girls and Women* (2007), which reminds therapists to be aware of gender-specific stressors such as the way work and family interact to place additional burdens on women and the biological realities of reproduction and of menopause. The guidelines also point out that women of colour, lesbians, and women with disabilities are often stereotyped in ways that signal disregard for the choices they have made and the challenges they face; all these factors can interfere with the therapeutic process.

**Real World  
PSYCHOLOGY**

**FIGURE 15.17 Scientific Method: Mayberg’s Study of DBS for Depression**

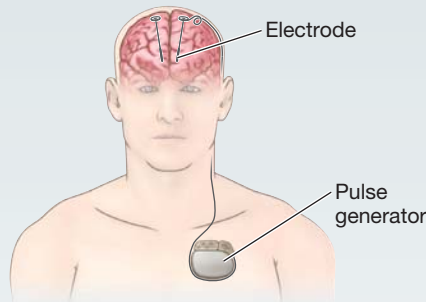
**Hypothesis:** Deep brain stimulation of an area of the prefrontal cortex may alleviate depression.

**Research Method:**

**1** A pair of small holes were drilled into the skulls of six participants.



**2** A pulse generator was attached under the collarbone, connecting to electrodes that passed through the holes in the skull to a specific area of the prefrontal cortex.



**Results:** Some participants reported relief as soon as the electrodes were switched on, and two-thirds of the participants felt normal within months.

**Conclusion:** DBS may be an especially effective method for patients resistant to other treatments.



**FIGURE 15.18 Jim Carrey in Real Life**

In dramatic and comedic roles (see, for example, Figure 13.14), Jim Carrey has proven his ability to depict other personalities and a wide range of emotions. In real life, he has spoken about a different challenge: dealing with bouts of depression.

Problems also exist in the treatment of depression in men. Men's reluctance to admit to depression and even greater reluctance to seek appropriate therapy have been described as "a conspiracy of silence that has long surrounded depression in men" (Brody, 1997). One famous Canadian man with depression is Jim Carrey. "I was on Prozac for a long time," he told the interviewer Steve Kroft on *60 Minutes* in 2004. "It may have helped me out of a jam for a little bit, but people stay on it forever. I had to get off at a certain point because I realized that, you know, everything's just OK." He went on to say:

"There are peaks, there are valleys. But they're all kind of carved and smoothed out, and it feels like a low level of despair you live in. Where you're not getting any answers, but you're living OK. And you can smile at the office. You know? But it's a low level of despair. You know?" (Leung, 2004)

Public statements from prominent men such as Jim Carrey may help break the silence surrounding depression in men and increase the number of men who seek psychotherapy. One goal is to help men stop masking their depression with alcohol, isolation, and irritability, any of which may be a symptom of unacknowledged depression.

### Lithium Is Most Effective for Bipolar Disorder

Although major depression and bipolar disorder are disorders of mood, they are fundamentally different and require different treatments. Bipolar disorder, in which mood cycles between mania and depression, is one of the few mental disorders for which there is a clear optimal treatment: psychotropic medications, especially lithium (Geddes, Burgess, Hawton, Jamison, & Goodwin, 2004). In one study, only about 20 percent of patients maintained on lithium experienced relapses (Keller & Baker, 1991). The mechanisms by which lithium stabilizes mood are not well understood, but the drug seems to modulate neurotransmitter levels, balancing excitatory and inhibitory activities (Jope, 1999). As with other psychotropic drugs, the discovery of lithium for the treatment of bipolar disorder was serendipitous. In 1949, the Australian researcher John Cade found that the urine of manic patients was toxic to guinea pigs. He believed that a toxin—specifically, uric acid—might be causing the symptoms of mania and that once the uric acid was removed from the body through the urine, the symptoms would diminish (a solution that would explain why the patients were not always manic). When he gave lithium urate, a salt in uric acid, to the guinea pigs, however, it proved nontoxic. To his surprise, it protected them against the toxic effects of the manic patients' urine and also sedated them. He next tried lithium salts on himself. When he was assured of their safety, he gave the salts to ten hospitalized manic patients, all of whom recovered rapidly.

Although lithium is effective in stabilizing mood, it has unpleasant side effects, including thirst, hand tremors, excessive urination, and memory problems. These side effects often diminish after several weeks on the drug. Because lithium works better on mania than on depression, patients often are treated with both lithium and an antidepressant. Evidence indicates that SSRIs are preferable to other antidepressants because they are less likely to trigger episodes of mania (Gijsman, Geddes, Rendell, Nolen, & Goodwin, 2004). Anticonvulsive medications, more commonly used to reduce seizures, also can stabilize mood and may be effective for intense bipolar episodes. But as with all psychological disorders, compliance with drug therapy can be a problem for various reasons. For example, patients may skip doses or stop taking the medications completely in an effort to reduce the drugs' side effects. In these situations, cognitive-behavioural therapy can help increase compliance with medication regimes (Miller,



Norman, & Keitner, 1989). Patients with bipolar disorder also may stop taking their medications because they miss the “highs” of their hypomanic and manic phases (Chapter 14 notes Kay Redfield Jamison’s description of the intoxicating pleasure of mania.) Psychological therapy can help patients accept their need for medication and understand the impact their disorder has on them and on those around them.

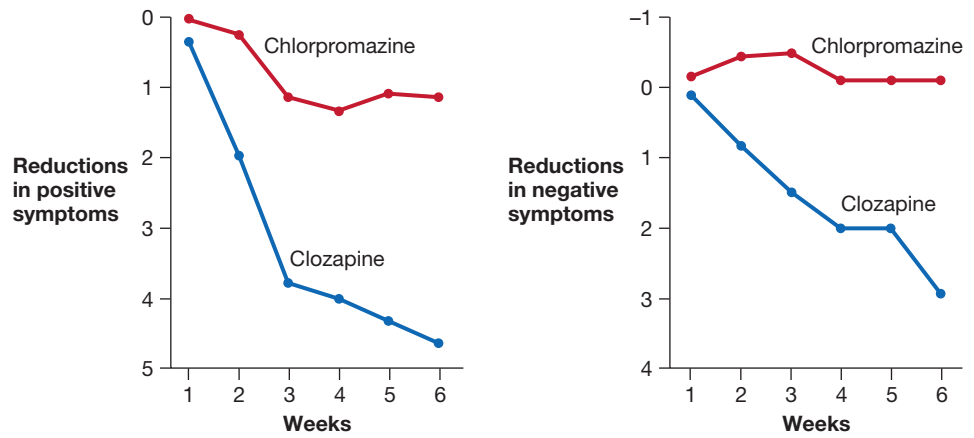
## Pharmacological Treatments Are Superior for Schizophrenia

In the early 1900s, Freud’s psychoanalytic theory and treatments based on it were widely touted as the answer to many mental disorders. Even Freud, however, admitted that his techniques were effective only for what he termed “neuroses” and were unlikely to benefit patients with more severe psychotic disorders such as schizophrenia. Because psychotic patients were difficult to handle and even more difficult to treat, they generally were institutionalized in large mental hospitals. In this undesirable situation, the staff and administration of mental hospitals were willing to try any inexpensive treatment that had a chance of decreasing the patient population or that at least might make the inmates more manageable. Brain surgery, such as prefrontal lobotomy, was considered a viable option for patients with severe mental disorders. Although Moniz initially reported that the operation was frequently successful (see “Alternative Biological Treatments Are Used in Extreme Cases,” above), it soon became evident to him that anxious or depressed patients benefited most from the surgery. Patients with schizophrenia did not seem to improve following the operation. Fortunately, as noted earlier, the introduction of psychotropic medications in the 1950s eliminated the use of lobotomy.

**PHARMACOLOGICAL TREATMENTS** Since the sixteenth century, extracts from dogbane, a toxic herb, had been used to calm highly agitated patients. The critical ingredient was isolated in the 1950s and named *reserpine*. When given to patients with schizophrenia, it not only had a sedative effect but also was an effective antipsychotic, reducing the positive symptoms of schizophrenia such as delusions and hallucinations. Shortly afterward, a synthetic version of reserpine was created that had fewer side effects. This drug, *chlorpromazine*, acts as a major tranquilizer. It reduces anxiety, sedates without inducing sleep, and decreases the severity and frequency of the positive symptoms of schizophrenia. Later, another antipsychotic, *haloperidol*, was developed that was chemically different and had less of a sedating effect than chlorpromazine.

Haloperidol and chlorpromazine revolutionized the treatment of schizophrenia and became the most frequently used treatment for this disorder. Patients with schizophrenia who had been hospitalized for years were able to walk out of mental institutions and live independently. These antipsychotics are not without drawbacks, however. For example, the medications have little or no impact on the negative symptoms of schizophrenia. In addition, they have significant side effects. Chlorpromazine sedates patients, can cause constipation and weight gain, and causes cardiovascular damage. Although haloperidol does not cause these symptoms, both drugs have significant motor side effects that resemble symptoms of Parkinson’s disease: immobility of facial muscles, trembling of extremities, muscle spasms, uncontrollable salivation, and a shuffling walk. Tardive dyskinesia—involuntary movements of the lips, tongue, face, legs, or other parts of the body—is another devastating side effect of these medications and is irreversible once it appears. Despite these side effects, haloperidol and chlorpromazine were the only available options.

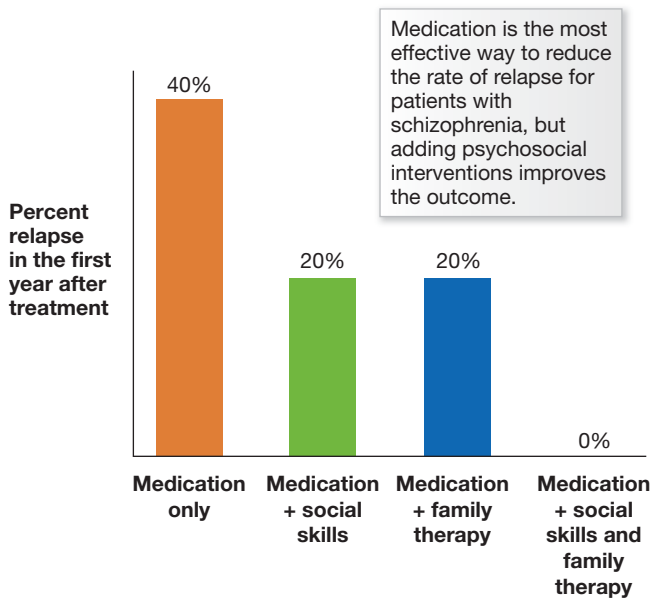
The late 1980s saw the introduction of *clozapine*, which is significantly different from previous antipsychotic medications in a number of ways. First, it acts not only on dopamine receptors but also on those for serotonin, norepinephrine,



**FIGURE 15.19** The Effectiveness of Clozapine

Many patients who had not responded to the previously available neuroleptics found that clozapine reduced the positive and negative symptoms of schizophrenia.

acetylcholine, and histamine. Second, it is beneficial in treating the negative as well as the positive symptoms of schizophrenia (FIGURE 15.19). Many patients who had not responded to the previously available neuroleptics improved on clozapine. Third, no signs of Parkinson's symptoms or of tardive dyskinesia appeared in any of the patients taking the drug. Clozapine has fewer side effects than either chlorpromazine or haloperidol, but its side effects are serious: seizures, heart arrhythmias, and substantial weight gain. Of even greater concern is that clozapine can cause a fatal reduction in white blood cells. Although the risk of this problem is low, patients taking the drug must have frequent blood tests. The cost of the blood tests, in addition to the high cost of the medication, has made this drug treatment prohibitively expensive for many patients. More recently, other medications similar to clozapine in structure, pharmacology, and effectiveness have been introduced that do not reduce white blood cell counts. Called *second-generation antipsychotics*, these drugs are now the first line in treatment for schizophrenia (Walker, Kestler, Bollini, & Hochman, 2004). An analysis of 11 studies of a total of 2,769 patients found that these second-generation antipsychotics have about one-fifth the risk of producing tardive dyskinesia as first-generation drugs (Correll, Leucht, & Kane, 2004).



**FIGURE 15.20** The Effectiveness of Antipsychotic Medications and Social Skills Training

**PSYCHOSOCIAL TREATMENTS** Medication is essential in the treatment of schizophrenia. Without it, patients may deteriorate, experiencing more frequent and more severe psychotic episodes. When antipsychotic drugs became available, other types of therapies for schizophrenia were virtually dismissed. It became clear over time, however, that although medication effectively reduces delusions and hallucinations, it does not substantially affect patients' social functioning. Thus antipsychotic drugs fall short of being a cure and require combination with other treatment approaches to help people lead productive lives.

*Social skills training*, for example, is an effective way to address some deficits in patients with schizophrenia (FIGURE 15.20). These patients can benefit from intensive training on regulating affect, recognizing social cues, and predicting the effects of their behaviour in social situations. With intensive long-term training, patients with schizophrenia can generalize

Suppose you are hurrying to class one winter morning, slip on some ice, fall, and sprain your ankle. You may not realize that your ankle is sprained, but you know you are injured. Another student offers to help you to the student health centre, and you gladly accept. However, if you were suffering from *anosognosia*, a condition caused by a brain disease or injury to the parietal lobe, you would not know you were injured. People with this condition may have quite dramatic impairments, such as paralysis and blindness, but are unaware of their problems. As discussed in the opening of Chapter 14, for example, the actor Tony Rosato denied that he had any mental health problems, in spite of clear evidence that he had Capgras syndrome.

Approximately 50 percent of individuals with schizophrenia, and 40 percent of individuals with bipolar disorder, are unaware of their disorder. However, unlike anosognosia, in which a parietal lobe defect can be seen on a brain scan, there are no objective markers for unawareness of mental disorders. This failure to recognize a disorder is the most common reason that people with these diagnoses do not take their medication, often resulting in worsening of symptoms and increased likelihood of victimization, homelessness, joblessness, incarceration, rehospitalization, and violent acts against others and themselves. In addition, if a person is not treated, the disorder may progress to the point where it is no longer treatable; research has shown, for example, that delaying treatment for schizophrenia causes the disorder to become more severe.

Many family members have been frustrated trying to get help for relatives who are unaware of their own disorders, refuse treatment, and deteriorate. Community members have been frustrated in their inability to help the homeless, who may have the right to refuse treatment. Should people unaware of their own mental disorders be treated even if they do not want to be?

We do not force treatment on people with medical problems, even if their reasoning for rejecting treatment is illogical. Treating mental disorders is even more of an ethical quagmire, mainly because we do not understand many of the disorders completely. As discussed in Chapter 14, the neural underpinnings of depression, bipolar disorder, and schizophrenia are still being studied. Diagnoses are based on behaviours, not on

blood tests, and those behaviours may have different origins and be open to various interpretations. In addition, a minority of both psychologists and psychiatrists do not agree that many mental disorders have biological bases; instead, they explain them as emotional reactions to negative life circumstances, stress, or acute trauma. Until research can prove direct causation of mental disorders by biological processes and can uncover the mechanisms that cause and can treat them, these practitioners believe any involuntary treatments violate an individual's right of self-determination.

Safety is also an ethical issue. Even if a diagnosis is agreed upon, treatments vary in side effects, costs, and effectiveness. When a person is treated involuntarily, who should determine what treatments to use—the family (if there is one), the physician, the community, the government? The optimal treatment as seen by the community or government may be the most cost-effective one, whereas the optimal treatment for the individual may not be. Ethicists also worry that if individuals are threatened with involuntary treatment, they will less likely seek treatment when they need it or may be reluctant to continue it once they have started.

Studies done from the ethical standpoint of fairness and justice suggest a different treatment modality. A sense of fairness and “being heard” can matter almost as much as treatment pressures. Therefore, any treatment must respect the person with the disorder and treat the person fairly. One such treatment that has proved highly effective and has markedly decreased rehospitalizations involves offering patients a contract in which they receive a small amount of money or gift certificates for treatment compliance. This cognitive-behavioural technique, in which positive or healthy behaviour is reliably and clearly rewarded, may be perceived as coercion or as exploitation of poor patients. However, the majority of patients do not consider the practice coercive and understand that, unlike involuntary treatment, they can turn it down.

What would you do if your sibling or parent, for example, was experiencing psychotic episodes but was unaware of having a disorder and refused medical evaluation or treatment? Would you consider it ethical to respect your relative's autonomy and do nothing, or would you force him or her to go for treatment?

the skills learned in therapy to other social environments. Also, when self-care skills are deficient, behavioural interventions can focus on areas such as grooming and bathing, management of medications, and financial planning. Training in specific cognitive skills, such as in modifying thinking patterns and in coping with auditory hallucinations, has been less effective.

Recently, Aaron Beck has proposed that an intensive form of cognitive-behavioural therapy (CBT) is effective for treating schizophrenia (Beck & Rector, 2005). Beck believes that brain dysfunction gives rise to disordered beliefs and behaviours and that schizophrenia may be due partly to limited cognitive resources and an inability to inhibit the intrusion of inappropriate thoughts. From this perspective, delusions and hallucinations reflect biased information processing. In CBT for schizophrenia, much initial effort involves getting the client to trust the therapist as nonjudgmental and understanding of the client's perspective. Over time, the therapy becomes more formal as the therapist helps the client understand how stressful life circumstances contribute to disordered thoughts and how alternative explanations might exist for delusions and hallucinations. Initial studies using CBT for schizophrenia indicate that it is more effective than other psychological treatments in reducing symptoms such as delusions and hallucinations.

**PROGNOSIS IN SCHIZOPHRENIA** Most patients diagnosed with schizophrenia experience multiple psychotic episodes over the course of the disorder. In some patients, the disorder apparently progresses; each schizophrenic episode lays the groundwork for increasingly severe symptoms in the future. Thus it is in the patient's best interest to treat the disorder early and aggressively.

Although the disorder becomes progressively more severe in some affected individuals, most patients with schizophrenia improve over time. One long-term study that followed participants for an average of 32 years showed that between half and two-thirds were recovered or had had considerable improvement in functioning on follow-up (Harding, Zubin, & Strauss, 1987). No one knows why most people with schizophrenia apparently improve as they grow older. Perhaps they find a treatment regimen most effective for them, or perhaps changes in the brain that occur with aging somehow result in fewer psychotic episodes. Dopamine levels may decrease with age, and this decrease may be related to the improvement in symptoms.

The prognosis for patients with schizophrenia depends on factors including age of onset, gender, and culture. Those diagnosed later in life tend to have a more favourable prognosis than those who experience their first symptoms during childhood or adolescence (McGlashan, 1988). Women tend to have better prognoses than men do (Hambrecht, Maurer, Hafner, & Sartorius, 1992), perhaps because schizophrenia in women tends to appear later than in men. Interestingly, culture also plays a role in prognosis. In developing countries, schizophrenia often is not so severe as in developed countries (Jablensky, 1989; Leff, Sartorius, Jablensky, Korten, & Ernberg, 1992), possibly because more extensive family networks in developing countries provide more support for patients with schizophrenia.

### There Are Important Considerations in Selecting a Psychotherapist

## Real World PSYCHOLOGY

Approximately 1 in 5 Canadians will have some form of diagnosable mental illness in his or her lifetime. The cost of treating mental disorders in Canada is more than \$33 billion each year. A dizzying array of providers offer treatment, ranging from those with limited training (e.g., former addicts who provide peer counselling) to those with advanced degrees in psychopathology and its treatment. In addition to mental health specialists, regular health care providers (e.g., internists, pediatricians), human-service workers (e.g., school counsellors), and volunteers (e.g., self-help groups) also assist those with mental problems. No matter who administers the therapy, however, most of the techniques used have emerged from psychological laboratories.

**Table 15.2 The Major Types of Specialized Mental Practitioners**

Specialty	Degree	Placement
Clinical psychologists	Ph.D. or Psy.D.	Academic or hospital settings
Psychiatrists	Medical degree (MD)	Hospitals or private practice
Counselling psychologists	Ph.D.	Schools/colleges (counsellors)
Psychiatric social workers	Master's in social work (M.S.W.)	Psychiatric hospitals, house calls
Psychiatric nurses	Bachelor's in nursing (B.S.N.)	Hospitals or residential treatment programs
Paraprofessionals	Limited advanced training	Outreach programs, residential treatment programs

As summarized in **TABLE 15.2**, the major types of specialized mental practitioners include the following:

- *Clinical psychologists* typically have a doctoral degree. The graduate training for a Ph.D. takes four to six years, and it emphasizes the design and analysis of research and the use of treatments that have empirical support. Many clinical psychologists work in academic or hospital settings, where they conduct research in addition to providing treatment. A relatively new training program in clinical psychology leads to the Psy.D. This program emphasizes clinical skills over research and is meant for those who intend to provide direct mental health services. Clinical psychologists typically are not able to prescribe medications, although efforts are under way to give them such privileges. In some U.S. states, clinical psychologists with specialized training in psychoactive drugs can prescribe medications.
- *Psychiatrists* have a medical degree (MD) and three to four additional years of specialized training in residency programs. They often work in hospitals or in private practice. Psychiatrists are the only mental health practitioners legally authorized to prescribe drugs in Canada.
- *Counselling psychologists* often have a Ph.D. in counselling psychology. They typically deal with problems of adjustment and life stress that do not involve mental illness, such as stress related to scholastic, marital, and occupational problems. Most universities have staff members who specialize in problems common to students, such as test anxiety, learning disorders, sleep problems, and family issues.
- *Psychiatric social workers* most often have a master's degree in social work (M.S.W.) and specialized training in mental health care. In addition to working with patients in psychiatric hospitals, they may visit people in their homes and address problems arising from the home environments. Their work might include helping clients receive appropriate resources from social and community agencies.
- *Psychiatric nurses* typically have a bachelor's degree in nursing (B.S.N.) and special training in the care of mentally ill patients. They often work in hospitals or in residential treatment programs that specialize in serious mental illness.
- *Paraprofessionals* have limited advanced training and usually work under supervision. They assist those with mental health problems in the challenges of daily living. For example, they may work in crisis intervention, pastoral counselling, or community outreach programs, or they may supervise clients of residential treatment programs.

Choosing the right therapist is difficult but extremely important for ensuring successful treatment. The right therapist must have the appropriate training and experience for the specific mental disorder, and the person seeking help must believe the therapist is trustworthy and caring. The initial consultation should make the person feel at ease and hopeful that his or her psychological problem can be resolved. If not, the person should seek another therapist. The ability to prescribe medication should play only a minor role in the choice of therapist, since almost all practitioners have arrangements with physicians who can prescribe medications. It is more important to find someone who is both empathic and experienced in the methods known to be effective in treating specific mental disorders.

The Internet provides a growing number of resources for those dealing with life problems on their own. These self-help programs are meant for minor stresses associated with daily living rather than for more serious mental disorders. The websites of the Canadian Mental Health Association ([www.cmha.ca](http://www.cmha.ca)) and Health Canada ([www.hc-sc.gc.ca/hl-vs/mental/](http://www.hc-sc.gc.ca/hl-vs/mental/)) offer additional information about choosing mental health practitioners.

#### CRITICAL THINKING SKILL

### Avoiding the Sunk Costs Fallacy

Suppose you are in therapy with someone who has a good reputation and was highly recommended to you by a good friend or your family physician. You have been meeting with this therapist once a week for the last three months. Despite this sizable commitment of both time and money, you do not feel you are doing any better or that the therapist is committed to helping you lessen your problem. Would you reason that since you have already spent so much time and money working with this therapist you should continue, or would you look for a new therapist?

If you stick with a therapist simply because of what you have invested, you are demonstrating the “sunk costs” fallacy. The time and money spent are gone, and you cannot get them back. Future actions cannot be justified by thinking about prior, or “sunk,” costs. This fallacy can occur in various settings, so it is important to learn how to recognize and avoid such thinking. Here are some other examples.

Suppose you have bought expensive tickets for a play. By intermission, you have not enjoyed the play at all. Do you stay because of the time and money you have already spent, or do you leave and spend the next hour doing something you might enjoy more? If you reason that you should stay because of what you have already spent, you are demonstrating the sunk costs fallacy. If you stay for more of the play, you might regret not having done something more fun. Other scenarios may have graver implications. For example, a government might reason that because it has invested many millions (or billions) of dollars in a war, in which thousands of people have died, withdrawing its troops from that war would mean losing the investments in money and in human lives. Nothing can bring back the money and the lives, however, so the decision about what to do next should not rest on how much has been spent or lost thus far. Instead, the decision should rest on what is the best option at this point.

## **SUMMING UP**

### **What Are the Most Effective Treatments?**

Psychotherapy and biological therapy are used to treat mental disorders. When the two are equally effective, psychotherapy is preferred because it has fewer side effects and persists beyond treatment. Cognitive and behavioural therapies, especially exposure and response prevention, are particularly useful for anxiety disorders, although drug treatments are also used for panic disorder and OCD. Among the treatment strategies for mood disorders are exercise, antidepressants, cognitive-behavioural therapy, electroconvulsive therapy, transcranial magnetic stimulation, and deep brain stimulation. Differences in the incidence of depression for men and women have led to specific suggestions for psychotherapy, which include a greater awareness of the way sex role expectations affect the willingness to admit to depression and seek treatment for it, and the biological and social realities of being female or male. Psychopharmacology is the recommended treatment for bipolar disorder and schizophrenia. Various drugs are safe for schizophrenia, but they are most effective when combined with other treatment approaches. Training in social and self-care skills can help patients improve their abilities to interact with others and to take care of themselves. Behavioural interventions can promote improved self-care and increased compliance with medication. In choosing among the many types of psychotherapists, it is most important to find someone the patient can trust and with whom he or she can establish a productive therapeutic relationship.

## **MEASURING UP**

Indicate whether cognitive-behavioural therapy, drug therapy, or a combination of the two is the recommended treatment for each disorder listed.

- a. bipolar disorder
- b. depression
- c. generalized anxiety disorder
- d. obsessive-compulsive disorder
- e. panic disorder
- f. phobias
- g. schizophrenia

## Can Personality Disorders Be Treated?

Just as not much is known about the causes of personality disorders such as borderline personality disorder and anti-social personality disorder, little is known about how best to treat them. There is a growing literature of case studies describing treatment approaches for personality disorders, but few large, well-controlled studies have been undertaken. The one thing about personality disorders that most therapists agree on is that they are notoriously difficult to treat. Individuals with personality disorders who are in therapy are usually also being treated for an Axis I disorder—such as OCD or depression—which typically is the problem for which they sought therapy in the first place. People rarely seek therapy for personality disorders because one hallmark of these disorders is that patients see the environment rather than their own behaviour as the cause of their problems. This

### **LEARNING OBJECTIVE**

Explain why personality disorders are difficult to treat.

outlook often makes individuals with personality disorders very difficult to engage in therapy.

## Dialectical Behaviour Therapy Is Most Successful for Borderline Personality Disorder

The impulsivity, emotional disturbances, and identity disturbances characteristic of borderline personality disorder make therapy for those affected very challenging. Traditional psychotherapy approaches have been largely unsuccessful, so therapists have attempted to develop approaches specific to borderline personality disorder.

The most successful treatment approach to date for borderline personality disorder was developed by the American psychologist Marsha Linehan in the 1980s. **Dialectical behaviour therapy (DBT)** combines elements of the behavioural, cognitive, and psychodynamic approaches (Lieb, Zanarini, Schmahl, Linehan, & Bohus, 2004). All patients are seen in both group and individual sessions, and the responsibilities of the patient and the therapist are made explicit. Therapy proceeds in three stages. In the first stage, the therapist targets the patient's most extreme and dysfunctional behaviours. Often these are self-cutting and suicidal threats or attempts. The focus is on replacing these behaviours with more appropriate ones. The patient learns problem solving techniques and more effective and acceptable ways of coping with his or her emotions. In the second stage, the therapist helps the patient explore past traumatic experiences that may be at the root of emotional problems. In the third stage, the therapist helps the patient develop self-respect and independent problem solving. This stage is crucial because borderline patients depend heavily on others for support and validation, and they must be able to generate these attitudes and skills themselves or they likely will revert to their previous behaviour patterns.

Because the symptoms experienced by individuals with borderline personality disorder can border on psychosis or mirror depression, researchers previously believed that these patients would develop an Axis I disorder such as schizophrenia or depression. Studies that have followed these individuals over time, however, have demonstrated that instead their symptoms remain relatively unchanged (Plakun, Burkhardt, & Muller, 1985). The only group that shows long-term improvement is borderline patients of a high socio-economic level who receive intensive treatment; they demonstrate improved interpersonal relationships and often achieve full-time employment (Stone, Stone, & Hurt, 1987). In the remainder of patients with borderline personality disorder, however, interpersonal and occupational problems are the norm. Substance abuse is common, and many patients attempt suicide multiple times.

Therapeutic approaches targeted at borderline personality disorder, such as DBT, may improve the prognosis for these patients. Studies have demonstrated that those undergoing DBT are more likely to remain in treatment and less likely to be suicidal than are patients in other types of therapy (Linehan, Armstrong, Suarez, Allmon, & Heard, 1991; Linehan, Heard, & Armstrong, 1993). SSRIs are often prescribed along with DBT to treat feelings of depression. Although DBT was initially developed as an outpatient therapy, it recently has been adapted for use in an inpatient setting (Swenson, Sanderson, Dulie, & Linehan, 2001). Because patients with borderline personality disorder thrive on attention, inpatient settings not designed for these patients can inadvertently reinforce dysfunctional behaviours, such as self-injury and suicide attempts, that bring them attention. The result is often both a worsening of symptoms and long-term hospitalization (Rosenbluth & Silver, 1992). The DBT program begins with a three-month inpatient stay followed by long-term outpatient therapy. It has been very effective in reducing depression, anxiety, and suicidal discussions and attempts (Bohus et al., 2004; Lynch, Frost, Salsman, & Linehan, 2007).

**dialectical behaviour therapy (DBT)** A form of therapy used to treat borderline personality disorder.



## Anti-social Personality Disorder Is Difficult to Treat

Although treating patients with borderline personality disorder may be very difficult, treating those with anti-social personality disorder often seems impossible. These patients live without thinking twice about it, care little for others' feelings, and live for the present without consideration of the future. All these factors make development of a therapeutic relationship and motivation for change remote possibilities at best. Individuals with this disorder are often more interested in manipulating their therapists than in changing their own behaviour. Therapists working with these patients must be constantly on guard.

### THERAPEUTIC APPROACHES FOR ANTI-SOCIAL PERSONALITY DISORDER

Numerous treatment approaches have been tried for anti-social personality disorder (and its extreme variant called *psychopathy*). Because individuals with anti-social personality disorder apparently have diminished cortical arousal, stimulants have been prescribed to normalize arousal levels. Evidence indicates that these drugs are beneficial in the short term but not the long term. Anti-anxiety drugs may lower hostility levels somewhat, and lithium has shown promise in treating the aggressive, impulsive behaviour of violent criminals who are psychopathic. Overall, however, psychotropic medications have not been effective in treating this disorder.

Similarly, traditional psychotherapeutic approaches seem of little use in treating anti-social personality disorder. Behavioural and cognitive approaches have had somewhat more success. Behavioural approaches reinforce appropriate behaviour and ignore or punish inappropriate behaviour in an attempt to replace maladaptive behaviour patterns with more socially appropriate ones. This approach seems to work best when the therapist controls reinforcement, the client cannot leave treatment, and the client is part of a group. Individual therapy sessions rarely produce any change in anti-social behaviour. Clearly, the behavioural approach cannot be implemented on an outpatient basis, since the client will receive reinforcement for his or her anti-social behaviour outside of therapy and can leave treatment at any time. For these reasons, therapy for this disorder is most effective in a residential treatment centre or a correctional facility.

More recently, cognitive approaches have been tried for anti-social personality disorder. Aaron Beck and his colleagues (1990) have conceptualized this disorder as a series of faulty cognitions. The anti-social individual believes his or her desire for something justifies any actions he or she takes to attain it. The person believes those actions will not have negative consequences or, if they do, that these consequences are not important. The person also believes he or she is always right and what others think is unimportant. Therapy therefore focuses on making the client aware of these beliefs and challenging their validity. Therapists try to demonstrate that the client can meet his or her goals more easily by following the rules of society than by trying to get around them, as in the following example (Beck et al., 1990):

Therapist: How well has the “beat-the-system” approach actually worked out for you over time?

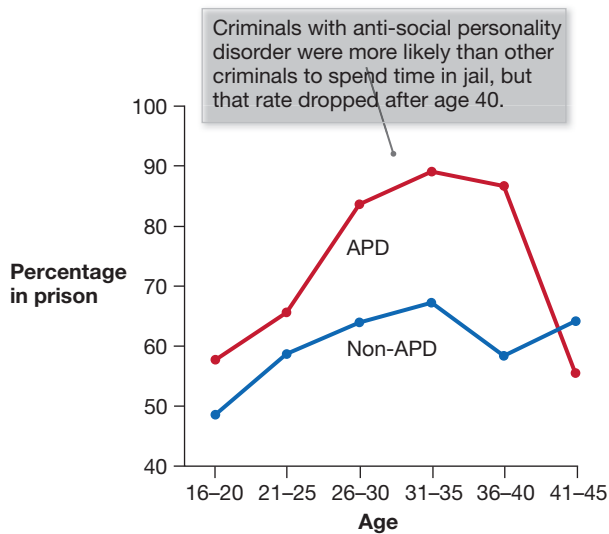
Brett: It works great . . . until someone catches on or starts to catch on. Then you have to scrap that plan and come up with a new one.

Therapist: How difficult was it, you know, to cover up one scheme and come up with a new one?

Brett: Sometimes it was really easy. There are some real pigeons out there.

Therapist: Was it always easy?

Brett: Well, no. Sometimes it was a real bitch. . . . Seems like I'm always needing a good plan to beat the system.



**FIGURE 15.21 Anti-social Personality Disorder** For this longitudinal study, the percentage of participants in prison during each five-year period is shown.

Therapist: Do you think it's ever easier to go with the system instead of trying to beat it in some way?

Brett: Well, after all that I have been through, I would have to say yes, there have been times that going with the system would have been easier in the long run. . . . But . . . it's such a challenge to beat the system. It feels exciting when I come up with a new plan and think I can make it work.

This dialogue illustrates both the cognitive approach and why these clients are so difficult to work with. Even if they know what they are doing is wrong, they do not care. They live for the thrill of getting away with something.

**PROGNOSIS FOR ANTI-SOCIAL PERSONALITY DISORDER** The prognosis that patients with anti-social personality disorder will change their behaviours as a result of therapy is poor, and this is especially true for those with psychopathic traits. Some of the more

recently developed cognitive techniques show promise, but no good evidence indicates that they produce long-lasting or even real changes. Robert Hare, a psychopathy expert and psychologist at the University of British Columbia, has shown that, fortunately for society, individuals with anti-social personality disorder but without psychopathy typically improve after age 40 (FIGURE 15.21). The reasons for this improvement are unknown, but it may be due to a reduction in biological drives. Alternative theories suggest these individuals may gain insight into their self-defeating behaviours or may just get worn out and be unable to continue their manipulative ways. The improvement, however, is mainly in the realm of anti-social behaviour. The underlying egocentricity, callousness, and manipulateness can remain unchanged (Harpur & Hare, 1994), especially for those who are psychopathic. In fact, although criminal acts decrease among those with anti-social personality disorder after age 40, more than half of individuals with psychopathic traits continue to be arrested after age 40 (Hare, McPherson, & Forth, 1988). Thus although some aspects of their behaviour mellow with age, psychopaths remain rather indifferent to traditional societal norms.

Because of the limited effectiveness of therapy for this disorder, time and effort may be better spent in prevention. *Conduct disorder* is a childhood condition known to be a precursor to anti-social personality disorder. Some of the environmental and developmental risk factors for conduct disorder have been identified, and focusing on these may reduce the likelihood that a child with conduct disorder will grow up to have anti-social personality disorder.



## SUMMING UP

### Can Personality Disorders Be Treated?

Personality disorders are characterized by long-standing maladaptive ways of interacting with the world, and they are notoriously difficult to treat. Efforts have been made to develop treatment programs for borderline and anti-social personality disorders because they can have devastating effects on the individual, the family, and society. Dialectical behaviour therapy is the most successful method of treating borderline personality disorder. At this point, no treatment approach appears particularly successful for anti-social personality disorder, especially its psychopathic variant.

## MEASURING UP

Why are personality disorders so difficult to treat? Select all that apply.

- People with personality disorders are difficult to engage in therapy because they do not believe their actions cause their problems.
- People with personality disorders believe their problems are caused by their environments.
- People with personality disorders believe they are fundamentally flawed individuals unworthy of help.

## How Should Childhood and Adolescent Disorders Be Treated?

Childhood experience and development are critically important to adult mental health. Problems not addressed during childhood will persist into adulthood and will likely be more significant and more difficult to treat. Most theories of human development regard children as more malleable than adults and therefore more amenable to treatment. Thus childhood disorders should be the focus of research into etiology, prevention, and treatment. To illustrate the issues involved in treating childhood disorders, the following section considers treatment approaches for adolescent depression, ADHD, and autism.

### The Use of Medication to Treat Adolescent Depression Is Controversial

Adolescent depression is a serious problem, affecting approximately 1 in 20 North American adolescents at any time (Angold & Costello, 2001). Untreated depression is associated with drug abuse, dropping out of school, and suicide. In Canada, approximately 550 teenagers and young adults kill themselves each year, making it the second leading cause of death for that age group (Statistics Canada, 2009). First Nations adolescents and gay and lesbian adolescents may be especially at risk. For many years, depression in children and adolescents was ignored or viewed as a typical part of growing up. Indeed, relatively few adolescents receive mental health treatment. Understandably, then, many in the mental health community reacted favourably to the initial use of SSRIs such as Prozac to treat adolescent depression. Studies had found tricyclic antidepressants ineffective and the side effects potentially dangerous for adolescents, but the first studies using SSRIs found them effective and safe (e.g., Emslie et al., 1997).

From the time that SSRIs were introduced as treatments for adolescent depression, some mental health researchers raised concerns that the drugs might cause some adolescents to become suicidal (Jureidini et al., 2004), partly on the basis of findings that SSRIs cause some adults to feel restless, impulsive, and suicidal. Following a report by one drug company of an increase in suicidal thoughts among adolescents taking its product, the U.S. Food and Drug Administration (FDA) asked all drug companies to analyze their records for similar reports. An analysis of reports on more than 4,400 children and adolescents found that about twice as many of those taking SSRIs reported having suicidal thoughts (4 percent) as those taking a placebo (2 percent), but none of the children or adolescents committed suicide. Given the FDA's evidence of increased thoughts of suicide, Health Canada convened a scientific advisory panel in 2004 that recommended manufacturers include in their product labels a warning that antidepressants increase the risk of suicidal thinking and behaviour in

### LEARNING OBJECTIVE

Explain key arguments in the debate about prescribing medication to children with depression and ADHD.

Understand that sometimes behavioural treatments are best for biological disorders such as autism.

## Real World PSYCHOLOGY

depressed children and adolescents and that physicians prescribing these drugs need to balance risk with clinical need. Physicians were also advised by Health Canada to watch their patients closely, especially in the first few weeks of treatment. Suddenly many parents were wondering whether SSRIs were safe for their children.

Many issues concerning SSRIs and children need to be evaluated critically. First, are SSRIs effective for young people, and if so, are they more effective than other treatments? Second, do these drugs cause suicidal feelings, or are adolescents with depression likely to feel suicidal whether or not they take medication? Finally, how many adolescents would be suicidal if their depression was left untreated?

The Treatment for Adolescents with Depression Study (TADS, 2004), an ambitious research program supported by the U.S. National Institutes of Health, provides clear evidence that the SSRI Prozac is effective in treating adolescent depression. This study examined 439 patients age 12 to 17 who had been depressed for an average of 40 weeks before the study began. Participants were assigned randomly to a type of treatment and followed for 12 weeks. The results indicated that 61 percent of participants taking Prozac showed improvement in symptoms, compared with 43 percent receiving cognitive-behavioural therapy and 35 percent taking a placebo. The group receiving Prozac and CBT did best (71 percent improved); this finding is consistent with those of other studies, which have shown that combining drugs and psychotherapy often produces the strongest results for treating depression. A more recent, 36-week follow-up of the TADS treatment sample found that although the combined group had the best outcomes (86 percent improvement), improvement with CBT alone (81 percent) was similar to that with Prozac alone (81 percent; March et al., 2007; **FIGURE 15.22**). In terms of suicidality, the results were more mixed. All treatment groups experienced a reduction in thoughts of suicide compared with the baseline. However, participants in the Prozac group were twice as likely to have serious suicidal thoughts or intentions compared with those undergoing other treatments, and of the 7 adolescents who attempted suicide during the study, 6 were taking Prozac. The greater risk of suicidal thoughts or events continued through 36 weeks. Critics of adolescents receiving drugs point out that these findings are consistent with other studies showing a risk from SSRIs (Antonuccio & Burns, 2004).

A few things should be kept in mind in analyzing of the use of SSRIs for adolescent depression. The suicide rates have dropped since the use of SSRIs became widespread (**FIGURE 15.23**). The greater the increase in the number of SSRI prescriptions for adolescents within a region, the greater the reduction in teenage suicides (Olfson, Shaffer, Marcus, & Greenberg, 2003). Thus not providing SSRIs to adolescents may raise the suicide rate (Brent, 2004).

Canadian physicians responded to the Health Canada warning by more closely monitoring their adolescent patients or stopping treatment of adolescents with SSRIs (Cheung, Sacks, Dewa, Pong, & Levitt, 2008). A large study of prescription practices in Manitoba found a significant decrease (14 percent) in the number of adolescents receiving SSRIs after the Health Canada warning but no change in prescriptions to young adults (Katz et al., 2008). Unfortunately, although there was no change in the suicide rate among young adults in Manitoba after the Health Canada warning, there was a 25 percent increase in completed suicides among adolescents. Thus concerns about the effect of reducing SSRI use in adolescents seem justified.

According to some researchers, the relative success of psychotherapy for teenage depression makes it a better treatment choice. Indeed, considerable evidence shows that psychotherapy is effective on its own (Mufson et al., 2004) and also enhances drug treatment. Psychological treatments such as interpersonal psychotherapy are successful as well (Hollon et al., 2002). But getting adolescents to comply with psychotherapy can be challenging. Psychotherapy is also time consuming and expensive,

## FIGURE 15.22 Scientific Method: The Treatment for Adolescents with Depression Study

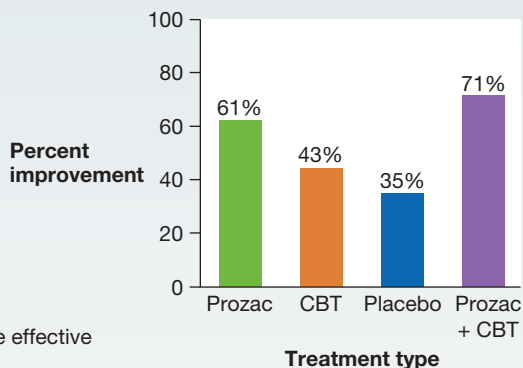
**Hypothesis:** Prozac is the most effective method for treating adolescent depression.

**Research Method:**

- 1 Patients aged 12 to 17 were randomly assigned to a type of treatment and followed it for 12 weeks.
- 2 Some of the patients were given Prozac, some cognitive-behavioural therapy, some a placebo, and some Prozac and cognitive-behavioural therapy together.

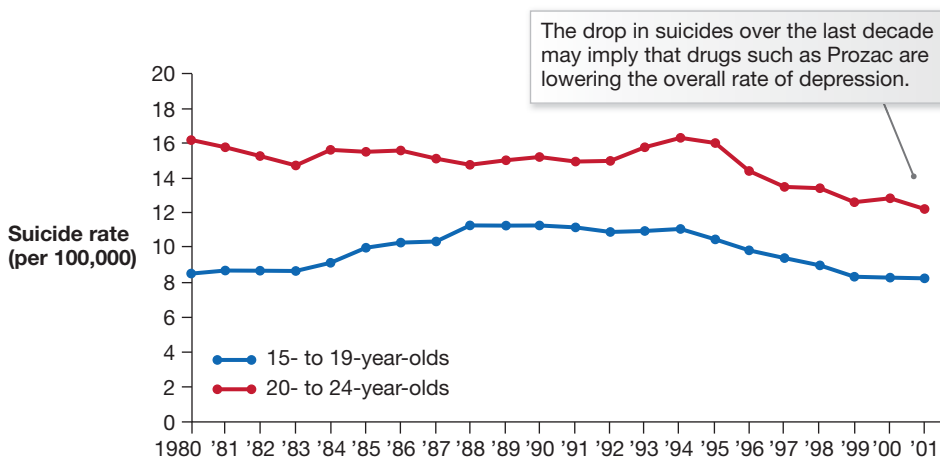


**Results:** The group receiving Prozac and CBT did best. A follow-up of the TADS treatment sample found that although the combined group continued to have the best outcomes, improvement with CBT alone was similar to that with Prozac alone.



**Conclusion:** Both CBT and Prozac are effective in treating adolescent depression.

and many health insurance companies provide only minimal support (Rifkin & Rifkin, 2004). In addition, it is unrealistic to expect there to be sufficient resources to provide psychotherapy to all adolescents who need it in the near future. By contrast, it is relatively easy for pediatricians and family physicians to prescribe drugs. Unfortunately, the prescribing of such medications by general practitioners can be problematic because these individuals do not have training in treating psychological



**FIGURE 15.23** Suicide Rates among People 15 to 24 Years of Age

disorders. Thus although prescribing drugs without CBT might be cost effective (Domino et al., 2008), it may not be in the best interests of depressed children.

## Children with ADHD Can Benefit from Various Approaches

There is some dispute about whether attention deficit hyperactivity disorder is a mental disorder or simply a troublesome behaviour pattern that children eventually outgrow. Some people diagnosed with ADHD as children grow out of it. Many more, however, suffer from the disorder throughout adolescence and adulthood. Longitudinal studies show that 70 percent of individuals diagnosed with ADHD during childhood still meet the criteria for the disorder as adolescents. These individuals are more likely to drop out of school and to reach a lower socio-economic level than expected. They show continued patterns of inattention, of impulsivity, and of hyperactivity, and they are at increased risk for other psychiatric disorders (Wilens, Faraone, & Biederman, 2004). Because of this somewhat bleak long-term prognosis, effective treatment early in life may be of great importance.

**PHARMACOLOGICAL TREATMENT OF ADHD** The most common treatment for ADHD is a central-nervous-system stimulant such as *methylphenidate*—most commonly, under the brand name Ritalin. The effects of this drug are similar to those of caffeine and amphetamines, but the drug is more potent than the former and less potent than the latter. Although Ritalin's actions are not fully understood, the drug may affect multiple neurotransmitters, particularly dopamine. The behaviour of children with ADHD might suggest that their brains are overactive, and it may seem surprising that a stimulant would improve their symptoms. In fact, functional brain imaging shows that children with ADHD have underactive brains; their hyperactivity may raise their arousal levels.

At appropriate doses, central-nervous-system stimulants such as Ritalin decrease overactivity and distractibility and increase attention and the ability to concentrate. Children on Ritalin experience an increase in positive behaviours and a decrease in negative behaviours (**FIGURE 15.24**). They are able to work more effectively on a task without interruption and are more academically productive; even their handwriting seems to improve. They also are less disruptive and noisy. This improved behaviour likely has contributed to the large number of children who take this medication, since parents often feel pressured by school systems to medicate children who have ongoing behaviour problems, and since parents often pressure physicians to prescribe the drug because its effects can make home life much more manageable. One study measured Ritalin's effects on the behaviour of children playing baseball (Pelham et al., 1990). Children with ADHD who were taking the medication would assume the ready position in the outfield and could keep track of the game. Children with ADHD who were not taking the drug would often throw or kick their mitts even while the pitch was in progress.

Studies have shown that children taking Ritalin are happier, more adept socially, and more successful academically. They also interact more positively with their parents, perhaps because they will more likely comply with requests. The medication has its drawbacks, however. Side effects include sleep problems, reduced appetite, body twitches, and temporary growth suppression. Evidence also indicates that although stimulants are beneficial in the short term, their benefits may not be maintained over the long term. In addition, there is a very real risk of abuse, with numerous cases of children and adolescents buying and selling these stimulants. Indeed, a controversial issue is whether treating ADHD children with Ritalin may increase the risk they will develop substance abuse problems as adults. Two recent studies have demonstrated that substance abuse problems are common among

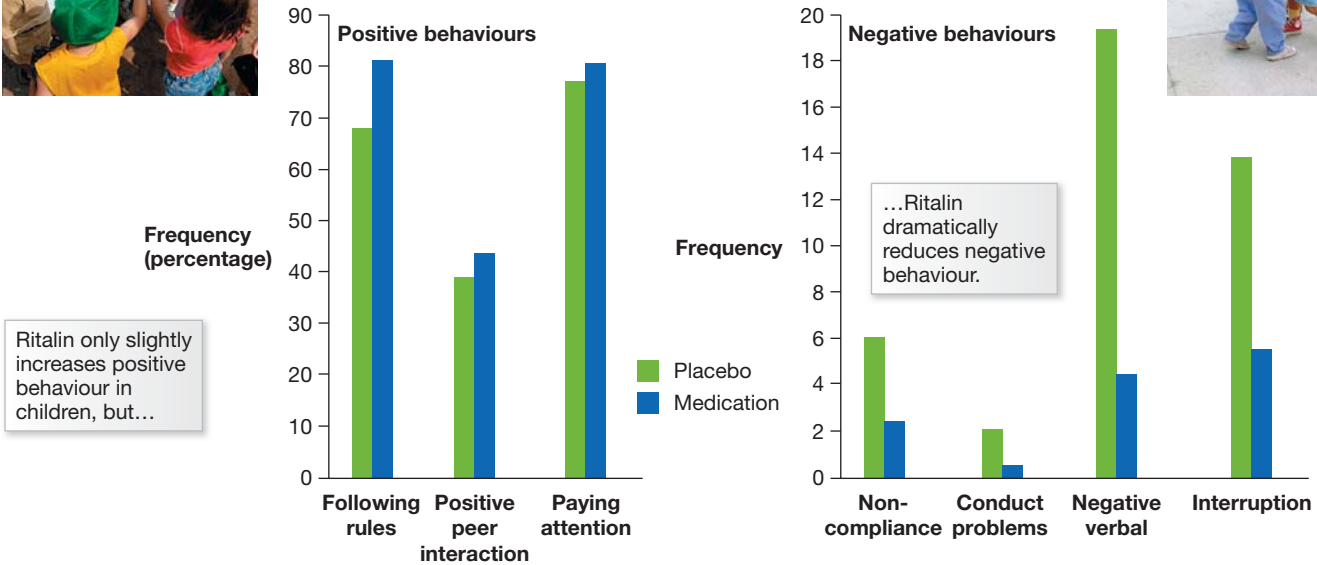


FIGURE 15.24 The Effects of Ritalin

those who had ADHD in childhood, but having taken Ritalin does not seem to have increased or decreased adult rates of substance abuse (Biederman et al., 2008; Mannuzza et al., 2008). Perhaps most important, some children on medication may see their problems as beyond their control. They may not feel responsible for their behaviours and may not learn coping strategies they will need if they discontinue their medication or if it ceases to be effective. Most therapists believe medication should be supplemented by psychological therapies such as behaviour modification, and some even urge that medication be replaced by other treatment approaches when possible. Nonetheless, the data make clear that treatment progresses much better if drugs are part of the overall treatment plan.

**BEHAVIOURAL TREATMENT OF ADHD** Behavioural treatment of ADHD aims to reinforce positive behaviours and ignore or punish problem behaviours. The difficulties with this treatment approach are similar to those discussed in the following section, on autism. Treatment is very intensive and time consuming. In addition, although it is often not difficult to improve behaviours in a structured setting, therapy's effects do not necessarily generalize beyond the clinic or classroom. Many therapists advocate combining behavioural approaches with medication. The medication is used to gain control over the behaviours, and then behavioural modification techniques can be taught and the medication slowly phased out. Others argue that medication should be used only if behavioural techniques do not reduce inappropriate behaviours. This controversy is ongoing, but recent research has shown that medication plus behavioural therapy is more effective than either approach alone.

The U.S. National Institute of Mental Health, in collaboration with teams of investigators, began the Multimodal Treatment of Attention Deficit Hyperactivity Disorder (MTA) in 1992. The study involved 579 children, who were assigned

randomly to community care or to one of three treatment groups, each lasting 14 months. The three treatment groups were medical management (usually treatment with a stimulant such as Ritalin), intensive behavioural treatment, and a combination of the two. Follow-up studies a year later revealed that the children receiving medication and those receiving a combination of medication and behavioural therapy had greater improvement in their ADHD symptoms than did those in the behavioural treatment group (Jensen et al., 2001). Children who received medication and behavioural therapy showed a slight advantage in areas such as social skills, academics, and parent-child relations over those who received only medication. After three years, however, the advantage of the medication therapy was no longer significant because those who received behavioural therapy improved over the three years, whereas those who received medication improved quickly but then tended to regress over the three years (Jensen et al., 2007). These findings reinforce the key point that although medications may be important in the short term, psychological treatments may produce superior outcomes that last.

### CRITICAL THINKING SKILL

## Evaluating Alternatives in Decision Making

Parents of children with mental and behavioural disorders face many challenges, including decisions about psychotherapy and medications. Decisions always involve uncertainty because a person cannot know in advance the consequences of his or her future actions. Decisions usually have to be made with missing information and involve guesses and predictions. Decision making is a recursive, or recycling, process because the nature of the decision may change as more alternatives are generated and evaluated. The decision also requires an action, although it may not be an overt movement—a person could decide which of two opinions to believe, for example—and sometimes the decision may be to do nothing.

Careful decision making is a time-consuming process, but when the decision is important, the time is well spent. The basic processes of decision making are the same whether the decision involves, for example, what to do about a child who has just been diagnosed with ADHD, what career to pursue, or what to have for lunch, though certainly some decisions are more important than others. The first step is to frame the question that needs deciding: *What should I do to help my child who was diagnosed with ADHD to succeed and be happy?* is different from *Should my child take Ritalin?* The first question allows for a broader range of options, which might include alternative schooling or psychotherapy or nothing at all. In general, a broader frame for a decision will yield a larger number of alternatives—the list of possible decisions. If you had a child with ADHD, you might seek the help of different types of professionals in generating a list of alternatives. You would then evaluate each alternative along many dimensions. For example, doing nothing would be an inexpensive alternative, but it probably would not help a child with ADHD lead a happy and successful life. Ritalin would be another alternative. You would continue evaluating alternatives until the best solution emerged. This decision making procedure allows you to compare multiple alternatives. By putting the decision making process on paper, you can consider many complex options simultaneously without being limited by the capacity of your working memory (FIGURE 15.25).



Frame the question that needs deciding.	List alternatives for each framed question.	Evaluate and compare each alternative until the best solution emerges.
	<b>Options</b>	<b>Contradicting Reasons and Evidence</b>
<b>A. What should I do to help my child who was diagnosed with ADHD to succeed and be happy?</b>	1. 2.	1. 2.
<b>B. Should my child take Ritalin?</b>	1. 2.	1. 2.

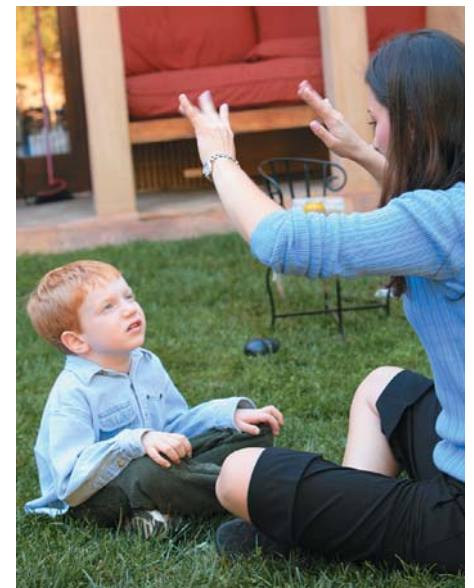
**FIGURE 15.25 Think Critically:** Evaluating Alternatives

## Children with Autism Benefit from a Structured Treatment Approach

The treatment of children with autism presents unique challenges to mental health professionals. The core symptoms of autism—impaired communication, restricted interests, and deficits in social interaction—make these children particularly difficult to work with. They often exhibit extreme behaviours as well as public self-stimulation. Although these behaviours must be reduced or eliminated before progress can occur in other areas, doing so is difficult because effective reinforcers are hard to find. Although normal children respond positively to social praise and small prizes, children with autism often are oblivious to these rewards. In some cases, food is the only effective reinforcement in the initial stages of treatment. Another characteristic of children with autism is an overselectivity of attention. This tendency to focus on specific details while ignoring others interferes with generalizing learned behaviour to other stimuli and situations. For example, a child who learns to set the table with plates may not know what to do when presented with bowls instead. Generalization of skills must be explicitly taught. For this reason, structured therapies are more effective for these children than unstructured interventions such as play therapy.

**BEHAVIOURAL TREATMENT FOR AUTISM** One of the best-known and perhaps most effective treatments for children with autism was developed by the psychologist Ivar Lovaas, at UCLA, and his colleagues. The program, **applied behavioural analysis (ABA)**, is based on principles of operant conditioning: Behaviours that are reinforced should increase in frequency, while behaviours that are not reinforced should be extinguished (**FIGURE 15.26**). This very intensive approach requires a minimum of 40 hours of treatment per week. In Lovaas's study, preschool-age children with autism were treated by teachers and by their parents, who received specific training. After more than two years of ABA treatment, the children had gained about 20 IQ points on average and most of them were able to enter a normal kindergarten program (Lovaas, 1987). In contrast, IQ did not change in a comparable control group of children who did not receive any treatment. A group of children who received 10 hours of treatment per week fared no better than the control group. Initiating treatment at a younger age also yielded better results, as did involving the parents and having at least

**applied behavioural analysis (ABA)** An intensive treatment for autism, based on operant conditioning.



**FIGURE 15.26 Applied Behavioural Analysis** This form of treatment involves intensive interaction between autistic children and their teachers and parents.

a portion of the therapy take place in the home. Children with better language skills before entering treatment had better outcomes than those who were mute or echolalic (repeating whatever they heard). Recent studies have shown that other tasks can improve ABA treatment. For example, one study found that teaching children to engage in joint attention during ABA treatment, such as by having the parent or teacher imitate the child's actions and work to maintain eye contact, improved language skills significantly over ABA treatment alone (Kasari, Paparella, Freeman, & Jahromi, 2008).

Although Lovaas's ABA program has been demonstrated to be effective, it has some drawbacks. The most obvious is the time commitment, because the therapy is very intensive and lasts for years. Parents essentially become full-time teachers for their children with autism. The financial and emotional drains on the family can be substantial. If the family has other children, they may feel neglected or jealous because of the amount of time and energy expended on the child with autism.

**BIOLOGICAL TREATMENT FOR AUTISM** Because good evidence exists that autism is caused by brain dysfunction, many attempts have been made to use this knowledge to treat the disorder. It is easy to find reports of children who have benefited from alternative treatment approaches. These case studies are compelling, but when the treatments are assessed in controlled studies, little or no evidence indicates that most are effective. However, a few biologically based treatment approaches have shown some promise, as discussed in Chapter 14.

One approach involves serotonin. Because SSRIs such as Prozac reduce compulsions in patients diagnosed with obsessive-compulsive disorder, and because autism involves compulsive and repetitive behaviour, and because some evidence indicates abnormal serotonin metabolism in children with autism, SSRIs have been tried as a treatment for autism. Indeed, in some children with autism the drug reduces repetitive motor behaviour and self-injury and improves social interactions (McDougle, 1997). More-recent research has examined whether the hormone oxytocin, which is important in bonding between mothers and infants, is involved in autism. In one study, high-functioning adults with autism were injected with oxytocin and then performed a social cognition task in which they listened to spoken sentences (e.g., "The boy went to the store") and had to identify the speaker's emotional tone. Those who received oxytocin were better able to tell if the sentence was read in an angry, sad, happy, or indifferent tone than those who received the placebo (Hollander et al., 2007). At this point, the neurobiology of autism is not well understood, and although attempts to use psychopharmacology to treat the disorder have led to some improvements in behaviour, much remains to be learned.

**PROGNOSIS FOR CHILDREN WITH AUTISM** Despite a few reports of remarkable recovery from autism, the long-term prognosis is poor. A follow-up study of men in their early twenties revealed that they continued to show the ritualistic behaviour typical of autism. In addition, nearly three-quarters had severe social difficulties and were unable to live and work independently (Howlin, Mawhood, & Rutter, 2000). Several factors affect the prognosis. Although therapists once believed the prognosis was particularly poor for children whose symptoms were apparent before age two (Hoshino et al., 1980), possibly only the most severe cases of autism were diagnosed before public recognition of the disorder increased. Early diagnosis clearly allows for more effective treatments (National Research Council, 2001). Still, severe cases—especially those involving notable cognitive deficiencies—are less likely to improve with treatment. Early language ability is associated with better outcome (Howlin et al., 2000), as is higher IQ. Children with autism have difficulty generalizing from the therapeutic setting to the real world, and this limitation

severely restricts their social functioning (Handleman, Gill, & Alessandri, 1988); a higher IQ may mean a better ability to generalize learning and therefore a better overall prognosis.

To understand how autism affects families and how treatment can be beneficial, consider the following case study. John O’Neil, a deputy editor at the *New York Times*, has described what it is like to be the parent of a child with autism (O’Neil, 2004). O’Neil’s son James began to show signs of being “different” in early childhood. Although he had been an easy baby, as a toddler he seemed to have difficulty looking his parents in the eye and did not display a strong sense of connection. James indicated little interest in objects, even toys, that were given or shown to him, instead repeating behaviours to the point of harming himself—for example, pulling on and off his cowboy boots until his feet were raw. He responded to loud noises by crying. James’s behaviour really started to deteriorate when he was two and a half, following the arrival of a baby brother and a move to a new house. His parents assumed he was overwhelmed, but the director of James’s new preschool noticed the telltale signs of autism. On her recommendation, a professional assessed James and determined that he had autism. During the first visit to a speech therapist, James’s mother learned just how much her son needed treatment: He had forgotten his name.

The discovery of James’s autism follows a familiar pattern. Although most diagnoses of autism are made by age three, the disorder can be detected earlier if parents or pediatricians know what to look for. Many children who will develop autism show abnormal social behaviour in infancy. Other signs include staring at objects for long periods and not reaching developmental milestones, such as speaking. Sometimes autism appears to strike suddenly in an otherwise normally developing child. The child simply withdraws from social contact, stops babbling, and may become self-abusive. Parents and pediatricians who notice such symptoms of autism in a child may write them off as quirks or feel that the child is just a little slow to develop. Luckily for James, the preschool staff recommended a professional evaluation because of his unusual behaviour. As mentioned above, research has shown that the earlier treatment begins, the better the prognosis.

On finding out that treatments for autism existed, the O’Neils were relieved. But then they heard the bad news: Treatment is expensive, difficult, and time consuming—as noted earlier, the recommended amount of treatment is over 40 hours per week. Most versions of treatment are based on Lovaas’s ABA therapy, which requires parents and teachers to spend hours helping children with autism learn basic skills, such as saying their names, by using operant conditioning to reward even small behaviours. The same behaviours, repeated over and over, for hours on end: That is the nature of ABA. It teaches each task as a series of simple steps, attempting to actively engage the child’s attention in highly structured activities, and it provides regular reinforcement of desired behaviours.

As is the case in many school districts, resources were insufficient for James to receive full treatment in school. His mother, a physician, gave up her full-time position to set up a home-based program for James. He spent up to eight hours every day performing tasks that most children would find extremely boring, such as repeatedly imitating the therapist’s placing two blocks next to each other or touching her nose. James’s day might begin with physical activities to strengthen coordination and build body awareness, followed by a snack break during which appropriate social behaviours were reinforced and language skills were stressed. Each part of the day was designed to work on James’s problem areas. Along the way progress was charted to guide subsequent sessions. At one point, James’s language skills clearly had to improve if he was going to be able to attend mainstream school. Encouraged by being given any treat he asked for, James learned to talk.



**FIGURE 15.27 James O'Neil** At the time of this photo, James, centre, was eight years old. At left is his friend Larry, also eight. At right is James's brother Miles, six.

He started school with the assistance of one of his full-time instructors, who attended class with him. Despite some rocky moments, James has made tremendous progress. He still has problems—in areas such as reading comprehension, math, attention, and social skills—and he does not understand why he has a disorder and why other kids do not. But James has triumphed. Perhaps his biggest accomplishment was making friends with a classmate named Larry (**FIGURE 15.27**). Why, O'Neil speculates, was Larry attracted to James as a friend? Perhaps they shared a love of potty humour, or perhaps they were similarly warm and enthusiastic. One day O'Neil overheard the two friends engaged in silly conversation, telling stupid jokes and gossiping about their “girlfriends.” In that moment, O'Neil realized just how many of his dreams for James had been realized.



## SUMMING UP

### How Should Childhood and Adolescent Disorders Be Treated?

Approximately 1 out of 20 adolescents experiences depression. Using drugs such as Prozac with adolescents is controversial: Although these drugs are effective in managing symptoms, they have a slight risk of increasing suicidal behaviours. The use of psychological treatments is most effective over the long run, although the cost is significantly greater and such therapies require more effort by the adolescents. Medications such as Ritalin can be quite effective in treating children with ADHD. However, side effects and ethical concerns are associated with this type of medication. For these reasons, many parents and clinicians have turned to other approaches, such as behavioural therapy. Recent research suggests that the most effective management strategy for ADHD may be a combination of medication and behavioural therapy. In contrast, the most effective treatment for autism currently is structured and intensive behavioural therapy.



## MEASURING UP

Label each point below as an argument either for or against the practice of prescribing SSRI medications to adolescents with depression.

- a. Depressed adolescents taking SSRIs report having suicidal thoughts twice as often as depressed adolescents not taking SSRIs.
- b. Many depressed adolescents improve when taking SSRIs.
- c. Psychotherapy alone is an effective treatment option.
- d. SSRIs are widely available.
- e. SSRIs offer a relatively inexpensive treatment.
- f. Suicide rates have dropped since the use of SSRIs became widespread.

## CONCLUSION

Although great strides have been made in identifying the etiology of mental disorders, this growing knowledge has not always given rise to new treatment approaches. Treatment of mental disorders is aimed at helping the individual think and behave in more adaptive ways, but the approaches vary tremendously. For some disorders, several approaches are equally effective. For other disorders, some approaches are more effective than others. New understanding of the ways in which mental disorders affect neural functioning may lead to the discovery of more effective psychotropic medications. History teaches us, however, that medication is not the magic bullet for mental disorders. Even with the creation of more effective medications, other interventions remain crucial. A pill may help relieve the symptoms of mental disorder, but it cannot help a patient cope with the effects of the disorder, interact with others, or think and behave in more adaptive ways. Psychological, cognitive, and behavioural interventions can address these issues more effectively than medication. Indeed, recent evidence indicates that although drugs may be more effective over the short term, psychological treatments are more effective over the long term. This finding recently was confirmed in studies with children being treated for depression and for ADHD.

The best treatments are those supported by careful empirical research. One of the major themes in this textbook is that our understanding of the human condition has progressed through the administration of the scientific method. This sense of progress is particularly true for the treatment of mental disorders, where pop psychology and pseudotherapies can lead people astray to devote time, money, and energy on ineffective or even dangerous efforts. The careful assessment of treatments for mental health disorders has given therapists a better idea of what works and what does not, freeing them to invest their efforts in identifying needed treatments. The continued application of the scientific method to understanding the treatment of mental disorders is crucial for providing the most effective care.

## CHAPTER SUMMARY

### How Are Psychological Disorders Treated?

- **Psychotherapy Is Based on Psychological Principles:** Psychotherapeutic treatments focus on insights. Psychodynamic forms focus on uncovering the unconscious. Humanistic approaches focus on clarifying feelings and motives. Behavioural approaches focus on modifying maladaptive behaviours. Cognitive approaches restructure thinking. Group therapy provides support, and a systems approach is part of family therapy. Common factors across treatments include both the value of confession and expectations that things will get better.
- **Culture Can Affect the Therapeutic Process:** The dominant culture in any country defines mental health and mental disorders; it also determines who needs psychotherapy and what type of therapy should be made available. Psychologists need to have multicultural knowledge if they are to provide competent psychotherapy to people from different backgrounds and with different belief systems.
- **Medication Is Effective for Certain Disorders:** Psychotropic medications change neurochemistry. Anti-anxiety drugs increase GABA activity. Antidepressants affect serotonin availability. Antipsychotics reduce positive symptoms.
- **Alternative Biological Treatments Are Used in Extreme Cases:** When traditional treatments are not successful, alternative treatments are used. These include psychosurgery, electroconvulsive therapy, transcranial magnetic stimulation, and deep brain stimulation.
- **Therapies Not Supported by Scientific Evidence Can Be Dangerous:** Increasingly, psychologists are turning to evidence-based practices. Some treatment approaches that have no credible evidence to support their use have proved lethal, and all may prevent or delay a patient from seeking help through an evidence-based therapy.

### What Are the Most Effective Treatments?

- **Treatments That Focus on Behaviour and on Cognition Are Superior for Anxiety Disorders:** Behavioural methods alleviate specific phobias. Cognitive restructuring is effective in treating panic disorders. Obsessive-compulsive disorder (OCD) responds to medications that block serotonin reuptake and to cognitive-behavioural therapy.
- **Many Effective Treatments Are Available for Depression:** Pharmacological treatments include MAO inhibitors, tricyclics, and SSRIs. Cognitive-behavioural treatments are most effective when combined with antidepressants. Alternative therapies include phototherapy for seasonal affective disorder (SAD) and both electroconvulsive therapy and transcranial magnetic stimulation for severe depression.
- **Lithium Is Most Effective for Bipolar Disorder:** The psychotropic medication lithium has been the most effective in stabilizing mood in bipolar patients but has considerable side effects. Psychological therapy can help support compliance with drug treatment.

- **Pharmacological Treatments Are Superior for Schizophrenia:** Antipsychotic medications are most effective for reducing the positive symptoms of schizophrenia. Tardive dyskinesia and other side effects are common with the older antipsychotic drugs. Clozapine acts specifically on dopamine and other receptors and reduces positive and negative symptoms, with fewer side effects. The prognosis for patients depends on factors including age of onset, gender, and culture.
- **There Are Important Considerations in Selecting a Psychotherapist:** Many types of education and training exist for psychotherapists. In selecting a psychotherapist, it is important to find someone with whom the client can establish a good relationship and who the client believes is committed to his or her improvement.

### Can Personality Disorders Be Treated?

- **Dialectical Behaviour Therapy Is Most Successful for Borderline Personality Disorder:** DBT combines elements of behavioural, cognitive, and psychodynamic therapy. Therapy proceeds in three stages. First, the most extreme behaviours are targeted and replaced with more appropriate behaviours. Next, the therapist explores past traumatic events. Finally, the therapist helps the patient develop self-respect and independence.
- **Anti-social Personality Disorder Is Difficult to Treat:** Psychotherapeutic approaches have not proved effective for treating anti-social personality disorder. Behavioural and cognitive approaches have been more effective, primarily in a controlled residential treatment environment. Generally, the prognosis is poor. Focusing on prevention by addressing conduct disorder in childhood may be the best strategy.

### How Should Childhood and Adolescent Disorders Be Treated?

- **The Use of Medication to Treat Adolescent Depression Is Controversial:** The use of medication, such as Prozac, is increasing as a treatment for adolescent depression. Such medications may lead to increased suicidality, but the available evidence indicates that medications may have more benefits than costs. Cognitive-behavioural treatment is also beneficial and may be preferred because its effects are long-lasting.
- **Children with ADHD Can Benefit from Various Approaches:** Ritalin, despite its side effects, is an effective pharmacological treatment and works best as part of an overall treatment plan including psychotherapy, particularly behavioural treatment.
- **Children with Autism Benefit from a Structured Treatment Approach:** Behavioural approaches have been effective in improving language and social behaviour. The treatment strategy is very time intensive and extends for years. In general, the long-term prognosis is poor.

## KEY TERMS

anti-anxiety drugs, p. 687	applied behavioural analysis (ABA), p. 719	cognitive-behavioural therapy (CBT), p. 683	dialectical behaviour therapy (DBT), p. 710	expressed emotion, p. 684
antidepressants, p. 687	biological therapies, p. 680	cognitive restructuring, p. 683	electroconvulsive therapy (ECT), p. 689	insight, p. 681
antipsychotics, p. 688	client-centred therapy, p. 682	cognitive therapy, p. 683	exposure, p. 683	psychotherapy, p. 680
				psychotropic medications, p. 686

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## ■ PRACTICE TEST

- Which of the following statements are true regarding how culture can affect the therapeutic process?
  - Culture can influence people's willingness to seek help.
  - Culture can influence the expression of mental disorders.
  - Definitions of mental health are consistent across cultures.
  - Strategies for assessing mental illness are consistent across cultures.
  - The extent to which mental illness is stigmatized varies by culture.
- Which of the following statements are true regarding pseudotherapies?
  - Because clients engaged in pseudotherapies may believe them to be valid, these clients may not seek effective therapies.
  - Pseudotherapies lack scientific evidence of their efficacy.
  - Some pseudotherapies are counterproductive, leading to increased levels of the behaviours they are intended to decrease.
  - Some pseudotherapies are physically dangerous, exposing clients to bodily harm or even death.
  - Special certifications are required for therapists wishing to practice pseudotherapies.
- Barlow advocates distinguishing between psychological treatments and general talk therapy. Which of the following attributes characterize psychological treatments?
  - Treatments should be based on evidence of their effectiveness.
  - Treatments should be appropriate for the particular disorders.
  - Specific techniques for treatment should be developed in the laboratory by psychological scientists.
  - Treatments should be guided by grand theories.
- Dialectical behaviour therapy takes place in three stages. Place the descriptions of the three stages below in the correct order.
  - The therapist helps the client explore past traumatic experiences that may be at the root of emotional problems.
  - The therapist helps the patient develop self-respect and independent problem solving.
  - The therapist works with the client to replace the most dysfunctional behaviours with more appropriate behaviours.
- During his early adult years, Joshua was diagnosed with anti-social personality disorder. Joshua is now 40. Over the coming years, his friends and family will likely see a decrease in which of the following behaviours? Select all that apply.
  - Joshua's lack of remorse for hurting others' feelings.
  - Joshua's tendency to feel entitled to special treatment.
  - Joshua's tendency to get into fist fights.
- Label each point below as an argument either for or against the practice of prescribing Ritalin (methylphenidate) to children with ADHD.
  - Children taking Ritalin are happier, more socially adept, and more academically successful than those who do not receive treatment.
  - Children taking Ritalin can experience disordered sleep, reduced appetite, bodily twitches, and temporary growth suppression.
  - Children taking Ritalin may come to see their ADHD as a problem beyond their control and may not learn coping strategies they will need later if they discontinue their medication or if it ceases to be effective.
  - Children taking Ritalin show a decrease in negative behaviours and an increase in positive behaviours.
  - The benefits of Ritalin are not maintained over the long run.
- Three-year-old Marley recently received a diagnosis of autism. Which of the following are true about her likely treatment?
  - Many individuals will need to be involved in Marley's treatment, including parents, teachers, and mental health practitioners.
  - Marley's treatment is likely to strain family dynamics and family finances.
  - Marley's treatment will focus largely on using social praise and small gifts to reinforce desired behaviour.
  - Marley's treatment will need to be highly structured.
  - Marley's treatment will require a minimum of 20 hours per week and will likely last for two to three months.
- Imagine you are asked to evaluate the quality of the following two methodologies for an empirical evaluation of a new treatment for ADHD. Label each of the methodologies as strong or weak. If a methodology is strong, briefly explain why. If a methodology is weak, provide a brief recommendation for strengthening it.
  - Parents will be asked whether they would like their child to receive medication or the new psychotherapy. Each child will be assigned to a condition based on the parents' preference.
  - The study will include four conditions: a nontreatment control group, a group receiving medication only, a group receiving the new psychotherapy only, and a group receiving both medication and the new psychotherapy.

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## ■ PSYCHOLOGY AND SOCIETY

- In a 2005 interview, the actor Tom Cruise claimed that "all [anti-depressants do] is mask the problem. There's ways with vitamins, and through exercise and various things. . . . Drugs aren't the answer. That these drugs are very dangerous; they're mind-altering drugs." First identify subclaims within the quote and then provide evidence supporting and refuting each subclaim, drawing from Chapters 14 and 15.
- Imagine your 10-year-old cousin has been diagnosed with ADHD. Your aunt and uncle ask if you have any advice on how to select a therapist and how to decide which treatments are most appropriate. Write an email to your relatives advising them on how to select a therapist and the kind of questions they will want to ask themselves and the therapist before choosing among treatment options.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.







# Cultural Psychology

IN SEPTEMBER 2005, A DANISH NEWSPAPER PRINTED CARTOONS CARICATURING the Muslim prophet Muhammad, violating a deeply held Muslim belief that the prophet should never be depicted. Many of the cartoons portrayed the prophet in deliberately offensive ways, such as with a bomb in his turban. Many Muslims responded with outrage. In the following months, citing the importance of freedom of expression, newspapers around the world reprinted the cartoons. By early 2006, Muslims' outrage had yielded some of the most widespread and angry demonstrations the world has witnessed. Across the Muslim world in the Middle East, Africa, and Asia, and among Muslim groups in North America, the South Pacific, and Europe,

## What Is Culture?

- Culture Consists of Information Transmitted through Learning
- Some Aspects of Culture Are Shared by Other Species, and Some Are Unique to Humans
- Humans Have Evolved to Accumulate Cultural Information

## What Is Cultural Psychology?

- Cultural Psychology Is the Study of How Culture Shapes Psychological Processes

## How Does Culture Affect the Mind?

- Culture and Mind Are Inextricably Bound
- There Is a Sensitive Period for Learning Culture

- Cultural Differences in Psychological Processes Become More Pronounced with Age
- The Self-Concept Varies across Cultures

## What Are the Psychological Consequences of Moving to a Different Culture?

- Acculturation Requires Significant and Often Stressful Adjustment
- People from Distinct, Minority Cultural Backgrounds Often Face Discrimination
- Multicultural People Can Switch between Different Selves
- Multicultural People May Be More Creative

## How Does Culture Affect How We Think and Behave?

- Cultures Differ in Analytic and Holistic Thinking

- Cultures Differ in Motivations for Control and Choice
- Cultures Differ in the Bases of Relationships
- Cultures Vary in Their Perceptions of Happiness
- Cultures Differ in Group Performance
- Cultures Differ in Moral Reasoning
- Language Influences but Does Not Determine Thought

## How Does Culture Influence Mental Health?

- Culture-Bound Disorders Are Largely Limited to Certain Cultural Contexts
- Some Universal Mental Disorders Present Differently in Different Cultures

**FIGURE 16.1 Cultural Conflict** Cartoons that caricatured the Muslim prophet Muhammad, published in newspapers, enraged Muslims around the world. The newspaper publishers cited freedom of speech, one of the highest cultural values in the Western world. Muslims who valued their religious beliefs over freedom of speech rioted and burned down buildings such as this Danish mission in Beirut, Lebanon.



people furiously and sometimes violently expressed their rage. They burned flags, torched embassies, and called for the violent deaths of the cartoonists and publishers. Dozens of people were killed in these demonstrations (FIGURE 16.1).

Those on either side of the conflict remain furious at and puzzled by the reactions of those on the other. In March 2010, a U.S. citizen and several Muslims in Ireland were arrested on charges of plotting to kill one of the Danish cartoonists. The next month, Muslim extremists warned that the creators of the cable-television cartoon series *South Park* were risking death for their outrageously satirical depiction of Muhammad, itself a response to the Danish-cartoon uproar. In May 2010, a Pakistan-born U.S. citizen, Faisal Shahzad, was arrested after trying to detonate a bomb in Times Square. Shahzad reportedly became radicalized, in part, by developments such as the Danish cartoons. These ongoing battles in a cultural war reflect the point made by political scientist Samuel P. Huntington in his 1993 article “The Clash of Civilizations?": With the end of the Cold War, Huntington argued, ideological and economic differences between people would be less important than religious and cultural ones.

The editor of the Danish newspaper justified the original publication of the cartoons by noting that Christian images are satirized quite frequently. For example, a much publicized contemporary Danish painting showed Jesus with an erection. So depicting Muhammad irreverently was an attempt to treat Muslims as equals in the cultural marketplace, to include their beliefs within the ongoing exchange of ideas that is the world. Furthermore, many Western commentators argued, freedom of expression must be treasured and exercised even if doing so means sometimes offending people. However, one protestor’s sign captured the feelings of many Muslims who rejected these arguments: “Freedom go to Hell!”

## What Is Culture?

### LEARNING OBJECTIVES

Explain what culture is.

Recognize how culture is adaptive for humans.

### Culture Consists of Information Transmitted through Learning

In a multicultural world, there is much potential for misunderstanding and conflict. To understand why this is so, you first have to understand what a culture is and how a culture functions. As discussed in Chapter 1, one common definition

of culture is that it refers to the beliefs, values, rules, and customs of a group of people who share a language and environment; these beliefs, values, rules, and customs are transmitted through learning from one generation to another. This definition describes culture in uniquely human terms (i.e., no other species has beliefs, values, rules, or customs, or even much evidence of a common language). But psychologists also define culture more broadly, and this chapter uses this more expansive definition. In this broader sense, culture is any kind of information acquired by individuals through imitative or social learning (Aoki, 1991). If that is what culture means, would you say that any other species can be said to have culture?

### Some Aspects of Culture Are Shared by Other Species, and Some Are Unique to Humans

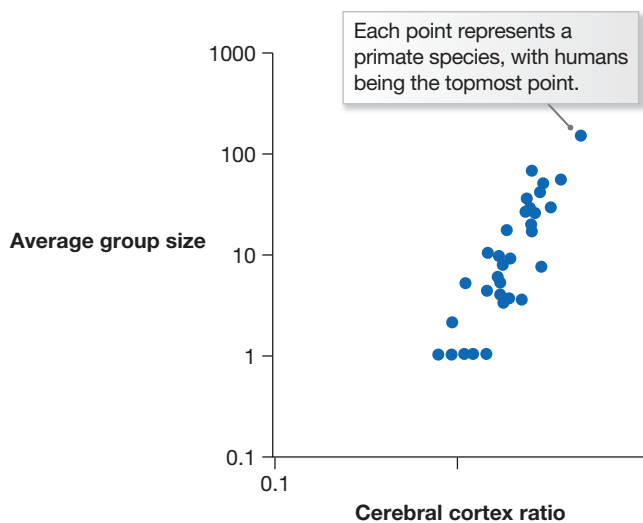
Humans are certainly a cultural species. People create cultural environments wherever they live, and these cultural environments shape the ways that people think and behave. Much research has found evidence for cultural learning in other species. For example, as discussed in Chapter 6, the clever monkey Imo developed the technique of washing potatoes. Through imitative learning, the other monkeys in her troop picked up this behaviour. Nonprimate species such as dolphins have demonstrated cultural learning; dolphins use distinctive sounds for each other in much the way humans use names (FIGURE 16.2; Janik, Sayigh, & Wells, 2006). Some less intelligent species such as pigeons and octopuses have shown limited evidence of learning from others within the species: for example, guppies will learn about routes or food sites from other guppies (Lachlan, Crooks, & Laland, 1998).

Humans, then, are not unique in being able to learn cultural information. But humans stand out in how much cultural learning they do and in doing it better than any other species. Yes, the monkeys learned to wash their potatoes from watching Imo, but it took considerable time for this behaviour to spread through the troop, and some of the monkeys never figured it out. In contrast, many aspects of human culture are learned by virtually every culture member, often after a single trial. For example, dialects, many words, and some specific tools are known by nearly everyone within a culture.

Moreover, unlike cultural learning in other animals, human cultural learning is so extensive that it pervades all aspects of our lives. The languages we speak, the ways we seek mates, the work we perform, the tools we use, the shelters we live in, the leisure activities we pursue, and the ways we relate to others are all cultural products. Indeed, it could be said that all human behaviour and all human thoughts



**FIGURE 16.2 Cultural Learning in Other Species** Nonhuman animals have communication systems. Some of these systems are visual, some are auditory, and some are tactile. For example, dolphins have visual, auditory, and tactile communication systems, and they even use vocal signals. How would animals' ability to communicate within their species be related to the levels of cultural learning of the species?



**FIGURE 16.3 Primate Groups and Their Brains** This scatterplot shows the relation, for various primate species, between average group size and the ratio of the cerebral cortex to brain volume. The larger the average group that a species lives in, the larger is the proportion of that species' brain that is made up of the cerebral cortex.

have been shaped in some way by cultural learning. The cultural learning identified in other species has thus far been limited to specific and often isolated aspects of their behaviours. The unique pervasiveness of culture in human lives allows us to say that humans are the only true cultural species.

## Humans Have Evolved to Accumulate Cultural Information

How has cultural learning become so central to our species? For our species to have evolved so that it depends this heavily on culture, culture must have been adaptive for our human ancestors—that is, culture must have had survival and reproductive value. What benefits might cultural learning have brought to our ancestors? Humans' social nature appears to have been a key factor in the evolution of the human brain. There is a clear relation between the average group size in which various primate species, including humans, live and the proportion of cerebral cortex in their brains (FIGURE 16.3; Dunbar, 1993): The larger the average group size, the larger the cerebral cortex ratio. This finding suggests that human brains evolved to be as big as they are because the cognitive capacities of a large brain were highly adaptive for social living.

Think of all the advantages possessed by primates in large groups. Such groups protect against predators and create significant pools of shared resources (FIGURE 16.4). However, such groups also present complex social dynamics, and individuals need to understand and navigate these dynamics if they are to survive within the group and particularly if they are to ascend the hierarchy.

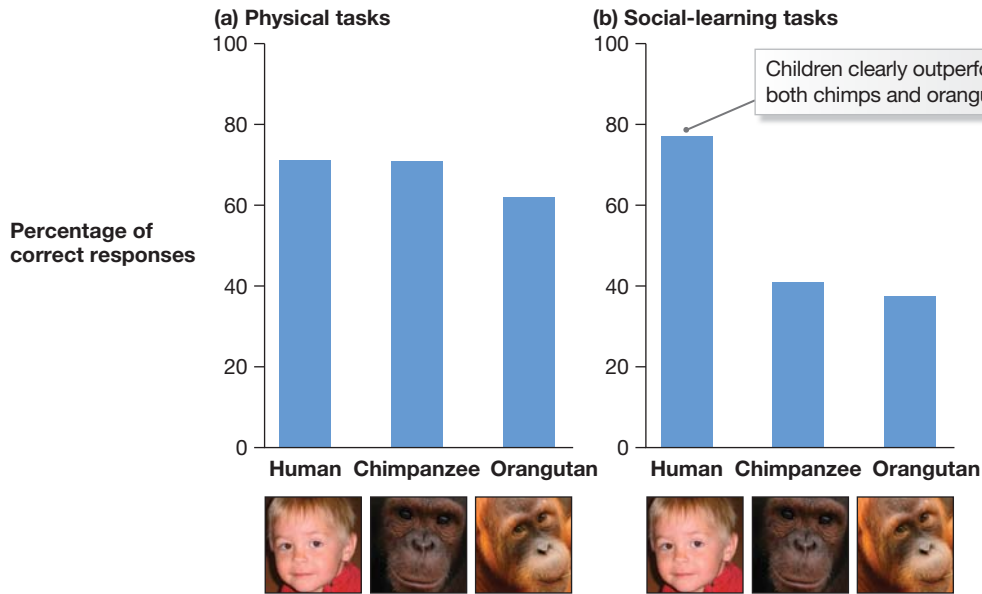
An even more significant benefit of group living for humans is that it provides greater opportunities for social learning. The ability to learn from others is far more developed in humans than in other primates. A study compared two-and-a-half-year-old human children with adult chimpanzees and orangutans on a number of cognitive tasks (Herrmann, Call, Hernández-Lloreda, Hare, & Tomasello, 2007). One set of tasks consisted of physical problems to solve (such as retrieving an out-of-reach reward with a stick). The children performed at about the same ability level as the chimps and orangutans on these tasks. A second set of tasks involved social learning, where the participants first watched a model solve a physical problem (such as how to get a reward out of a container). For these social-learning tasks the children clearly outperformed chimps and orangutans. These results suggest that humans do not differ all that much from other primates in terms of their general problem solving intelligence; rather, the human brain appears to have evolved to be especially adept at learning information from others (FIGURE 16.5). This skill at social learning required the evolution of two capacities that are largely unique to humans: sophisticated communication skills and a theory of mind.

First, humans evolved sophisticated communication skills that allowed them to convey beliefs, intentions, and complex thoughts. These skills, in turn, allowed individuals within a group to coordinate their behaviours (Pinker, 1994). The development of language, the human capabilities for which far transcend the communication skills of other primate species, was a key adaptation for cultural learning. Think of all the advantages that language gave humans. It allowed them to more accurately communicate needs, describe threats or opportunities, understand complex social dynamics, and more precisely describe and perpetuate cultural ideas.

Second, as discussed in Chapter 11, to understand social dynamics one must be able to identify the intentions of fellow group members—that is, one must have a theory of mind. Humans in all cultures develop a theory of mind early in life



**FIGURE 16.4 Living in Groups** These San bushmen live in the Deniui village, near Tsumkwe in the Kalahari Desert in eastern Namibia. They benefit from the advantages of living in large groups, such as access to shared resources and opportunities for social learning.



**FIGURE 16.5 Evolution and Social Learning** On physical tasks, 2.5-year-old children, chimpanzees, and orangutans had roughly the same percentage of correct responses, but the children had many more correct responses on social-learning tasks. These results suggest that humans have evolved specific social-learning skills.

(Callaghan et al., 2005). Evidence for a theory of mind in other species is much weaker, if not largely absent, though there is some conflicting evidence regarding its presence in chimpanzees. Having a theory of mind allows humans to imagine the intentions of others, and this ability allows cultural learning to occur with a far higher degree of precision than simple observation (Tomasello, 1999). Such high-precision cultural learning enables humans to do something important that no other species can do. Humans can *accumulate* cultural information. That is, after watching a model perform a behaviour, humans can reproduce that behaviour accurately and then improvise and add to that behaviour. In this way, cultural information accumulates and evolves.

The cumulative nature of human culture means that we can acquire a far richer degree of cultural information than could be learned in any individual's lifespan if each of us had to start from the beginning. So, for example, archaeological records reveal that tens of thousands of years ago humans used very simple tools, such as hammers and knives that were nothing more than rocks with slightly altered edges. Subsequent finds in the archaeological record reveal that these tools slowly became more and more sophisticated over generations and that cultural innovations in tools began to appear at an increasingly rapid pace. Think of how quickly cultural information accumulates today. For example, over the past few decades, the average power of computing chips has been doubling about every 18 months. The ability to accumulate cultural information, and to create increasingly sophisticated, complex, and powerful tools, has been (and remains) highly adaptive for humans. The utility of this accumulation of culture is not limited to physical technologies. Governments, institutions, education systems, popular culture, belief systems, and languages evolve over time as they build upon existing cultural information.

In contrast, the simple tools that chimpanzees use, such as a twig for fishing termites out of a mound (FIGURE 16.6), are not any more complex than those used by chimpanzees thousands of generations ago. Because they lack a theory of mind that is of the same degree as humans' theory of mind, chimpanzees and other animals cannot engage in high-precision cultural learning. As a result, each generation of animals can do little more than learn what the previous generation was able to do, and the cultural information does not accumulate. Each generation must start over at square one.

**FIGURE 16.6 Limited Cultural Information** Cultural learning occurs in non-human species, as when chimpanzees teach their young to use simple tools for acquiring food. Cultural information rarely accumulates in nonhuman species, however. Even over millions of years, chimpanzees have not developed more-sophisticated tools.



## SUMMING UP

### What Is Culture?

Culture can be defined as information that is acquired by individuals through imitative or social learning. Although some other species have culture, none are as adept at social learning as humans. This learning enables humans to accumulate culture, and the accumulation enables them to benefit from the learning of previous generations. Culture is adaptive in that it provides humans with tools, institutions, and communication systems.

## MEASURING UP

1. Which of the following statements is true regarding the cognitive abilities of nonhuman primates and young children?
  - a. On all cognitive tasks, young children outperform nonhuman primates.
  - b. On all cognitive tasks, chimpanzees outperform children younger than three years old.
  - c. Young children are similar to apes in their problem solving abilities, but are better than apes in their social learning abilities.
  - d. Social learning tasks are more difficult than problem solving tasks for humans and chimpanzees.
  - e. Orangutans outperform young children on social learning tasks, whereas chimpanzees outperform young children on problem solving tasks.
2. Which of the following statements are true about culture in humans and other animal species?
  - a. Only humans accumulate cultural information over generations.
  - b. All animal species show evidence for culture.
  - c. Only humans show evidence for culture.
  - d. Only primate species (including humans) show evidence for culture.
  - e. Some less complex species, such as pigeons, are able to learn cultural information from similar species.
  - f. Chimpanzee culture today is more complex than it was a thousand years ago.

### LEARNING OBJECTIVE

Define cultural psychology.

## What Is Cultural Psychology?

### Cultural Psychology Is the Study of How Culture Shapes Psychological Processes

The field of cultural psychology emerged because most researchers believe that culture plays a prominent role in our mental lives. It also emerged because psychologists wanted to see if behaviours and mental processes are the same in all cultures. Cultural psychology is the study of how culture shapes psychological processes. As social psychology emerged out of the fact that humans are ultimately social animals, and thus social environments have a great impact on how we think and feel, so cultural psychology emerged out of the fact that humans are ultimately cultural animals. Psychologists have been aware of the role of culture since Wilhelm Wundt, the founder of modern experimental psychology (see Chapter 1, “Introduction”), published his ten-volume *Elements of Folk Psychology* (1921), in which he argued that higher-order psychological processes needed to be studied by considering the cultural environments in which they occur. However, it was not until the early

1990s that cultural psychology research started getting published in mainstream journals and attracted the attention of the field.

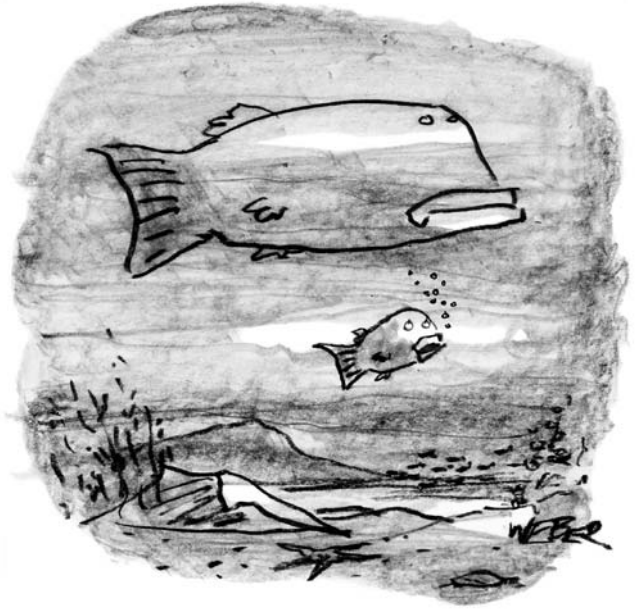
Like social environments, cultural environments arise from the interactions between people and from the information that people share. Cultural environments are social environments on a larger scale, with the norms and shared understandings that develop within them potentially extending to all aspects of an individual's life. Cultural environments are more sweeping and inclusive than social environments. Although you can quite easily leave one social situation and enter a new and different one, most people rarely leave their own cultural environments. Hence, most people are exposed to a single all-encompassing set of norms and shared understandings. Our own culture, like water to a fish, remains largely invisible to many of us. We often do not realize that people who grew up in other cultures may have a very different set of beliefs, values, rules, and customs than we do.

The following exploration of cultural psychology is guided by two key themes. The first addresses how each person is related to others. Every human is both a distinct, unique individual and a social creature that is fundamentally connected with others. How people accomplish individual goals and how they seek belongingness with others are two sets of behaviours that are emphasized differently across cultures.

A second theme in the chapter is that both universal and culturally specific psychologies exist. People the world over share the same biology, and at some level of analysis the psychological experiences of people around the world are universally similar. For instance, chili peppers taste spicy to people in Thailand as in Canada, in Poland as in Brazil. But at other levels of analysis we see pronounced cultural variation in psychological processes, such as the preferences for spicy tastes. Moreover, experiences within a culture can shape psychological experiences—hence people in Thailand, where spicy food is common, may develop a tolerance for strong chili peppers and not experience them as hot at all. A pepper considered mild in Bangkok or Mexico City might bring tears to the eyes of restaurant-goers in Toronto.

Cultural psychologists are interested in the ways that people with different cultural experiences differ in their psychological processes. As you read this chapter, bear in mind some of the key questions that we will be exploring. What is culture? How does culture affect thoughts and behaviours? Are fundamental ways of thinking universal across cultures? Is the sense of self universal across cultures?

As discussed in Chapter 2, however, a serious limitation of the conclusions that we draw from much psychological research is that often we do not know how well those conclusions generalize to other cultures. All people's brains normally function the same, so we do not have to question how well fundamental neuronal processes generalize. But because social interactions play a key role in higher-order psychological processes, it is less clear how these processes will emerge across cultures. Does a finding, say, that Canadian university students tend to rationalize their decisions indicate that people the world over make the same kind of rationalizations? The uncertainty that psychologists have about the generalizability of some of their research findings is due to the fact that most psychological phenomena have been studied primarily with university students in North America and Europe (Henrich, Heine, & Norenzayan, 2010). Furthermore, many of the findings about key psychological processes do not generalize well across cultures. Findings that have not been replicated include the susceptibility to some perceptual illusions (Segall, Campbell, &



*"Why is it so wet?"*

Herskovits, 1963; see also “Culture Influences Perception” in Chapter 5), the relation between thinking and speaking (Kim, 2002), preferential learning for nouns over verbs (Tardif, 1996), preferred decisions in the ultimatum game (Henrich et al., 2005), and some aspects of numerical reasoning (Gordon, 2004).



## SUMMING UP

### What Is Cultural Psychology?

Cultural psychology is the study of how culture shapes psychological processes. Cultural psychologists study how each individual is related to others. They also study how psychological processes occur in different cultures. The findings of cultural psychology have been largely limited in two ways: Most participants in psychology experiments are Western university students, and many findings do not replicate well across cultures.



## MEASURING UP

A cultural psychologist might study \_\_\_\_\_.

- the effects of genes on intelligence
- the neurological bases of food preferences
- the way that cultural information travels through the brain
- the way that a psychological process occurs in different cultures

## LEARNING OBJECTIVES

Recognize how universal human propensities can be expressed in culturally particular ways.

Understand how humans acquire cultural information as they are socialized.

Describe how the self-concept differs between people from individualistic and people from collectivistic cultures.



## How Does Culture Affect the Mind?

The American anthropologist Clifford Geertz (1973) asserted that “we all begin with the natural equipment to live a thousand kinds of life but end in the end having lived only one” (p. 45). This statement captures the tension between the universality and cultural variability of psychological processes. As discussed earlier in this chapter, humans in all cultures normally are born with the same basic potentials. We all could learn any language and adopt any cultural worldview if raised in the particular culture. Imagine how different your life would be if you were born into a very different cultural environment—for example, a Yanomamo hunting and gathering tribe in the Amazon river basin or a family of nomadic herders on the steppes of Mongolia (FIGURE 16.7). At the same time, many of the psychological experiences of humans are similar around the world.

### FIGURE 16.7 Cultural Worlds Vary

The film *Babies* (2010) nicely captures the vastly different cultural environments that humans are born into. This documentary looks at a year in the lives of four babies: one in Mongolia, one in Namibia, one in San Francisco, and one in Tokyo.





**TABLE 16.1** summarizes some findings from the anthropological literature regarding universal characteristics of humankind. As these findings suggest, a common foundation underlies the psychological experiences of all people. However, we also know that because people participate in specific cultures, and have experiences particular

**Table 16.1 Universal Behaviours, Reactions, and Institutions**

A sampling of some of the behaviours and characteristics that anthropologists believe hold for all human cultures, grouped into categories to show general areas of commonality.

**Sex, Gender, and the Family**

Copulation normally conducted privately	Rape	Rape proscribed
Live in family (or household)	Sex differences in spatial cognition	Sexual jealousy
Husband usually older than wife	Sexual modesty	Sexual regulation
Males dominate public realm	Division of labour by gender	Males more aggressive
Males more prone to lethal violence	Females do more child care	Marriage
Mother-son incest unthinkable	Incest prevention and avoidance	Preference for own kin

**Social Differentiation**

Age statuses	Classification of kin	Ingroup distinguished from outgroup
Division of labour by age	Leaders	

**Social Customs**

Baby talk	Pretend play	Group living
Dance	Rites of passage	Law (rights and obligations)
Dominance/submission	Tabooed foods	Magic to win love
Feasting	Toys	Practice to improve skills
Gossip	Body adornment	Property
Hygienic care	Death rites	Rituals
Magic to increase and sustain life	Etiquette	Tabooed utterances
Nonbodily decorative art	Food sharing	

**Emotion**

Childhood fear of strangers	Wariness around snakes	Rhythm
Facial expressions of fear, anger, disgust, happiness, sadness, and surprise	Envy	Melody

**Cognition**

Aesthetics	Anthropomorphism of animals	Myths
Belief in supernatural, religion	Medicine	Taxonomy
Classification of flora	Language	
Classification of fauna	Narrative	

SOURCE: Compiled by D. E. Brown, 1991, appearing in Pinker, 2003.

to those cultures, these universal psychological characteristics are shaped and expressed differently across cultures. For example, marriage is nearly a cultural universal—in almost all cultures there are formalized and publicly recognized enduring relationships centred around the raising of children (see Figure 11.38). But marital practices vary dramatically across cultures, with some cultures practicing monogamy (one husband, one wife), some practicing polyandry (one wife, multiple husbands), some practicing polygyny (one husband, multiple wives; the most common marriage system among contemporary hunting and gathering tribes, and likely also for most of human history), and some practicing homosexual marriage. Imagine the vast difference between married life with one spouse and married life with several. Universal tendencies can thus be expressed in culturally particular ways.

## Culture and Mind Are Inextricably Bound

The fact that many universal aspects of the mind are expressed differently across cultures demonstrates that culture and mind are not fully separable. Cultures emerge from the interaction of the minds of the people that live within them. Cultures in turn shape the kinds of things that those minds think about, and in so doing they influence the ways that those minds process information. For precisely this reason, many cultural psychologists argue that to have a rich understanding of the mind it is necessary to have a rich understanding of the culture in which a particular mind exists.

Consider the cultural practice, common in school systems across North America, of tailoring a child's education to his or her individual needs. In many North American schools, children are promoted or held back depending on their performance in class or on standardized tests. Likewise, many schools provide individualized education plans for students with many kinds of special needs, or use a strategy called "tracking," in which students within a grade are grouped according to their abilities. Such strategies reflect a desire to ensure that education addresses each child's specific and unique needs. In contrast, in school systems across Japan, during the period of mandatory education, *all* students are promoted together to the next grade regardless of whether some are performing at a level above or below their peers (this is sometimes called "social promotion" in North America). Likewise, Japanese students tend not to receive individualized education plans and are not grouped according to their abilities. The North American education system highlights the individuality of each student, whereas the Japanese system emphasizes the importance of students' belonging with their peers. Here, participation in a particular cultural environment (e.g., one that tracks or does not track students through school) can be seen to shape the mind.

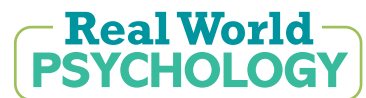
At the same time we acknowledge that culture can shape the mind, we have to ask how particular cultures came to be the way they are. How did North American school boards come to emphasize performance-based promotion and Japanese school boards come to emphasize social promotion? Although many factors influence how cultures develop, one is that they develop out of the participation of like-minded individuals. Interactions among individuals create cultural norms, and those norms reflect the underlying values of those individuals. For example, perhaps North American school boards decided to emphasize performance-based promotion because many North Americans believe it is important to respect the needs of individuals. The Japanese Ministry of Education's decision to emphasize social promotion likely emerged from the Japanese people's feeling that it is important to develop a strong sense of belonging with one's peers. That is, culturally shaped ways of thinking influence the education models that countries adopt. In this way, culture and mind are bound together. The mind is influenced by participating in certain cultural practices, and cultural practices are shaped by the minds of the people who live within them.

The underlying thesis of cultural psychology is that culture and mind make each other up (Shweder, 1991) and that we cannot properly study culture or mind without considering how each affects the other.

## There Is a Sensitive Period for Learning Culture

As discussed earlier, humans evolved to engage in cultural learning. Furthermore, in many ways, humans are pre-wired to acquire cultural information at a young age. Language development provides especially clear evidence for this. Though humans are capable of producing and recognizing approximately 150 phonemes, no language uses more than 70 of them. Interestingly, humans are born with the capacity to recognize all 150 phonemes, but through socialization and being exposed to certain languages, they lose the ability to distinguish between phonemes not in their own languages. For example, as discussed in Chapter 11, the Japanese language does not have separate phonemes for the sounds “la” and “ra,” and Japanese who do not learn English as children cannot reliably distinguish between them. Being exposed to a language shapes the ways that we perceive phonemes, and it does so early in life. One study found that native English-speaking children can distinguish between two similar phonemes from the Hindi language when they are 6–8 months old, but by the time they are 10–12 months old they have largely lost this ability (Werker & Tees, 1984). Even four-day-old infants show a preference for the rhythms of their own language over other languages (Mehler et al., 1988). Furthermore, our ability to learn new languages diminishes with age. People who acquire a new language after puberty often speak it with an indelible accent of their native tongue.

As with this sensitive period for acquiring languages, there appears to be a sensitive period for acquiring other kinds of cultural information. A study of Japanese-born children who moved to the United States at different ages along with their parents found that those who arrived after age 15 reported having a difficult time fitting in to life in the United States and preferred Japanese ways of doing things (Minoura, 1992). Similarly, a study of Hong Kong immigrants to Vancouver found that those who arrived in Canada after the age of 15 did not come to identify with Canadian ways more as their length of time in Canada increased, whereas those who arrived in Canada before the age of 15 identified more with Canada with each additional year they spent there (Cheung, Chudek, & Heine, 2010). That is, becoming Canadian appears to be more a function of how young someone is when he or she arrives in Canada. People who acquire the ways of a culture later in life appear to preserve an echo of the emotional repertoire of their original (or heritage) culture, an echo that is like the accent many people have when speaking a foreign language.



## Cultural Differences in Psychological Processes Become More Pronounced with Age

Humans are born without any culture, and they acquire culture as they are socialized. Children are particularly sensitive to cultural information from a very early age, and as they grow up they acquire more and more cultural information. The universal mind that children are born with comes to be shaped in culturally particular ways. For these reasons, cultural differences in psychological processes tend to increase as people age and are socialized into their respective cultural worlds.

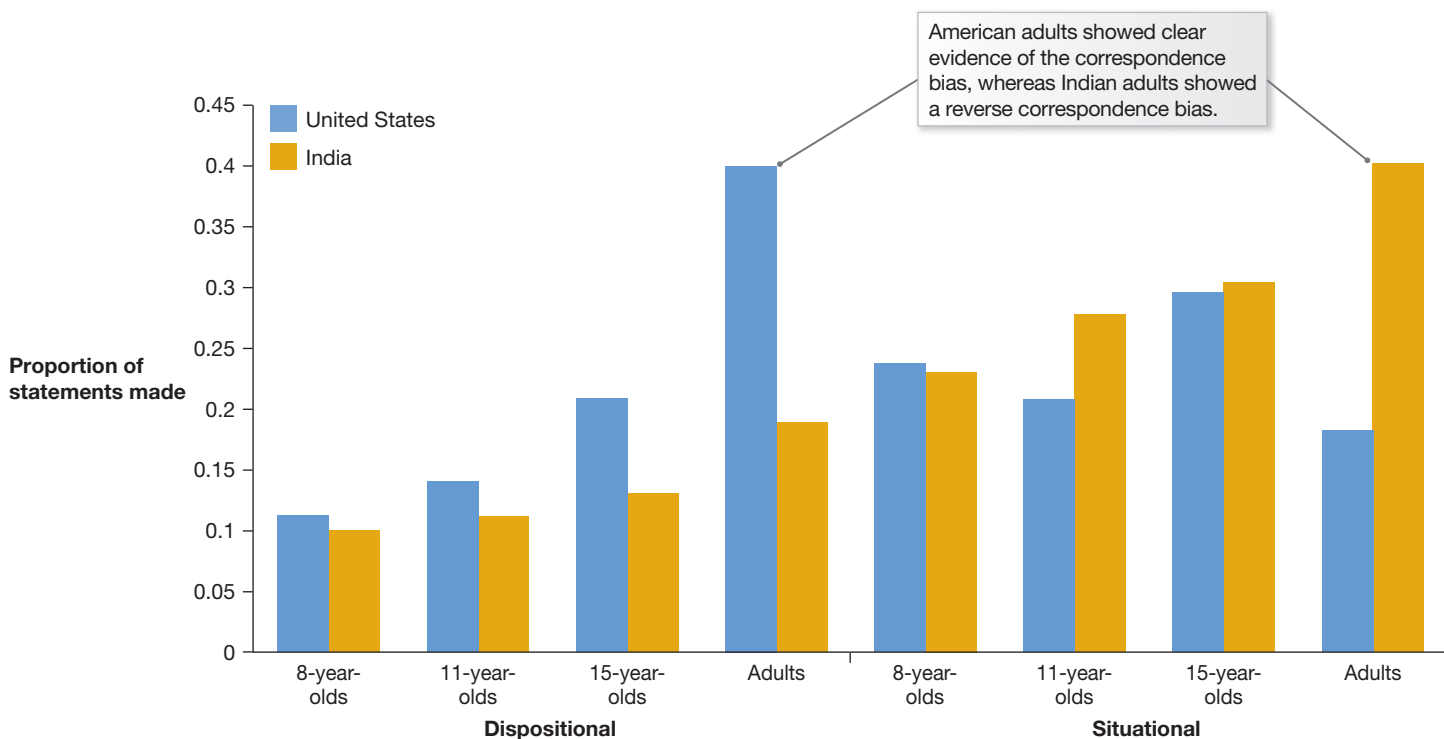
For example, consider how people develop theories to explain others' behaviours. As discussed in Chapter 12, the tendency to explain others' behaviours by emphasizing personal attributions over situational attributions is called correspondence bias, or the fundamental attribution error. People of Western descent tend to fall into this bias more readily than people from numerous other cultures, who use more information,

both situational and dispositional, when making attributions. This tendency is known as the correspondence bias. Westerners (i.e., people whose ancestors derive from Western Europe) tend to view the individual as the source of action and control, whereas people from South and East Asia, for example, tend to see behaviour as arising from an individual's interacting with others according to situational demands. Furthermore, this cultural difference in how people make attributions for other people's behaviours increases with age. The American psychologist Joan Miller (1984) asked 8-, 11-, 15-, and 19-year-old Americans and Indians to describe a situation in which someone had behaved in a prosocial or deviant manner and to then explain why the person had behaved that way. Here is an example that the study provides of a deviant behaviour as described by an Indian 19-year-old:

This concerns a motorcycle accident. The back wheel burst on the motorcycle. The passenger sitting in the rear jumped. The moment the passenger fell, he struck his head on the pavement. The driver of the motorcycle—who is an attorney—as he was on his way to court for some work, just took the passenger to a local hospital and went on and attended to his court work. I personally feel the motorcycle driver did a wrong thing. The driver left the passenger there without consulting the doctor concerning the seriousness of the injury—the gravity of the situation—whether the passenger should be shifted immediately—and he went on to court. So ultimately the passenger died (p. 972).

The participants' explanations were categorized in two ways. Either they indicated that something about the person (a personal, or dispositional, attribution) caused the action, or they indicated that something about the situation (a situational attribution) caused the action. A personal attribution could be irresponsibility or callousness, for example, while a situational attribution could be having important work obligations or a victim's not looking seriously hurt. As shown in **FIGURE 16.8**, eight-year-olds from the two cultures gave quite similar responses. The older American participants tended to make more personal attributions but a constant number of situational attributions. In contrast, the older Indian participants tended to make more situational attributions but a constant number of personal attributions. In other

**FIGURE 16.8 Dispositional and Situational Attributions** This graph shows (left) the proportions of dispositional statements made in Joan Miller's 1984 study and (right) the proportions of situational statements made in the study. In the United States and India, eight-year-olds made approximately equal numbers of statements that attributed behaviour to personal characteristics. Adults in the United States were far more likely to cite personal characteristics, while adults in India were far more likely to cite situational characteristics.



words, American adults showed clear evidence of the correspondence bias, but none of the other American age groups or the Indians showed much evidence of it. Indeed, the Indian adults showed a reverse correspondence bias (they emphasized situational factors more than personal ones). Other studies, too, have shown that universal potentials come to be shaped by culture and that those cultural influences grow larger with age (see Gabrenya, Wang, & Latane, 1985; Ji, 2008).

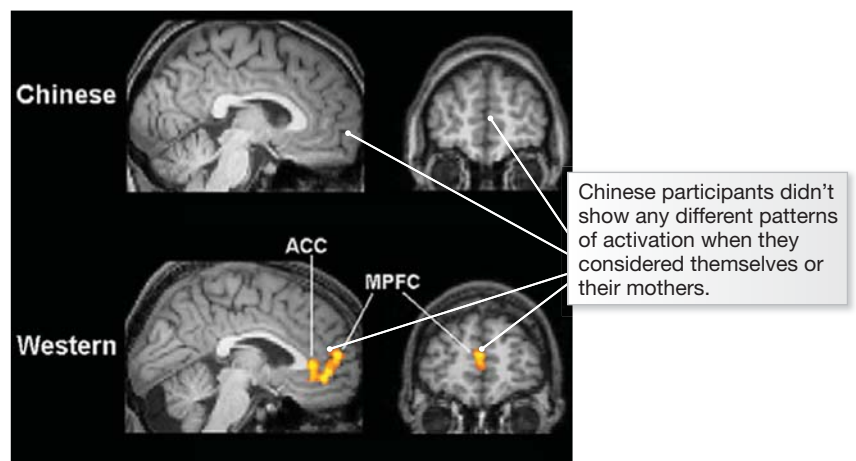
## The Self-Concept Varies across Cultures

Being socialized in a particular cultural context affects much of how people think. In particular, it shapes how people come to view themselves. As discussed in Chapter 13, the self is experienced differently in different cultures. In individualistic cultures, people's senses of themselves are likely to be independent, grounded in internal aspects of themselves (such as attitudes, personality traits, and abilities); people emphasize ways in which they are distinct from others, and they value self-reliance. In collectivistic cultures, people's senses of themselves are likely to be interdependent, grounded in shared aspects of themselves (such as roles, relationships, and group memberships); people in these cultures emphasize how they are connected with others, and they value group harmony (Markus & Kitayama, 1991).

Neural imaging can present evidence of these cultural differences. In one study, Western and Chinese participants were instructed to consider how well a number of adjectives described themselves and how well they described their mothers. In Westerners, different regions of the brain were activated when the participants evaluated themselves than when they evaluated their mothers. In the Chinese, the same brain regions (located in the medial prefrontal cortex, where other work has found increased activation on self-related tasks; Heatherton et al., 2006) were activated for both types of evaluation, a finding that suggests the Chinese participants' mental representations of themselves and of their mothers are fused (FIGURE 16.9; Zhu et al., 2007).

Because the self-concept is implicated in how we process information that relates to ourselves, these cultural differences in self-construals affect a wide array of psychological processes. Research on the self-concept has shown that people in Western cultures are powerfully motivated to view themselves as consistent. For example, across a diverse range of situations people tend to view themselves consistently and to behave consistently (e.g., Funder & Colvin, 1991). People strive to make their behaviours consistent with their attitudes (Festinger, 1957; Heider, 1958). Because dissonance arises when behaviours and attitudes clash (see Chapter 12, "Social Psychology"), people are motivated to change their attitudes to justify their actions.

How similarly do you view yourself in different situations? When you are hanging out with your friends, for example, you probably act differently than when you are meeting with your professor, but do you feel like a different person? If your sense of self is primarily connected with characteristics within you, such as your traits and attitudes, then your self-concept should be relatively consistent across situations, as those characteristics tend to remain constant. But if your self-concept is primarily connected with the roles and relationships that you have with others, then your self-concept should vary depending on what roles and relationships are



**FIGURE 16.9 Cultural Variation in Brain Activity** These brain scans show the activation in brain regions when Chinese people and Americans thought about themselves and when they thought about their mothers. The coloured areas represent areas of activation. Whereas the Chinese used identical regions of the brain for both thoughts about themselves and thoughts about their mothers, Americans showed activation in different regions.

important in a given situation. Which of these scenarios would you imagine is the case for people from East Asian cultures? In a study by Kanagawa, Cross, and Markus (2001), Japanese and American participants completed a questionnaire in numerous different settings. As in the exercise described in “Our Self-Concepts Consist of Self-Knowledge” in Chapter 13 (p. 614), they were asked to write 20 open-ended sentences that described themselves. Some completed the questionnaire while alone, some completed it while sitting next to a peer, some completed it in a group, and some completed it in a professor’s office. Whereas the American participants gave highly similar responses across the different settings, the Japanese participants gave different responses depending on who was in the room with them (also see Cousins, 1989; Suh, 2002). In other words, the interdependent self-construal appears to vary in different contexts much more than the independent self-construal does.

As discussed in Chapter 12, when people act in ways that are inconsistent with their inner beliefs they feel anxiety and discomfort and are motivated to reduce these feelings by resolving the inconsistency. This reaction makes sense to the extent that people view their beliefs as determining their behaviours, as they tend to do in the West. In contrast, when people believe that their behaviours arise to fit social norms or to meet the expectations of others, as they tend to do in East Asia, their experience of dissonance is different.

Think about a difficult decision you have made, such as choosing which university to attend, deciding on a major, or figuring out how to deal with a family member’s illness. Many people, particularly those from North America and Europe, tend to follow difficult decisions with rationalizations. After making your decision, did you feel comfortable with it? Were you sure it was the right decision? Did you convince yourself that it was right by focusing on only the positive aspects of that choice and the negative aspects of other choices? As discussed in Chapter 12, this kind of rationalization is known as postdecisional dissonance. Westerners show clear evidence of postdecisional dissonance, but East Asians generally do not (Heine & Lehman, 1997). As researchers at the University of Waterloo found, however, East Asians do show postdecisional dissonance when making choices for others—for example, when ordering food for friends at a restaurant (Hoshino-Browne et al., 2005). This finding suggests that East Asians are motivated to make their behaviours consistent with others’ expectations (also see Kitayama, Snibbe, & Markus, 2004). Likewise, Poles (who also tend to be more interdependent than Americans) strive to act in ways that are consistent with others’ actions, whereas Americans are more likely to act consistently with the ways that they have in the past (Cialdini, Wosinka, & Barrett, 1999). In sum, depending on their self-construals, people strive to be consistent in different ways.



## SUMMING UP

### How Does Culture Affect the Mind?

There are many universal human propensities, but they tend to get expressed in culturally specific ways. It is difficult to fully separate culture and mind because cultural practices can shape the ways that people think and are themselves shaped by the values, thoughts, and behaviours of people in those cultures. People likely evolved to depend on cultural information, and they are especially adept at learning it while they are young. As people are exposed to cultural information over time, that information continues to shape their thinking. For this reason, cultural differences in psychological processes become more pronounced with age. A key

cultural difference is that people from individualistic cultures have more-*independent* selves, whereas people from collectivistic cultures have more-*interdependent* selves. These differing senses of self shape the ways that people understand both themselves and their worlds.

### ▶ MEASURING UP

1. When a person moves to a new culture, \_\_\_\_\_.
  - a. he or she is immediately influenced by the cultural practices there
  - b. if the person is younger than 15 years of age, he or she will identify with the new cultural practices more easily than a person older than 15 will
  - c. he or she remains largely uninfluenced by the new cultural practices and continues to act in ways consistent with his or her original culture
  - d. the person can easily identify with the new culture if sufficiently motivated to
2. Self-consistency differs across cultures in that \_\_\_\_\_.
  - a. people from collectivistic cultures strive to be more consistent than those from individualistic cultures
  - b. people from collectivistic cultures are just as bothered by inconsistency as are those from individualistic cultures; however, they are less willing to assert their consistency
  - c. people from collectivistic societies aspire for their decisions to be consistent with their beliefs
  - d. people from collectivistic cultures experience the self more differently across situations than do those from individualistic cultures

## What Are the Psychological Consequences of Moving to a Different Culture?

Some humans migrated out of Africa about 60,000 years ago. Since at least that time, humans have been a migratory species, and there have likely never been any large-scale societies composed solely of people from one cultural background. Rather, in such societies people from different cultural backgrounds have always interacted on a regular basis. Still, the extent to which people are migrating to different countries is higher now than ever before. Toronto, for example, used to be made up largely of people of British ancestry, but today it is as cosmopolitan as cities come. In 2005 Statistics Canada projected that by 2012 the visible minority (i.e., nonwhite) population of the city will have come to be the majority (Statistics Canada, 2005; **FIGURE 16.10**). The growing cultural diversity of communities around the world raises an important question. If people think in quite different ways across cultures, what happens to a person's sense of self when that person moves to a different cultural environment?

### Acculturation Requires Significant and Often Stressful Adjustment

**Acculturation** is the process by which people, having migrated to a different cultural environment, come to learn a culture that differs from their original culture. Research on acculturation is difficult—and it is often hard to identify basic commonalities in

### ◀ LEARNING OBJECTIVES

Identify the stages of acculturation that people commonly go through.

Recognize how cultural distance and cultural fit predict acculturative success.

Understand how people with multiple cultural backgrounds can frame-switch between different selves.

Recognize how multiculturalism can be associated with creativity.

**acculturation** The process of adaptation to a culture different from one's own.



**FIGURE 16.10 Acculturation** Throngs greeted Pope John Paul II as he rode through Toronto in his Popemobile in July 2002. Here, the many flags convey some of the national backgrounds and cultures represented in the crowd. These immigrants share common religious beliefs with many Canadians, so they are likely to have a close cultural fit.

**U-shaped curve** In psychology, a pattern of acculturation, characterized by three phases: the “honeymoon stage,” “crisis” or “culture shock,” and “adjustment.”

**culture shock** The feelings of anxiety, estrangement, helplessness, and incongruousness with one’s surroundings that often follow emigration to a new cultural environment.



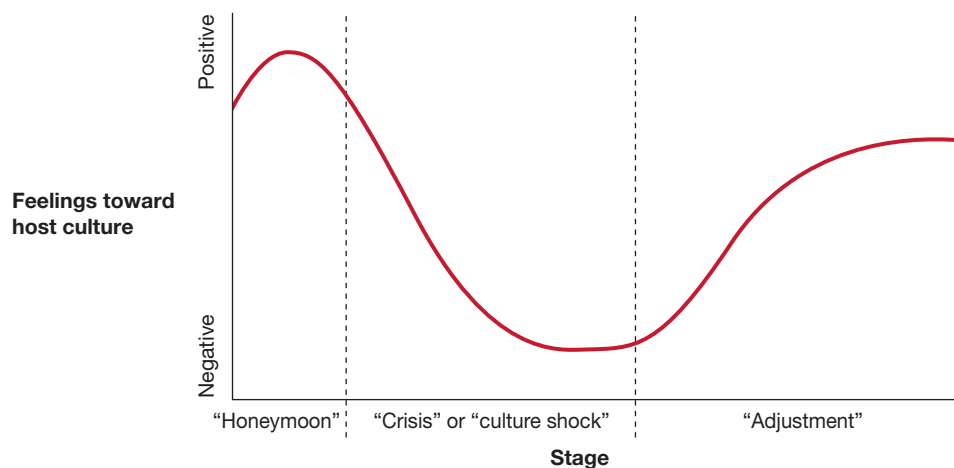
**FIGURE 16.11 Culture within Culture** Every year, thousands of people immigrate to Canada from places all over the world. To what extent does becoming Canadian mean abandoning one’s home culture? Here, Sikhs celebrate Vaisakhi, an event that marks the inauguration of Sikhism in 1699. The details might suggest India, but this photograph was taken in Vancouver, BC.

the acculturation process—because individuals have very different experiences depending on where they come from, where they migrate to, their reasons for migrating, their ages, their genders, their sexual orientations, and the social networks they have in their new communities. For example, the experience of moving to Toronto will differ greatly for someone coming from an English-speaking Western culture, such as Australia, than for someone coming from a developing, non-Westernized culture, such as Sri Lanka. Despite the tremendous variability in people’s acculturation experiences, all acculturation involves psychological adjustment (**FIGURE 16.11**). Furthermore, this adjustment is often extremely stressful.

Have you ever moved to a different culture? If so, think about the kinds of adjustment you went through. The psychological adjustment associated with acculturation does not occur suddenly, but takes

place over many years, sometimes over generations. One way to look at this adjustment is to consider people’s attitudes to their new culture (often referred to as the host or mainstream culture). A common pattern of adjustment for acculturating individuals forms a **U-shaped curve** (**FIGURE 16.12**; Lysgaard, 1955). Often, the first few months in the new culture are exciting, as people revel in their novel and exotic experiences. Following this “honeymoon stage” (often from 6 to 18 months in the new culture, although the time varies greatly across individuals), many people develop quite negative views toward their host culture, as the novelty wears off and people find themselves in a foreign place where they often have few close friends from the host culture and lack much of the basic knowledge and many of the language skills necessary to thrive. This stage is called the “crisis” or “culture shock” stage. **Culture shock** is the anxiety, helplessness, irritability, and general homesickness that people experience on moving to a different culture (Church, 1982). Following this period of unhappiness, people typically learn how to exist in the host culture, make friends, improve their language skills, and slowly develop increasingly positive attitudes toward the host culture. This “adjustment” phase tends to extend over a number of years.

Not everyone has the same acculturating experiences. For some, the adjustment is of less significance. One important factor in predicting acculturative success is



**FIGURE 16.12 Adjustment and Acculturation** As this graph shows, acculturating individuals generally experience three stages of adjustment. During the “honeymoon” stage, their feelings toward the host culture are very positive. During the “crisis” or “culture shock” stage, their feelings become especially negative. During the “adjustment,” their feelings gradually become more positive, though they do not regain the heights of the “honeymoon.”



**cultural distance**, the difference between two cultures in their overall ways of life. Not surprisingly, the smaller the distance, the easier acculturation should be. For example, an immigrant to Quebec from France would have to make fewer adjustments than an immigrant to Quebec from Zaire (Berry & Annis, 1974; Ward & Kennedy, 1995). The greater the differences between an individual's heritage and host cultures, the more significant the adjustment that person must make, and the more likely it is that the person will experience significant stress. Likewise, some individuals' values and personalities allow them to fit in with their host cultures better than other people's do. **Cultural fit** is the degree to which an individual's values and personality are similar to the dominant cultural values in the host culture. Studies find that people with values and personalities that are more similar to those that are common within the host culture have an easier time adjusting (Cross, 1995). And, of course, people's personalities most likely reflect the overall tendencies of their particular cultures. For example, people from English-speaking countries tend to score higher in extroversion than people from some Southeast Asian countries, among them Singapore (McCrae et al., 2005). Consistent with this, Singaporeans who scored high in extroversion adjusted better when they moved to New Zealand than those who scored low; and English-speaking expatriates who scored high in extroversion reported more adjustment problems when they moved to Singapore than those who scored low (Armes & Ward, 1989; Searle & Ward, 1990). The better the fit between an individual's personality and values and the host culture, the easier will be the adjustment process.

**cultural distance** The disparity in customs, traditions, beliefs, and general heritage between two cultures.

**cultural fit** The degree to which one's values and behavioural norms align with those common to another culture.

## People from Distinct, Minority Cultural Backgrounds Often Face Discrimination

Immigrants to different cultural environments have to make significant psychological adjustments as they learn how to fit in, and immigrating populations vary tremendously in terms of the ease with which their members adjust. For some, the adjustment is gradual and relatively painless. For others, it is not. Compounding the difficulties of immigration is the fact that people from different cultures are not always treated with equal respect. As Chapter 12 highlighted, prejudice and discrimination toward many ethnic groups persist around the globe. For many people, moving to a different cultural environment is fraught with active discrimination, systematic disenfranchisement, unjust treatment, mocking and humiliation, violence, and even threats to their lives. People in the host country sometimes make matters worse by grouping immigrants into inaccurate ethnic categories, as when Canadians view those from India and Pakistan or from Korea and China as members of the same group. Moreover, prejudice against minorities is not limited to those who move to foreign places, but also extends to those whose ancestral backgrounds are different.

One consequence of being discriminated against, as discussed in Chapter 8, is stereotype threat. Stereotypes represent cultural beliefs—that is, they are shared beliefs among members of a culture. People are vulnerable to stereotype threat whenever a negative stereotype exists about a group to which they belong. People succumb to stereotype threat whenever they act in a way consistent with a negative stereotype about a group to which they belong and thus are at risk for “proving the stereotype.” Stereotyped minorities are particularly vulnerable to falling victim to self-fulfilling prophecies (see Chapter 15, “Treatment of Psychological Disorders”) and acting in ways consistent with the negative beliefs that others have about their groups (Steele & Aronson, 1995).

All cultures have negative stereotypes about certain groups, but the groups that are stereotyped vary tremendously across cultures. In many countries, indigenous



(a)



(b)



(c)

**FIGURE 16.13 Modern-Day**

**Discrimination** (a) A step toward ending discrimination: Drummers from a number of coastal First Nations protest a pipeline that would run through their communities.

(b) More steps against discrimination: Maori protestors march in Auckland to protest a new municipal government structure that would not include reserved Maori seats.

(c) Discrimination in place: Many Muslims in London, England, live in the poor area of Whitechapel. Economic inequity plagues many such immigrant communities.

**frame-switching** The shifting of thoughts and behaviours to those appropriate for a given cultural context.

populations are the targets of discrimination, such as First Nations people in Canada, aboriginal groups in Australia, the Maori in New Zealand, the Katkari in India, the Mapuche in Chile, and the Ainu in Japan (FIGURE 16.13). Likewise, groups that once were enslaved by others are often the victims of persistent discrimination, such as African Americans in the United States, Indonesians among the Dutch, Hungarians in the Ottoman Empire, Jews in the Roman Empire, and certain indigenous tribes, such as the Mossi in Western Africa. Furthermore, immigrants who compete with nonimmigrant workers for jobs (in particular, when the immigrant groups are from historically poorer regions of the world) are salient targets of discrimination, such as the Irish in the nineteenth-century United States, Turks in Germany, Arabs in France, Pakistanis in England, Koreans in Japan, Poles in Russia, and so on. Every national culture includes groups that are actively discriminated against. Historical circumstances, economic competition, and cultural distinctiveness all play an important role in determining which groups become targets of discrimination.

Although having a distinct cultural background is sometimes associated with discrimination, being from a distinctive group also has psychological benefits. People with a distinctive cultural background are more likely to come to strongly identify with their group and to increase their loyalty toward it—their distinctive group membership becomes an important source of meaning and self-esteem in their lives (Brewer, 1991). This stronger sense of group identification engenders many positive feelings among minority members toward themselves and their groups and appears to be an important means to cope with the discrimination that distinctive cultural groups sometimes experience (Schmitt & Branscombe, 2002).

### Multicultural People Can Switch between Different Selves

What happens when people with experience in more than one culture switch between different cultural contexts? When people move to a different cultural environment and learn a second language, they typically do not end up speaking a language that is a mixture of their first and second languages—for example, Indonesian speakers who learn English do not speak Engloesian. Rather, they learn to switch between Indonesian and English depending upon the context.

The same kind of **frame-switching** holds for psychological processes that vary between cultures. Frame-switching is changing how you think and behave depending on the context. So, for example, a girl growing up in an inner city African American neighborhood thinks and behaves one way with her neighborhood friends and another when volunteering at a nursing home (Anderson, 1999). Importantly, frame-switching does not occur just for consciously accessible behaviours (such as how one talks), but also for thoughts that lie beyond people’s awareness, such as how they make attributions (see Chapter 12, “Social Psychology”).

As discussed earlier, Indians are more likely to explain behaviours in situational terms than are Americans, who tend to emphasize personal factors. This emphasis on the situation has been identified in other collectivistic cultures, such as Chinese, and it has also been shown to hold for how people explain the behaviours of non-humans, such as fish (Morris & Peng, 1994). The Hong Kong University researcher Ying-yi Hong and colleagues (Hong, Morris, Chiu, & Benet-Martinez, 2000) hypothesized that people who have been exposed to two cultural worlds frame-switch between making situational or personal attributions depending on which context is made important to them. The researchers studied Chinese people in

In a multicultural society, challenges can arise when people of different cultural backgrounds interact. What is the best way to deal with group differences in a multicultural community? Should those differences be ignored, so that people can focus on the similarities they share with people from different ethnic groups and perhaps attend to all that humans have in common? Or should such differences be acknowledged and be viewed as a source of strength? This issue divides society and psychologists.

Viewing all people as sharing similarities is frequently called a “colour-blind” approach. The hope underlying this approach is that people will interact without giving much attention to each other’s ethnic backgrounds. Much research has shown that people very easily adopt an “us versus them” mindset and favor their own group over other groups (Gaertner, Mann, Murrell, & Dovidio, 1989). People are more likely to show such intergroup discrimination when their attention is called to group boundaries, even when those group boundaries are based on trivial distinctions (e.g., whether people belong to a group that prefers art by the painter Wassily Kandinsky or a group that prefers art by the painter Paul Klee; Tajfel, 1974). If attention is not drawn to people’s distinctive cultures, therefore, people will be less likely to create boundaries between themselves and others.

In contrast, attending to and celebrating group differences is frequently called a multicultural approach. The rationale behind this approach is that people really *do* identify strongly with their groups (and likely have since ancestral times), particularly if their groups are smaller than other groups or are disadvantaged in some way. Minority groups tend to greatly value their group identities, and they often respond quite negatively to efforts by majority group members to ignore their distinctive group identities (Verkuyten, 2005). Efforts to downplay group differences may come across as suggesting that minority members would

be accepted as long as they shed their distinctive cultural identities and act like the majority group.

Research has revealed that groups that emphasize multicultural messages fare better in numerous respects than groups that emphasize colour-blind messages. For example, an extensive study of a few thousand employees from various companies assessed the relationship between each company’s attitude toward diversity and employees’ engagement with their work (Plaut, Thomas, & Goren, 2009). The more multicultural (and the less colour-blind) were the attitudes of the white employees, the more minority members were engaged with their work. Similarly, minority members have more trust and comfort with a company that offers multicultural messages than with one that offers colour-blind messages, especially when the company has only a few minority employees (Purdie-Vaughns, Steele, Davies, Ditlemann, & Crosby, 2008). White students also show more-positive attitudes toward minority members when the environment presents multicultural messages than when it presents colour-blind ones (Richeson & Nussbaum, 2004; Wolsko, Park, Judd, & Wittenbrink, 2000). According to another study, white Canadian and First Nations participants had more-positive conversations after being exposed to multicultural messages than after being exposed to colour-blind messages. Further, the multicultural messages increased the identity security of the First Nations participants while reducing the amount of negative emotion expressed by the white Canadians (Vorauer, Gagnon, & Sasaki, 2009).

In light of these findings, which approach would you take as an employer? To improve relations across diverse ethnic groups, would you emphasize people’s similarities? Or would you encourage people to be mindful of the diversity around them? In what ways might you combine the positive aspects of each approach?

Hong Kong, reasoning that the long Western influence over this former British colony would have left the citizens familiar with both traditional Chinese ways and Western traditions. Participants were asked to explain the behaviour of a target fish that was swimming in front of other fish (FIGURE 16.14). The explanations of the target fish’s behaviour were compared across the conditions. As Figure 16.14 shows, those primed to think Chinese thoughts were especially likely to explain the target fish’s behaviour in terms of situational (external) attributions, whereas those primed to think American thoughts were especially *unlikely* to use situational attributions to explain the target fish’s behaviour. The Hong Kong Chinese participants could switch between Chinese and Western ways of explaining the fish’s behaviour,

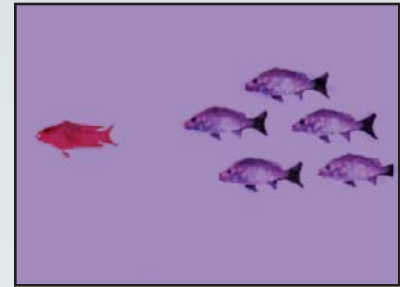
FIGURE 16.14 Scientific Method: Frame-switching in Action

**Hypothesis:** People who have been exposed to two cultural worlds can frame-switch between making situational or personal attributions.

**Research Method:**

(1) Chinese participants in Hong Kong were either shown pictures intended to prime traditional Chinese thoughts (e.g., a Chinese dragon, the Great Wall, a rice farmer), pictures intended to prime American thoughts (e.g., Mickey Mouse, the Statue of Liberty, a cowboy), or pictures to prime neutral thoughts (e.g., nature scenes).

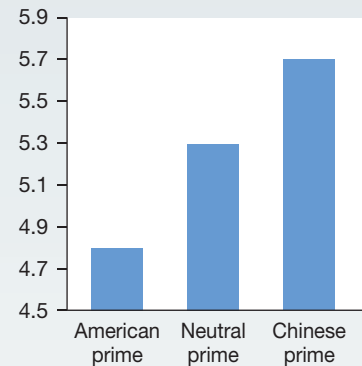
(2) All of the participants were then shown a stimulus like the one at right, and were asked whether the red fish was being chased by the other fish (i.e., behaviour driven by the situation), or whether the fish was leading the other fish (i.e., behaviour driven by personal decisions).



**Results:**

Hong Kong participants who were primed with American images were least likely to attribute the fish's behaviour to situational forces, whereas those primed with Chinese images were most likely to view the fish as acting because of situational forces.

Likelihood of making an external attribution



**Conclusion:**

The Hong Kong Chinese participants could unknowingly switch between Chinese and Western ways of explaining the fish's behaviour.

and they did so, even though they were unaware that Chinese and Westerners tend to make different kinds of explanations for others' behaviours. (Participants in cultural research studies are consistently surprised to learn of the cultural differences in attributions. People do not seem to have intuitions about how culture shapes their explanations of people, let alone about fish.) This tendency to frame-switch has been identified with various other psychological measures, including self-enhancement and co-operation (Ross, Xun, & Wilson, 2002; Wong & Hong, 2005). Multicultural people seem to switch between different self-construals depending on the context.

### Multicultural People May Be More Creative

Artists of many kinds have created some of their most famous works during or following stints abroad. For example, the American author Ernest Hemingway wrote books such as *The Sun Also Rises* while living in France. The French painter Paul Gauguin rendered his signature paintings while living in Tahiti. The Taiwanese director Ang Lee directed movies such as *Brokeback Mountain* while living in the United States. The Canadian author Yann Martel wrote his bestseller *The Life of Pi* after growing up in Costa Rica, France, Mexico, and Canada. One possible explanation for this pattern is that people with creative personalities are more likely to desire multicultural experiences. A competing explanation is that there is something about adjusting to life in another culture that makes people more creative (Leung, Maddux,

Galinsky, & Chiu, 2008). Indeed, one key feature of creative insight is that people come to see something from a new and different perspective. Adjusting to life in another culture might provide a shift in perspective that allows people to see things differently. According to research by Will Maddux (of INSEAD, in France) and Adam Galinsky (from Northwestern University, in the United States; 2009), people who have lived in different cultures perform better on creativity tests (e.g., the Duncker candle problem; see Figure 8.19) than do people who have lived exclusively in one culture; merely visiting different cultures as tourists does not lead to enhanced creativity. Further, when people who had lived in multiple cultures were primed to think about adapting to life in another culture, they became more creative than did those people who were primed to think about other things (FIGURE 16.15). Having multiple perspectives, such as those gained by adapting to life in a new culture, appears to enhance creative thought.

**FIGURE 16.15 Scientific Method: Creativity and Adapting to Different Cultures**

**Hypothesis:** Thinking about adapting to different cultures leads to enhanced creativity.

**Research Method:**

(1) Multicultural participants were asked to imagine thinking about adapting to a new culture (Adapt Prime), observing a foreign culture (Observer Prime), or did not receive any such instructions (No Prime).

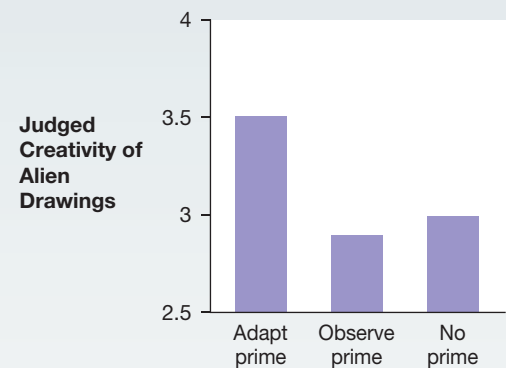
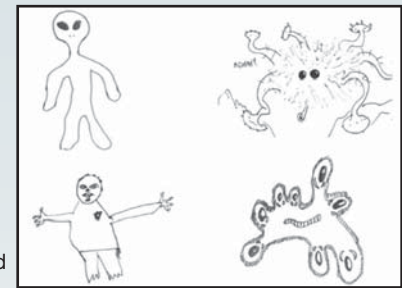
(2) The participants were then asked to draw an alien, unlike anything observed on Earth.

**Results:**

Objective judges evaluated the drawings that followed the adapting prime to be more creative than those done in the other conditions.

**Conclusion:**

Adapting to a new culture makes people aware of multiple perspectives, and this awareness helps make them more creative.



**SUMMING UP**

**What Are the Psychological Consequences of Moving to a Different Culture?**

Acculturation involves much psychological adjustment, which often is stressful. Generally, a person who moves to a new culture first enjoys the experience, then goes through a period of culture shock, and gradually fits in and succeeds in the new cultural environment. A person from a more distant culture, or who has a poor cultural fit, undergoes more-significant adjustment in the acculturation process. Over time, a person's habitual ways of thinking can change with acculturation, as the person engages in new cultural practices. Many people from distinct, minority cultural backgrounds suffer much discrimination and experience stereotype threat. Multicultural people can switch between different selves depending on which self is activated by the context. Further, multicultural people's access to more than one perspective can enhance their creativity.

**MEASURING UP**

1. Which of the following stages is not typically associated with the acculturation experience?
  - a. negotiation stage
  - b. adjustment stage
  - c. crisis stage
  - d. honeymoon stage

2. People who are exposed to multiple cultures tend to \_\_\_\_\_.
  - a. think in terms of a mixture of their different cultural values
  - b. oscillate between their different cultural frames at regular intervals
  - c. choose one cultural perspective and stick with it, regardless of circumstance
  - d. switch between different cultural frames depending on what situation they are in

## How Does Culture Affect How We Think and Behave?

### LEARNING OBJECTIVES

Describe the differences between analytic and holistic thinking.

Recognize how cultures differ in terms of their motivations for control and choice.

Understand how the nature of relationships can vary across cultures.

Describe how cultures vary in their perceptions of happiness.

Explain how cultures differ in their performance within groups.

Recognize how moral reasoning varies across cultures.

Understand how language can influence thought.

You have a rich set of psychological experiences. Included within that set are all of your feelings, thoughts, and beliefs. How similar do you think your feelings, thoughts, and beliefs are to those of people in other cultures? As discussed earlier, people in individualistic cultures tend to have different views of themselves than people in collectivistic cultures have. These different self-construals influence many of the ways in which we think. For example, how we understand ourselves influences how we understand others: We often use our theories about how we think to understand how other people think. Further, and more profound, how we understand other people appears to influence how we understand other, nonsocial aspects of our world as well.

### Cultures Differ in Analytic and Holistic Thinking

Which of the following three is least like the other two? A dog, a carrot, a rabbit. The psychologists Ji, Zhang, and Nisbett (2004) asked this and similar questions of American and Chinese university students. A clear trend emerged from their responses. Americans tended to group the dog and rabbit together, excluding the carrot, whereas Chinese tended to group the rabbit and carrot together, excluding the dog. The American responses indicate a **taxonomic categorization** strategy—the stimuli are grouped on the basis of perceived similarities of attributes. A dog and a rabbit are both mammals, whereas a carrot is not—that is the reason that the Americans put them together. In contrast, the Chinese responses indicate a **thematic categorization** strategy—the stimuli are grouped on the basis of a relationship among them. Rabbits have a relationship with carrots in that they eat them, whereas dogs have little relationship with either rabbits or carrots. These two categorization strategies reflect an underlying difference in the ways that people with independent and interdependent views of self think about their worlds.

One way of thinking is known as **analytic thinking**. Analytic thinking is characterized by a focus on objects and their attributes. Objects are perceived as existing independently from their contexts, and they are understood in terms of their component parts. The attributes that make up objects are used as a basis to categorize them, and a set of fixed, abstract rules is used to predict and explain the behaviour of objects. A second way of thinking is known as holistic thinking. **Holistic thinking** is characterized by an orientation to the context as a whole. It is an associative way of thinking in which there is attention to the relations among objects, and among the objects and the surrounding context. Objects are understood in terms of how they relate to their context, and the behaviour of those objects is predicted and explained on the basis of those relationships. In general, analytic thinking is more common in individualistic cultures, particularly those in North America

**taxonomic categorization** A system of grouping stimuli based on perceived similarities of attributes.

**thematic categorization** A system of grouping stimuli based on perceived relationships among them.

**analytic thinking** A system of evaluation in which a person views objects as independent from context and in terms of individual characteristics. The person then uses the resulting assessments to form a set of abstract rules meant to predict and explain the objects.

**holistic thinking** A system of evaluation in which a person views objects with regard to context and in terms of the relationships between them. The person then uses the resulting assessments to guide behaviour.

(Kitayama, Park, Sevincer, Karasawa, & Uskul, 2009). In contrast, holistic thinking is more common in collectivistic cultures, particularly those in East Asia, where it has been studied the most.

To consider your own thinking style, look at **FIGURE 16.16**. Do both pictures show the same caribou? Japanese and American participants were shown these two pictures as well as dozens of similar ones that included many different animals. Unlike you, they never saw a pair of pictures side by side. Participants saw one picture and then they saw either the same scene again or the same animal, such as the caribou, with a different background. They were then asked whether they had seen that animal before. Japanese and Americans did equally well on this task when they were shown the same picture the second time. However, when they were shown a picture of the same animal with a new background, Japanese participants were more likely than Americans to say that they had not seen the animal before. This effect generalized across a broad array of different scenes. Apparently, Japanese people attend a great deal to background and see focal objects in relation to the background. So when the background changes, the focal object also appears different. Americans, in contrast, focus primarily on the foreground. So they do not readily notice changes in the background (Masuda & Nisbett, 2001). Indeed, research that places East Asians and Americans in eye-trackers (devices that measure where people's gazes are directed) reveals that East Asians look significantly more at the backgrounds of scenes than do Americans (Chua, Boland, & Nisbett, 2005).

Cultural differences in analytic and holistic thinking also become evident through the Figure Line Task (**FIGURE 16.17**). In this experiment, participants are shown a stimulus: for example, a square that is 90 mm tall and has within it a line that is 30 mm long. Participants are then presented with two squares that are less than 90 mm tall and asked to draw a particular line in each. For the “absolute task,” the participants need to draw a line the exact length of the stimulus line (i.e., 30 mm). For the “relative task,” they need to draw a line that has the same proportion to its square as in the stimulus—that is, the line should be one-third the height of the square. People with analytic perceptual styles excel at separating a foreground object from its background, and thus they tend to be good at the absolute task (reproducing the exact length of the line in the target square when they draw it in the different-sized square). People with holistic perceptual styles are adept at preserving the relations between a foreground object and its background, and thus they tend to be good at the relative task (reproducing the relative length of the line in the target box when they draw it in a different-sized square; Kitayama, Duffy, Kawamura, & Larsen, 2003). When people from East Asia perform the absolute task, they show more activity in regions of the brain associated with attentional control than when they perform the relative task. This finding indicates that the absolute task is more difficult for them. In contrast, Americans show more activity in attentional control centres when they perform the relative task. This finding indicates that the relative task is more difficult for them (Hedden, Ketay, Aron, Markus, & Gabrieli, 2008).

## Cultures Differ in Motivations for Control and Choice

Cultures differ in many ways of thinking other than analytic and holistic thinking. Control is one example. Striving for control over life is a universal human concern. However, the ways that people seek control can vary across cultural contexts. The American psychologists Rothbaum, Weisz, and Snyder (1982) proposed two kinds of control: primary and secondary. People achieve a sense of **primary control** by striving to shape existing realities to fit their perceptions, goals, or wishes. For



(a)



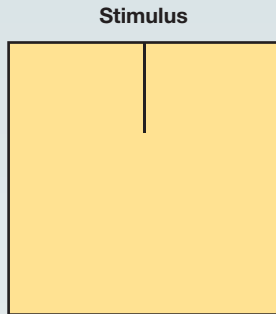
(b)

**FIGURE 16.16 Identity in Context** In a 2001 study by Masuda and Nisbett, East Asians and Americans were shown these figures separately. When viewing slide (b), East Asians were more likely than Americans not to recognize that they had already seen the same caribou in slide (a).

**primary control** Influencing one's environment to achieve one's goals, desires, or wishes.

### FIGURE 16.17 Try for Yourself: Analytic versus Holistic Perception

Look at the stimulus. Do not measure the length of the line in it.



In the “absolute task” square, draw a line that is as close as possible to the *absolute length* of the line in the stimulus. Then, in the “relative task” square, draw a line that is as close as possible to the *relative length* of the line in the stimulus—that is, line should be one-third the height of the “relative task” square. Measure each of your lines with a ruler.

#### Absolute task



#### Relative task



#### Result:

The “absolute” line should be 12 mm long. The “relative” line should be 6 mm long.

#### Explanation:

People from individualistic cultures tend to perform better at the absolute task. People from collectivistic cultures tend to perform better on the relative task. Which task were you more accurate in? Is this result consistent with what researchers would expect, given your cultural background?

**secondary control** Psychologically aligning oneself with another to achieve a sense that one’s goals, desires, or wishes are being fulfilled.

example, imagine that you really want to watch the new Seth Rogen movie. You would be exerting primary control by convincing a friend to go with you and heading off to the Cineplex to see the movie. This kind of control is especially familiar to Westerners. People achieve a sense of **secondary control** when they attempt to align themselves with existing realities, leaving the realities unchanged but exerting control over their psychological impact. For example, imagine that your friend says no to the Seth Rogen film and states that she really wants to see the new Sandra Bullock movie. You could exert secondary control by convincing yourself that you would like to see this movie too.

Though everyone experiences both kinds of control, cultures differ in terms of how common each type is. Specifically, primary control is more common and more desired in individualistic cultures, such as in the United States, whereas secondary control is more common and more desired in collectivistic cultures, such as in Japan (Morling, Kitayama, and Miyamoto, 2002). The participants in Morling, Kitayama, and Miyamoto’s study were undergraduates, and the American students viewed secondary control as aversive and often described it in terms of change, as in “I had to adjust when my roommate’s boyfriend kept coming over.” The Japanese students tended to describe their secondary control experiences more positively, as in “My friend wanted to go out for coffee, so we went to the coffee shop together.”

One way that people exercise primary control is by making choices, trying to ensure that their existing realities match their desires. Choice appears to be a greater concern for those from individualistic cultures. For example, a study of European American and Asian American children in grade five compared their choices in a computer game (Iyenger & Lepper, 1999). The participants were divided into three groups: Children in a “personal choice” condition were allowed to make a number of choices that were irrelevant to the success of the game (e.g., the name of their spaceship). Those in an “outgroup choice” condition were not allowed to make any choices. They were told that their spaceship had been given the name that was most popular among grade-three students at another school (it turns out that grade-five students do not have much respect for the opinions of grade-three students). Those in an “ingroup choice” condition were told that their spaceship had been given the name that was most popular with the students in their own class. The experimenters then measured how many games the children attempted during a fixed time period. As **FIGURE 16.18** shows, the European American children played more games when they chose the name of their spaceship and played fewer games when members of either an outgroup or an ingroup chose for them. The European American children seemed to react negatively to the idea that others were choosing for them, regardless of who those others were, and lost interest. In contrast, the Asian American students attempted the most games when their own classmates chose the spaceship name for them. However, like the European Americans, they were not very motivated when members of an outgroup chose for them. Apparently, the Asian American children viewed the ingroup’s choosing as an opportunity to promote a sense of belongingness with other group members. The European Americans, in contrast, seemed to react as though they had been stripped of their freedom to choose.

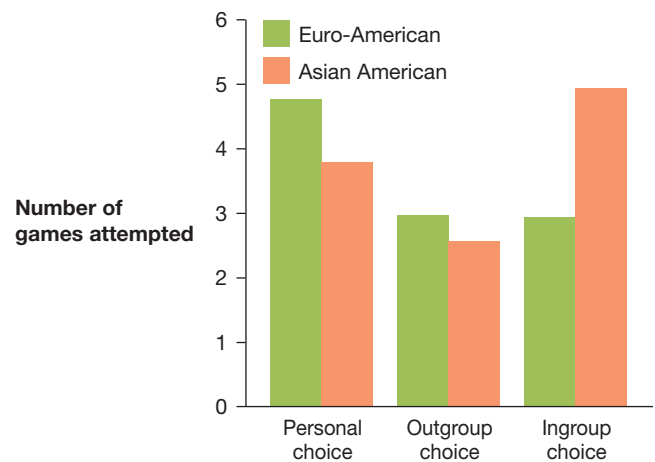


The role of culture in choice becomes even clearer when we consider what acts constitute choices. The Indian cultural psychologist Krishna Savani and colleagues (in press) had students in the United States and in India come to the labs and perform a number of actions: For example, the participants had to select a seat to sit in, select a pen to complete a consent form, select a magazine to read, and so on. At the end of the study, participants were asked to list all the choices they had made in the course of the study. The Americans tended to list about twice as many choices as Indians, even though they completed the same set of tasks. That is, Americans were more likely than Indians to view their behaviours as expressions of free choice. The freedom to choose is valued even more in North American contexts than it is in other Western cultures. For example, in one survey of people from the United States and five Western European countries, people were asked whether they would prefer a choice from 50 ice cream flavours or 10 ice cream flavours. Only the American sample preferred a choice from 50 flavours (Rozin, Fischler, Shields, & Masson, 2006).

A complicating factor in such studies is that, as noted earlier, most participants in psychology studies are university students, who tend to differ from other members of the population in certain ways. Most obviously, they tend to be of higher socio-economic status (SES) than those who do not go to university, and SES is one important aspect of a culture. People of higher SES tend to have more choices than those of lower SES. Those with lower SES more often have to accept what is given to them rather than being able to choose from a range of alternatives. The cultural psychologists Alana Snibbe and Hazel Markus (2005), at Stanford University, demonstrated that upper-middle-class Americans were less satisfied when they had been deprived of making a choice than were working-class Americans. Even within a country, people of different SES view choices, and choice itself, differently.

## Cultures Differ in the Bases of Relationships

In some cultures, one of the most important choices that people make is deciding whom they will marry. Indeed, for many people, this choice is their biggest concern, and fretting about it occupies years of their lives. However, reflecting clear cultural differences in the value of choice, and in the nature of marriage, in many cultures people do not choose their marriage partners. Rather, their families do. **TABLE 16.2** shows some of the different kinds of mate selection patterns in pre-industrial societies (Broude & Green, 1983). Indeed, in over half of the societies, and especially so for women, parents and kin play a significant role in the decisions. And **arranged marriages** are not a feature of just pre-industrial societies: They are still present in China, India, Japan, and Turkey and among orthodox Jews (although the rates of arranged marriages in many cultures have recently been dropping; e.g., Sprecher & Chandak, 1992). Furthermore, arranged marriages do not seem to be necessarily less satisfying than **love marriages**. In the initial years of marriage, those in love marriages profess more love for their partners than do those in arranged marriages. Over time, those in arranged marriages reported having the most love (**FIGURE 16.19**; Gupta & Singh, 1982). The existence of arranged marriage in some cultures and its absence in others reflect very different attitudes toward what marriage entails. In cultures where extended family systems are strong (i.e., there is much interdependence among parents, grandparents, uncles, aunts, and cousins), there tend to be more arranged marriages than in cultures that have a nuclear family structure (Lee & Stone, 1980).



**FIGURE 16.18 Choice and Motivation**

This chart summarizes the results of Iyengar and Lepper's 1999 study. **(Left to right)** American children of European descent played more games than Asian American children when they were allowed to make choices, even though those choices were tangential to the game. Both groups of children played about the same number of games when an outgroup made choices for them. Asian American children played far more games when an ingroup made choices.

**arranged marriage** A type of marriage in which the bride and groom have been preselected by the bride's and groom's respective families.

**love marriage** A type of marriage in which the bride and groom have selected each other as marriage partners.

**Table 16.2 Mate Selection Practices in Pre-industrial Societies**

	MEN	WOMEN
Parents choose partner; individual cannot object	13%	21%
Parents choose partner; individual can object	17%	23%
Both individual choice and arranged marriages are acceptable	18%	17%
Individuals, parents, kin, and others must agree on an appropriate match	3%	3%
Individual chooses partner autonomously: parental, kin, and/or community approval necessary or highly desirable	19%	29%
Individual chooses partner autonomously: approval by others unnecessary	31%	8%

Based on Broude & Green, 1983, pp. 273–274.

Note: The numbers indicate the percentage of pre-industrial societies that adopted each mate selection practice for each sex.

Moreover, individualistic societies are more likely to favour love marriages. The notion that each person is a unique individual is associated with the view that each person has unique needs that can be fulfilled only by another equally unique partner (Dion & Dion, 1993).

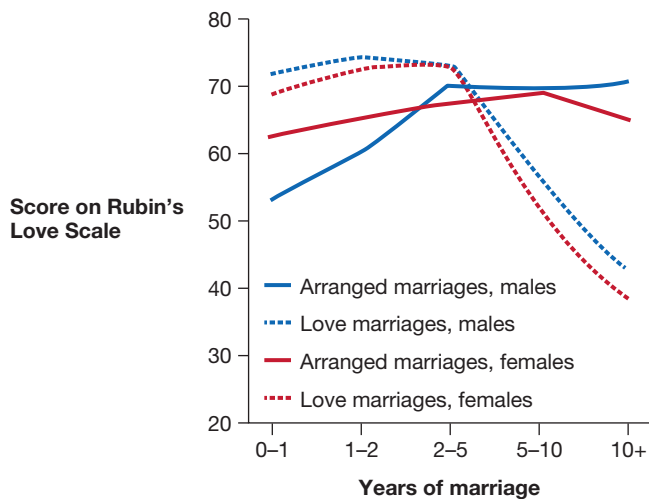
The meaning of friendships also varies across cultures. Consider the following poem:

Beware of friends.  
 Some are snakes under grass;  
 Some are lions in sheep's clothing;  
 Some are jealousies behind their façades of praises;  
 Some are just no good;  
 Beware of friends.  
 (Kyei & Schreckenbach, 1975, p. 59)

This Ghanaian poem expresses a sentiment that is quite common in West African collectivistic contexts (Adams & Plaut, 2003). In a cultural context that emphasizes how people are fundamentally connected, why would people view friends with suspicion?

Adams argues that relationships are more conditional in individualistic contexts. The default state between any two individualistic people is that they have no relationship. A relationship must be developed, and people must make efforts to do so, which they will do only if they perceive benefits from being in that relationship. Individualistic societies typically provide people with many opportunities to abandon less desirable relationships and pursue new ones—that is, people have high relational mobility (Falk, Heine, Yuki, & Takemura, 2009).

In contrast, in collectivistic contexts, the default state between any two people in the same ingroup is that they have a relationship. Their relationship exists because of their positions within their social networks, regardless of whether that relationship benefits or harms them. They have little relational mobility and few options to pursue new relationships if their current ones are not so desirable. In collectivistic contexts, close relationships are not automatically assumed to be positive ones. Friendships bring not only good times but also obligations, which can be costly. The American cultural psychologists Glenn



**FIGURE 16.19 Arranged and Love Marriages in India** The Indian psychologists Usha Gupta and Pushpa Singh's 1982 study was based on the "love scale," a questionnaire developed by the American social psychologist Zick Rubin to measure couples' feelings of love and liking. As shown here, the amount of reported love after ten years of marriage was strikingly higher for Indians in arranged marriages than for Indians in love marriages.

Adams and Victoria Plaut (2003) found that Ghanaians are more suspicious of friendships than Americans. Likewise, Ghanaians are more likely than Americans to feel that they have enemies, and they are more likely than Americans to view those enemies as coming from their close personal networks (Adams, 2005).

These differences in the bases of relationships are also connected with differences in the value of physical attractiveness. In cultural environments where relational mobility is high, physical attractiveness is especially valued, as it allows the person to succeed in attracting a wider array of interested partners. As discussed in Chapter 12, physical attractiveness can be associated with a number of other positive qualities according to “what is beautiful is good” stereotypes. However, in cultural environments where relational mobility is low, physical attractiveness is less valued, as there are fewer opportunities to attract interested partners. Because of this, there are also fewer positive qualities associated with physical attractiveness. Cross-cultural research conducted with Americans and Ghanaians finds that whereas Americans who were rated by objective judges to be more physically attractive reported having more-satisfying outcomes in their lives (e.g., they rated having more-satisfying careers, social lives, and lives in general), reflecting the “what is good is beautiful” stereotype, Ghanaians who were rated as more physically attractive reported *less* satisfying outcomes in their lives (Anderson, Adams, & Plaut, 2008). Physical attractiveness is of more benefit in societies where people have more opportunities to form new relationships.

## Cultures Vary in Their Perceptions of Happiness

People everywhere pursue activities that make them happy. Happiness, a state of mind and an emotion, feels good. It signals to the individual that all is well. An abundance of research reveals the clear benefits to being happy, such as increased longevity and greater career success—at least in North America, where most of this research has been conducted (Lyubomirsky, King, & Diener, 2005). Given that happiness has such beneficial consequences, should governments do what they can to maximize their countries’ gross national happiness (GNH)? The notion of a GNH might make you think of a giant collective feeling, like the one that Canadians shared after their team won the gold medal in men’s hockey in the 2010 Olympics, but the concept is more complicated than that. It was coined in 1972 by Bhutan’s former king Jigme Singye Wangchuck as an alternative to the economic indicator called the gross national product (GNP), and it refers to citizens’ overall sense of their quality of life and their country’s social progress.

Defined as a feeling or as a sense of progress, happiness is a central value among North Americans. Indeed, the pursuit of happiness has been central enough to American culture that it was described as an “unalienable right” in the Declaration of Independence. Approximately 89 percent of Americans and 85 percent of Canadians report being quite happy, and these numbers have remained constant over the past 60 years (Veenhoven, 1993).

But happiness has not always played such a central role in people’s lives. In 1843, the British historian Thomas Carlyle wrote that “‘happiness our being’s end and aim’ is at bottom, if we will count well, not yet two centuries old in the world.” Carlyle referred to changes during the Enlightenment, the seventeenth-century intellectual, scientific, and cultural movement in which the world was seen as a more rational place and happiness was seen as achievable through efforts to pursue a good life. Before the Enlightenment, people cared less about how they could become happy and more about how their souls could be saved.

In today’s world, people from Northern and Western Europe, various English-speaking countries, and much of Latin America are most likely to describe themselves



(a)



(b)

**FIGURE 16.20 Happiness and Economic Status** (a) The Maasai, a semi-nomadic ethnic group of Kenya and northern Tanzania, are economically among the poorest peoples on the planet. Yet, despite the problems of sustaining their traditional pastoral lifestyle, they are one of the happiest populations ever studied. (b) Wealth predicts happiness, but only up to a point. Research suggests that this man, if he is typical of wealthy people, would probably be just as happy with his life if he could only afford a somewhat more modest lifestyle.

as happy (Inglehart & Klingemann, 2000). People from former Soviet republics and some impoverished countries in Africa and South Asia are least likely to report being happy. Around the world, people are not equally satisfied with their lives. Why do cultures vary in their levels of happiness? Answering this question is perhaps more complicated than you might expect. The unhappiness reported in Africa and South Asia suggests that poverty is associated with unhappiness, but research reveals that wealth reliably predicts happiness only up to a point. After the point at which average citizens can satisfy their basic needs (indicated by an average GNP at least 40 percent of that of the United States), no clear relation between wealth and happiness exists across nations (Diener & Biswas-Diener, 2002). A country's levels of human rights and of income equality among its citizens are both associated with higher levels of national happiness (Diener, Diener, & Diener, 1995).

Cultural factors also affect how people in different countries view happiness (FIGURE 16.20). In Latin American nations such as Puerto Rico, Colombia, and Brazil, people report that it is especially desirable to experience positive emotions. People in these countries report feelings of happiness that are far greater than would be predicted on the basis of their countries' GNPs. At the other extreme, people in East Asian countries such as Japan, Taiwan, and South Korea are more likely than those from other cultures to report that they do not especially value happiness (Diener, 2001). People in these countries are notably less happy than would be predicted on the basis of GNP. As the Japanese social psychologist Hiroshi Minami writes, "It seems that feelings about happiness in life are for some reason diluted among the Japanese. The reason that the word 'happiness' is not used daily is not only because the Japanese masses are not blessed with happiness in daily life but because they have cultivated a habit of hesitation toward happiness" (1971, p. 34). This hesitation toward happiness may have grown out of a concern with balance in East Asian thought, where life is viewed as cyclical, so that happy times are necessarily viewed as leading to unhappy times (Spencer-Rodgers, Peng, Wang, & Hou, 2004). With such a view, one cannot systematically work toward increasing happiness without knowing that some day there will be a payback for having had all those good feelings. Rather than working toward happiness, many Asians work toward maintaining a proper balance in their lives.

In addition, cultures vary as to the *kind* of happiness they prefer. The American psychologist Jeanne Tsai and colleagues have found that North Americans tend to prefer positive emotions that are high in arousal, such as excitement and elation. In contrast, East Asians tend to prefer positive emotions that are low in arousal, such as calmness and relaxation (Tsai, Knutson, & Fung, 2006). To make themselves feel happier, European Americans are more likely to engage in active activities such as jogging or rollerblading, whereas Asian Americans are more likely to engage in passive activities such as sightseeing and picnicking. Young North Americans tend to prefer music with faster tempos than do East Asians. Users of illegal drugs in the West are more likely to seek excited states (e.g., from cocaine or amphetamines), whereas users of illegal drugs in East Asia are more likely to seek calm states (e.g., from heroin or opium; Tsai, 2007). In sum, cultures vary in their overall levels of happiness because (1) cultures differ in their ability to provide universally desirable features (such as sufficient wealth, human resources, and income equality), and (2) cultures differ in their ideas about what happiness is.

## Cultures Differ in Group Performance

People in individualistic and collectivistic cultures differ in how they relate to each other. These differences have a significant impact on how people behave in groups. Take the example of **social loafing**. Research reveals that Westerners tend to work

**social loafing** The tendency for a person to work less hard in a group than when working alone.

harder when they are being evaluated as individuals than when their group is being evaluated. In a classic study, the American sports psychologist Alan Ingham and colleagues (1974) divided the participants into two teams. They asked each member of one team to pull as hard on a rope as he or she could. On average, each person pulled 59 kilograms. The researchers divided the second team into groups of three and asked all three together to pull as hard as they could, but each group included two confederates who stood behind the true participant and just pretended to be pulling. When participants thought that other people were pulling on the rope with them, they pulled only 48.5 kilograms. That is, they showed evidence of social loafing. Research conducted in collectivistic cultures, however, reveals that this phenomenon is not universal. Chinese and Israelis have been shown to work harder in a group than as individuals (a tendency called **social striving**) if they are working with an ingroup, whereas Americans have been shown to work harder as individuals than when working with any kind of group. However, if Chinese and Israelis are working in a less-valued group, they demonstrate the same kind of social-loafing pattern that American participants do (Earley, 1993; **FIGURE 16.21**).

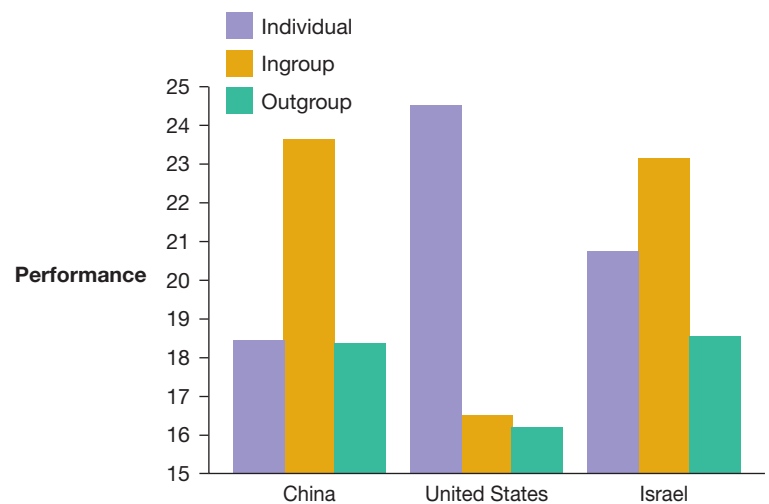
As discussed in Chapter 12, participants often show strong conformity motivations and go along with a group, even if their beliefs conflict with those of others in the group. Around the world, studies conducted on conformity have employed the same kind of line judgment task used by Asch (1955; see Figure 12.20). The results revealed larger conformity effects in collectivistic cultures than in individualistic ones, although the conformity effects are quite pronounced in all cultures. Conformity rates are especially high among collectivistic cultures when people are conforming to those in an ingroup (Bond & Smith, 1996). Though conformity is a universal motivation, it is stronger in collectivistic societies where the costs for not conforming tend to be greater (**FIGURE 16.22**).

The kinds of relationships that people have with others also affect their willingness to co-operate. In general, motivations for co-operation with ingroup members are stronger among people from collectivistic backgrounds than among those from individualistic backgrounds. One study demonstrated this point quite clearly. Madsen (1971) had children (ages 7–10) from small towns in California and Mexico participate in a game that rewarded them for playing co-operatively but punished them for playing competitively (**FIGURE 16.23**). If a child allowed his or her partner to take a turn, the partner would win a marble. If the partner then allowed the child to have a turn, the child would win a marble. If the children competed over who would go first, neither would win any marbles on that turn. The only way to win marbles was to co-operate. In a first trial, the children had to figure out the task for themselves. The American children did not do too well at this point. Out of a possible 10 marbles that could be won, they won, on average, only 0.25 marbles. In a second trial, the children were explicitly shown a strategy of turn-taking and were told that this strategy was the way to win marbles. The American children fared better after the training, although they averaged just 4.7 out of a possible 10 marbles. Even when the way to win marbles was made clear to these children, they often were still unable to resist their competitive urges to try to win more marbles than their partners.

In stark contrast, the Mexican children seemed to have an easier time learning how to co-operate to win marbles. In the first 10 trials, they averaged 6.4 out of 10 marbles.

## Real World PSYCHOLOGY

**social striving** The tendency for a person to work harder in a group than when working alone.



**FIGURE 16.21 Social Loafing and Social Striving** As reported by the American researcher P. Christopher Earley (1993), Americans perform far better when working alone than when working in groups. Chinese and Israelis differ in how well they perform when working alone. Like Americans, they do not perform so well when working in an outgroup. They perform best when working in an ingroup.



**FIGURE 16.22 Conformity** In Japan, Mitsubishi showroom employees work out together before the shop opens. Since Japan is a collectivistic culture, chances are good that this exercise will promote a feeling of unity and in turn boost productivity.

After training, they averaged a remarkable 9.5 out of 10 marbles. It seems that the Mexican children's motives for co-operation trumped their competitive instincts.

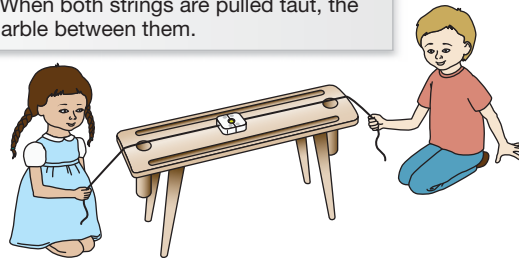
## Cultures Differ in Moral Reasoning

One challenging area of study across cultures is moral reasoning. How do people's ideas about right and wrong differ across cultures? Are their different views equally legitimate? Determining the legitimacy of other people's moral views is difficult because our own moral standards, whether we are scientists or nonscientists, were influenced through socialization in our own culture. It is hard to consider another set of moral standards legitimate, as we are socialized precisely to think in ways consistent with our own cultural values.

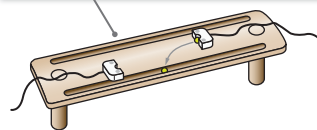
As discussed in Chapter 11, the most famous framework for making sense of moral behaviour came from the American developmental psychologist Lawrence Kohlberg, who proposed that people in all cultures proceed through the same developmental stages. According to Kohlberg, people move through the pre-conventional, conventional, and post-conventional levels of moral reasoning in order, but some individuals never reach the highest, post-conventional, level. Much cross-cultural research has tested Kohlberg's model. One review of studies of moral reasoning in 27 cultural areas around the world found that all cultures included adults who reasoned at the pre-conventional and conventional levels. Hence, at these levels, Kohlberg's model appears to be universal. However, evidence of post-conventional reasoning was not found universally. Although every urban Western sample included some people who showed post-conventional moral reasoning, not a single person from any of the traditional tribal or village folk populations that were studied showed post-conventional reasoning (Snarey, 1985). Hence, the highest level of moral reasoning in Kohlberg's scheme is limited to Western urban populations.

The American cultural psychologist Richard Shweder and colleagues critiqued Kohlberg's model by arguing that post-conventional moral reasoning represents just one of three different codes of ethics that guide moral judgments around the world

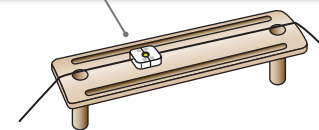
The game apparatus consists of two pieces—each attached to string on a table. When both strings are pulled taut, the pieces can hold a marble between them.



If one of the children moved his or her piece first by pulling the string, then the marble between the pieces would fall into the gutter.



But if the children both pulled their strings together, they could move the marble to either cup at the end of the table.



Then the game would begin again, once an adult had supplied a new marble.

**FIGURE 16.23 Co-operation** In the game used by Madsen, the children could win marbles if they co-operated. That is, if they took turns, each player could pull one marble at a time to his or her side. If they both pulled on their strings at the same time, neither would win the marble, which would fall into the gutter.

(Shweder, Much, Mahapatra, & Park, 1997). According to Shweder, the code of ethics in Kohlberg's postconventional level is an **ethic of autonomy**. This ethic views morality in terms of the violation of freedoms or of rights. An act is seen as immoral under the ethic of autonomy when it directly hurts another person or infringes on a person's freedoms and rights. According to this code, not being free to express one's views, even if they offend others, is a violation of the ethic of autonomy. A second code of ethics is an **ethic of community**, which emphasizes how individuals have duties that conform with their roles in a community or social hierarchy. According to this code, actions are wrong when individuals fail to perform their duties to others. For example, a man who decides against attending the funeral of his mother would be in violation of this ethic. A third code of ethics is an **ethic of divinity**, which is concerned with sanctity and the perceived "natural order" of things. In this ethic, actions are immoral if they cause impurity or degradation to oneself or others, or if they show any disrespect for God or God's creations. How might each of the ethics described above be applied to the cartoons depicting Muhammad discussed at the beginning of the chapter?

Research shows that the ethic of autonomy is found in a wide array of cultural contexts around the world (Turiel, 2002). The ethic of autonomy is likely universal, at least at pre-conventional and conventional levels, as it solves a problem that is universal for humans: People cannot live in groups if they do not feel remorse about harming others. Humans evolved emotions that signal when one might be harming another, and these moral feelings facilitate group living by reducing conflict. The ethic of autonomy is especially pronounced within Western populations (particularly among liberal, university-educated populations) because there is little competition from the other two ethics in most Western cultures. In contrast, in many other cultures the ethics of community and divinity play a much larger role than they do in the West. For example, Joan Miller and colleagues have shown that Indians place greater weight on the ethics of community than do Americans. In one study, they asked a group of Indians and Americans to imagine themselves in a dilemma in which the only solution is to either violate an ethic of autonomy to fulfill an obligation to a friend or violate an ethic of community to preserve a stranger's rights. A majority of Indians opted to violate the ethic of autonomy to preserve the ethic of community, whereas a majority of Americans did the opposite (Miller & Bersoff, 1992).

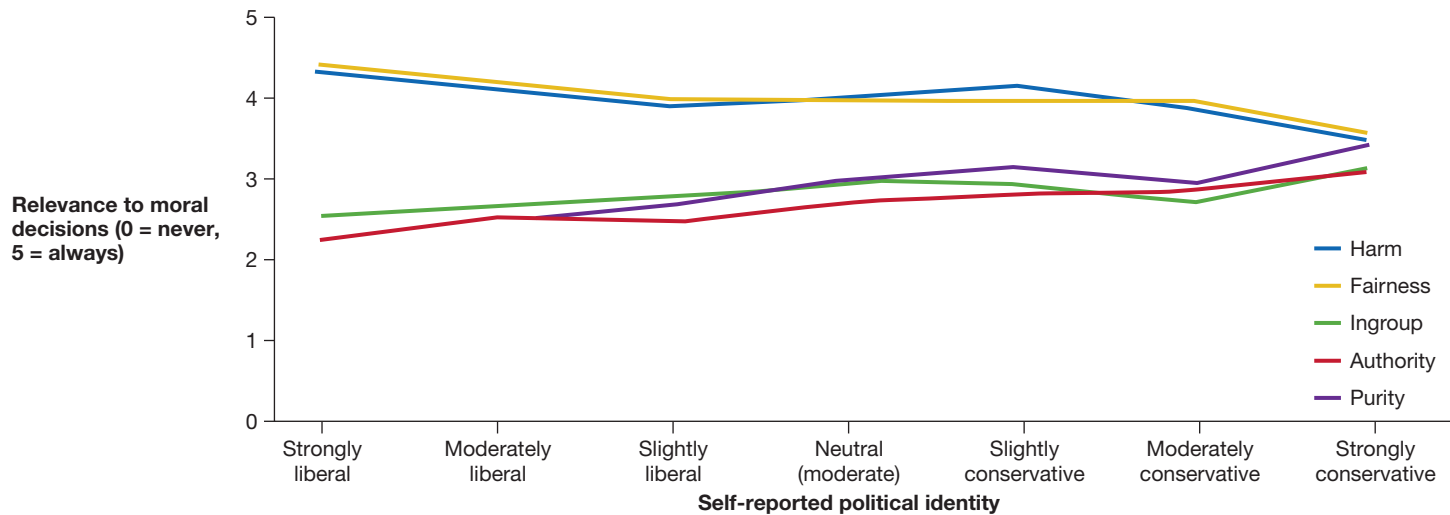
Other research has explored how people respond to violations of the ethic of divinity. In one set of studies, the American psychologist Jonathan Haidt and colleagues found that when presented with scenarios that involved breaking strongly held taboos (such as not eating the family pet or not engaging in sex with a sibling) people from different cultural contexts reasoned differently. Although participants from all cultures found the behaviours offensive, university-educated populations (especially Americans) tended to focus their moral evaluations on the extent of perceived harm, whereas people of lower socio-economic status were more likely to base their moral evaluations on how much disgust they felt about the behaviours (Haidt, Koller, & Dias, 1993). The ethic of divinity appears more common among those of lower socio-economic status and in some non-Western cultures. In sum, there appears to be considerable cultural variation in the bases by which people around the world view behaviours to be right or wrong.

These different ethics are not only distributed unequally across different countries, they also are distributed unequally across people of different political persuasions within countries. One study found that Americans who described themselves as strongly liberal relied almost exclusively on an ethic of autonomy (which was further delineated into concerns with harm and concerns with fairness) in making moral decisions. In contrast, Americans who described themselves as strongly

**ethic of autonomy** One of Shweder's three codes of ethics, under which a person views his or her actions as right or wrong based on whether those actions directly hurt another person or infringe on another person's rights and freedoms.

**ethic of community** One of Shweder's three codes of ethics, under which a person views his or her actions as right or wrong based on the extent to which those actions conform with his or her role in a community or social hierarchy.

**ethic of divinity** One of Shweder's three codes of ethics, under which a person views his or her actions as right or wrong based on whether those actions cause impurity or degradation to himself or herself, show disrespect to a higher being, or show disrespect to the higher being's creations.



**FIGURE 16.24 Political Identity**

Politically liberal Americans rely almost exclusively on concerns about fairness and causing harm. In contrast, politically conservative Americans also rely on concerns about the ingroup, respecting authority, and purity.

conservative relied on each of the ethics of autonomy, community (which was further delineated into concerns with respecting the ingroup and respecting authority), and divinity (captured by a concern with purity) to a roughly similar degree (FIGURE 16.24; Graham, Haidt, & Nosek, 2009). One reason, then, why political disputes frequently seem so entrenched is that people on different sides rely on different ethical principles in their moral reasoning. Think again about the issues surrounding the cartoons of Muhammad. Do you see any way of reconciling the moral reasoning of the newspaper editors with that of the Muslim protestors?

### Language Influences but Does Not Determine Thought

One obvious way that cultures differ is that the people in them speak different languages. Does the language that people speak have an impact on their psychology? Does the language that people speak influence how they think?

These questions have been controversial in psychology and linguistics since the American linguist Benjamin Whorf (1956) first proposed what would later become the **Whorfian hypothesis**. This hypothesis has been posed in two forms. The strong form of the hypothesis is that language *determines* thought; that is, you can think only through language. Much evidence indicates that the strong version of the Whorfian hypothesis is not valid. A weaker version of the hypothesis is that language *influences* thought. This idea remains controversial, but much research supports it.

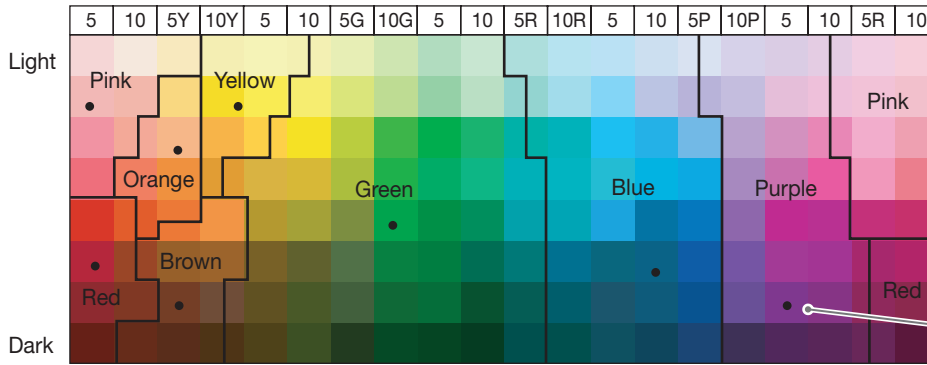
One domain in which psychologists have tested the Whorfian hypothesis is in colour perception. As discussed in Chapter 5, colour is determined by the wavelength of light and exists as a continuum that traces through the rainbow. However, colour is expressed in languages in discrete words, such as *blue* and *yellow*. Categories of colour words vary greatly in languages around the world. Some languages, for example, have only three colour words, corresponding to the English words *black* (or dark), *white* (or light), and *red* (Berlin and Kay, 1969). Other languages divide the colour spectrum into categories that do not map cleanly onto the colour labels used in English. If people speaking different languages from each other use different categories for colours, do they perceive colours differently as well?

For example, FIGURE 16.25 shows the boundaries of the different colour labels for English speakers, Berinmo speakers (from New Guinea), and Himba speakers

**Whorfian hypothesis** The controversial theory that the language one speaks influences the way one thinks.

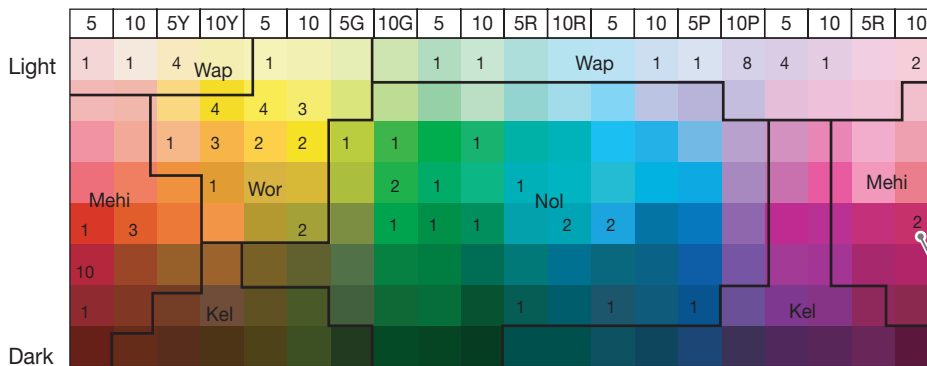


### English naming



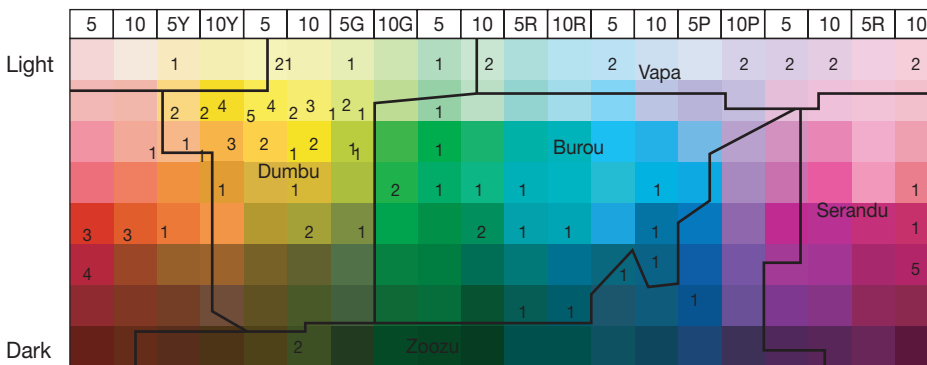
The dots represent the focal colours (e.g., the best example of blue) for the English speakers (as identified by thousands of participants in past research).

### Berinmo naming



The numbers indicate the Berinmo and Himba speakers who selected the particular colour chip as the best example of their respective colour labels (e.g., the best example of Mehi).

### Himba naming

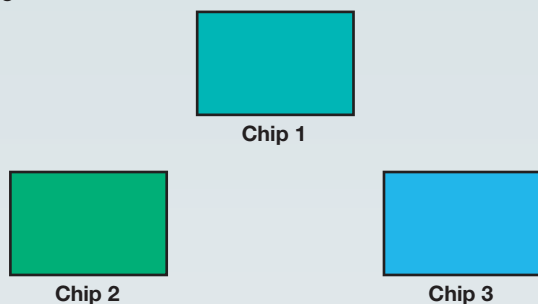


**FIGURE 16.25 Colours and Language** The same colours appear in each chart, but they are named and grouped differently in each of three languages: English, Berinmo, and Himba.

**FIGURE 16.26 Try for Yourself: Perception of Colours**

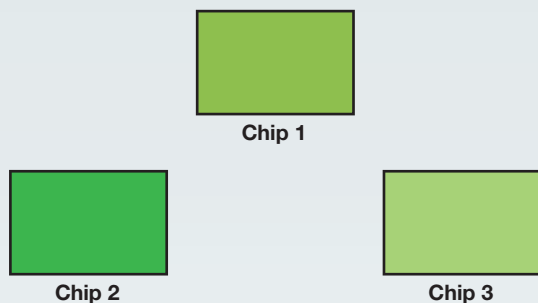
Which chip, 2 or 3, is more similar to the colour in chip 1 below?

**English boundaries**



Again, which chip, 2 or 3, is more similar to the colour in chip 1 below?

**Berinmo boundaries**



**Result:**

Most English speakers select Chip 3 for the first one, whereas Berinmo speakers are equally likely to select Chip 2 as they are Chip 3. In contrast, English speakers are equally likely to select Chip 2 as Chip 3 in the second example, whereas Berinmo speakers tend to choose Chip 2.

**Explanation:**

For the first example, both Chips 1 and 3 fall within the boundaries of the English category of blue, whereas Chip 2 is usually perceived as green. Berinmo colour categories don't distinguish Chips 2 and 3. For the second example, Berinmo colour categories distinguish Chips 2 and 3 whereas English colour categories do not. The colour categories in one's language influence perception at the boundaries of those categories.

(from Namibia). You might notice a couple of things in these three colour grids. First, the Berinmo and Himba colour words overlap somewhat with English colour words. For example, *Red*, *Mehi*, and *Serandu* cover a fairly similar range of hues across all three languages. Colour perception is thus not determined by language. If it was, this kind of similarity would not occur (Berlin & Kay, 1969; these findings are supported by many other studies). Second, despite this similarity for some colours, the ranges for these colour terms vary considerably, as do the focal colours that are selected for some of the other colours; the word *Nol* covers *green* and *blue*, and *Zoozu* covers *dark colours* and *light purple*.

Focusing on the same three languages, the British psychologist Debi Roberson and colleagues investigated whether the difference in colour labels affected the perception of colours (Roberson, Davidoff, Davies, & Shapiro, 2005; Roberson, Davies, & Davidoff, 2000). They presented participants with language-specific series of three colour chips, such as those shown in **FIGURE 16.26**, and asked participants which two of each three chips were most similar. In each triad, Chip 1 was equally close to Chips 2 and 3 in terms of hue. However, Chips 1 and 3 fell under the same colour label (*blue* in the English example) and Chip 2 fell under a different colour label (*green* in the English example). Even though Chips 2 and 3 were equally close to Chip 1 in terms of hue, most participants said that Chip 1 looked more similar to Chip 3 than to Chip 2. In other words, chips perceived to fall in the same category looked more similar. This effect emerged only when the colours crossed the boundaries of colour terms within participants' own language. In other words, speakers of Berinmo and Himba might not have chosen Chips 1 and 3 as being more similar in the English-language example; they would have followed the categories of their own languages. This finding, that language appears to influence colour perception, challenges some earlier findings that suggested it does not (Rosch Heider, 1972). Other research has revealed that language influences people's perceptions of other things as well, such as time, space, and quantities (Boroditsky, 2001; Gordon, 2004; Levinson, 1997). The language that people speak appears to influence, but not determine, some of the ways that they think.



## SUMMING UP

### How Does Culture Affect How We Think and Behave?

People from a Western cultural background are more likely to think in analytic terms, whereas people from East Asian cultures are more likely to think in holistic terms. People from different cultures experience control differently, with primary control strategies being more common in individualistic cultures and secondary control strategies being more common in collectivistic cultures. Marriages based on love are more common in cultures with nuclear family structures. Levels of happiness vary across

cultures, and this is due both to differences in the distribution of factors that universally predict happiness and to the different kinds of happiness that people across cultures seek. People in individualistic cultures are more likely to show social loafing and are often more competitive than those from collectivistic cultures. Three ethics guide people's moral reasoning: The ethic of autonomy is most common in individualistic cultures, the ethic of community is common in some collectivistic cultures (such as India), and the ethic of divinity is common among political conservatives in the West and people in many non-Western cultures, especially among those of lower socio-economic status. The language that people speak appears to influence but not determine some of the ways that they think.

## MEASURING UP

1. Which of the following *is not* more characteristic of North American cultures than of East Asian cultures?
  - a. North Americans prefer high-arousal positive emotions.
  - b. North Americans attend more to the backgrounds in scenes.
  - c. North Americans have stronger motivations for primary control.
  - d. North Americans show more social loafing on tasks with their ingroups.
2. The moral reasoning of North American university students tends to be dominated by \_\_\_\_\_.
  - a. a concern with each person's role(s) in a community
  - b. a concern with purity and the natural order
  - c. conventional moral reasoning
  - d. the ethic of autonomy

## How Does Culture Influence Mental Health?

People from different cultures differ not only in their normal psychological functioning, but also in the ways that their thinking departs from normal. As discussed in Chapter 14, one major model of the cause of mental disorders, the socio-cultural model, views psychopathology as arising from the interaction between individuals and their cultures. Cultural variations in mental disorders are a real challenge for clinical psychology and psychiatry. If it is difficult to determine what represents a mental disorder within one culture, it is that much more challenging when comparing cultures that differ in their beliefs, values, and motivations.

### Culture-Bound Disorders Are Largely Limited to Certain Cultural Contexts

A growing area of research in clinical psychology and in psychiatry is the study of mental disorders that are largely limited to certain cultural contexts. Consider **dhat syndrome**, a disorder that is frequently identified in numerous South Asian cultures. *Dhat* syndrome is characterized by a belief in some young men that they are leaking semen. This belief causes them to be morbidly anxious, as their culture views semen as a source of vitality—much more so than Western cultures do. *Dhat* syndrome is often associated with paralyzing guilt and anxiety on the part of its victims, who may become convinced that they have caused a leak through their indulgence in certain disapproved-of sexual acts, such as masturbation (Obeyesekere, 1985). *Dhat* syndrome is considered a **culture-bound disorder**: a disorder that is

### LEARNING OBJECTIVES

Recognize how culture-bound disorders are limited to certain cultures.

Understand how some universal disorders, such as depression, social phobia, anorexia nervosa, and schizophrenia, can appear differently across cultures.

**dhat syndrome** A disorder frequently identified in South Asian cultures, characterized by a belief in young men that they are leaking semen, usually as a result of engaging in sexual activities of which their cultures disapprove. This belief produces feelings of anxiety, guilt, and fear.

**culture-bound disorder** A disorder that is influenced by the specific factors of a particular culture. In other cultures, the disorder manifests itself infrequently or differently.

greatly influenced by cultural factors and occurs far less frequently, or is manifested in highly divergent ways, in other cultures. *Dhat* syndrome would be a very puzzling disorder if it was identified in the West. Western cultures lack the cultural value system of many South Asian cultures regarding the nature of semen, the kinds of sexual acts that are disapproved of, and what happens to people who engage in these disapproved-of acts. These specific cultural beliefs are necessary for *dhat* syndrome to be meaningful and for semen maintenance to be a significant concern in people's lives (for further discussion, see Kleinman, 1988).

In addition to *dhat* syndrome, a variety of other culture-bound disorders have been identified around the world. For example, one of the most common disorders in mid-nineteenth-century Europe was hysteria, where women exhibited symptoms such as faintness, insomnia, paralysis, loss of appetite for food or sex, and “a tendency to cause trouble” (Maines, 1998). The rash of women suffering from hysteria fuelled the development of Freud's psychoanalytic theory. However, diagnoses of hysteria decreased dramatically in the early twentieth century, and it is no longer recognized as an illness. Its prevalence in the nineteenth century is often attributed to the repressive social norms of Victorian Europe (e.g., Drinka, 1984).

### Some Universal Mental Disorders Present Differently in Different Cultures

Though many psychological disorders occur in all parts of the world, the same underlying disorder may present differently in different cultures. Occasionally the presented symptoms are so different that researchers differ about whether the underlying disorder *is* the same (e.g., Kleinman, 1988).

**DEPRESSION** Though depressive disorders are some of the most common mental disorders, their prevalence varies greatly across cultures. In particular, depression is less commonly identified in China than in Western cultures. Epidemiological surveys have found that the rates of depression in China are approximately one-fifth of those in North America (Kessler et al., 1994). This difference in prevalence might be a product of the fact that many of the symptoms of Chinese sufferers of depression differ from the symptoms of North American sufferers. Specifically, some symptoms of depression are **somatic**: that is, they are experienced primarily as physical symptoms, such as headaches, fatigue, and pain. Other symptoms of depression are psychological; that is, they are experienced primarily in the mind, such as depressed mood, difficulty concentrating, and feelings of guilt. A number of studies have revealed that Chinese symptoms of depression are more likely to be somatic, whereas North American symptoms of depression are more likely to be psychological (Chang, 1985; Kleinman, 1982). One study of Canadian and Chinese psychiatric outpatients found that Canadian patients were considerably more likely than Chinese patients to describe their depression in terms of underlying psychological difficulties, whereas the Chinese patients were more likely than Canadian patients to report somatic complaints (Ryder et al., 2008). The manifestation of depression can thus vary across cultures.

**SOCIAL PHOBIA** Because humans are a social species, it is natural that people are often concerned about losing the favour of others. Most likely, we all feel anxious in some kinds of social situations. But people who suffer from social phobia are so concerned about being negatively evaluated by others that it interferes with their lives. In collectivistic cultures, it is extremely important to maintain social harmony and to fit in with others. It thus should not be surprising that people from collectivistic cultures say they experience social phobia symptoms more than Westerners

**somatic symptoms** Physical side effects of psychological disorders.

do. For example, East Asians tend to score higher than Westerners on self-report measures of social anxiety (Okazaki, 1997). However, in East Asia there is far less evidence of people meeting the clinical criteria of social phobia than there is in the West (Hwu, Yeh, & Chang, 1989; Lee et al., 1987). This finding indicates that East Asians do not see social anxiety as a major obstacle in their lives, perhaps because the symptoms of social anxiety are viewed as more acceptable in collectivistic cultures than in individualistic ones.

At the same time, when social anxieties become problematic, they may present differently across cultures. One disorder that was identified by a Japanese psychiatrist is *taijinkyofushou* (TKS; Morita, 1917), which translates loosely as a phobia of confronting others. TKS is often viewed as a culture-bound disorder, because it is very rarely diagnosed outside of East Asia. TKS is similar to social phobia in that it is elicited by social situations. However, the symptoms of TKS are distinct from those of social anxiety disorder. TKS's physical symptoms include extensive blushing, body odour, sweating, and a penetrating gaze; the symptoms often are imagined. A person diagnosed with severe TKS is not only preoccupied with these symptoms but intensely concerned that they will cause other people to feel uncomfortable. This focus on disturbing others has led TKS to be labeled the “altruistic phobia” (Kasahara, 1986).

***taijinkyofushou* (TKS)** A disorder whose sufferers are morbidly afraid of offending others or causing others discomfort from the sufferers' physical flaws, which are likely imagined.

**ANOREXIA NERVOSA** Anorexia nervosa is characterized by a refusal to eat for fear of becoming fat. Its incidence increased during the latter half of the twentieth century. For example, in Denmark, the rates of people diagnosed with anorexia increased by a factor of 4 from the 1970s to the 1980s, and children as young as nine have shown anorexic symptoms (Pagsberg & Wang, 1994; Rosen, 2003). The dramatic rise in rates of anorexia appears to be due largely to changing cultural norms with regard to ideal body weight (FIGURE 16.27). Indeed, studies that have contrasted Miss America pageant contestants and *Playboy* centrefolds across the past few decades have revealed a trend of increasing thinness (Garner et al., 1980). Furthermore, there is less evidence of anorexia in some cultures than in North America. These changes across time and the cultural differences in rates of anorexia suggest that culture plays a key role in the manifestation of the disorder.

At the same time, evidence of anorexia appears in all regions of the world (for a review, see Keel & Klump, 2003). Indeed, the historical literature reveals many instances of people voluntarily starving themselves in the presence of food. For example, over the past nine centuries in the Italian peninsula about half of the people who were canonized as saints refused food because of a belief that their resulting emaciation reflected divine intervention. Their condition has been termed “holy anorexia” (Bell, 1985). Although losing weight was not the motivation for such self-starvation, as it largely is today, some researchers propose that people with temperaments predisposing them toward anorexic symptoms are especially attracted to ascetic lifestyles (Keel & Klump, 2003). To the extent that this is true, it suggests that anorexia is a cultural universal but that the motivation for self-starvation varies across historical and cultural contexts (e.g., avoiding becoming overweight versus being a spiritual ascetic).

**SCHIZOPHRENIA** As discussed in Chapter 14, schizophrenia is primarily a brain disorder. And since brains do not differ structurally in any systematic way across cultures, schizophrenia presents quite similarly across cultures—indeed, more similarly than any of the other mental disorders discussed in this chapter. One large-scale study of 12 different cultures found that when a strict definition of schizophrenia was applied, the annual incidence rates of schizophrenia ranged from 0.7 to 1.4 per 10,000 (Jablensky et al., 1991, WHO, 1973). This finding reveals little cultural variation in worldwide incidences of schizophrenia.



(a)



(b)

**FIGURE 16.27 Cultural Norms and Anorexia** Across the globe, as embodied by these models from (a) North America and (b) Asia, the standard of beauty increasingly favours thinness. To what extent do cultural standards affect people's self-perceptions? Would anorexia be less common if public figures had average body types and the media did not mock them for it?

Still, environmental factors play a significant role in the development of schizophrenia. This role is especially evident when we examine cultural variability in the presentation of the disorder. In different cultures, there is considerable variation in which subtypes of schizophrenia are most common. For example, paranoid-type schizophrenia was the most commonly observed subtype in most locations that were examined, but the proportions varied considerably across locations. Seventy-five percent of people with schizophrenia in the United Kingdom received a diagnosis of paranoid schizophrenia compared with only 15 percent of those in India. Although catatonic schizophrenia was rarely observed in the West (only 1–3 percent of cases in the United States and the United Kingdom), it accounted for over 20 percent of schizophrenia patients in India. Paranoid and catatonic subtypes of schizophrenia are dramatically different manifestations of the disease, and the cultural differences in their proportions reflect the role of culture in the presentation of schizophrenia.

The most striking finding about cultural differences in schizophrenia is that the course of the disease was significantly better for patients in less developed societies than in the more industrially advanced ones (Leff, Sartorius, Jablensky, Korten, & Ernberg, 1992). This information is especially noteworthy as rates of schizophrenia are typically higher in the lower social classes than in the higher ones. Explanations of this cultural difference have focused on how communities in developing countries are more likely to find some kind of meaningful social role for the person, as opposed to institutionalized care. In sum, there is less cultural variability in schizophrenia than in many other mental disorders, a reflection of the extent to which schizophrenia is a disorder of the brain. The cultural variability that exists attests to the role of personal experience in the manifestation and course of the disease.

## SUMMING UP

### How Does Culture Influence Mental Health?

Cultures shape abnormal thinking as well as normal thinking. Culture-bound disorders are those that appear to be greatly controlled by cultural factors. Some mental disorders, such as depression, social phobia, and anorexia nervosa, show universal features as well as culturally specific manifestations. Because it is biologically based, schizophrenia shows the least cultural variation of all major psychological disorders.

## MEASURING UP

- Which of the following statements is true about cultural differences in depression?
  - Depression is more common in Asian cultures than in Western cultures.
  - Depressed mood is a primary concern for depressed Chinese patients.
  - Somatic symptoms are more common in depressed Chinese than in depressed North Americans.
  - Depression presents itself in nearly identical ways across cultures.
- The study of schizophrenia across cultures reveals \_\_\_\_\_ .
  - that people with schizophrenia in developing countries fare better than those in developed countries
  - that schizophrenia is a culture-bound disorder
  - that prevalence rates of schizophrenia vary widely across cultures
  - that the subtypes of schizophrenia are equally common in different cultures

## CONCLUSION

Cultural psychology examines how growing up in particular cultures shapes the ways that people think, feel, and behave. As a cultural species, humans acquire much of the knowledge necessary for survival by learning it from others. Because children growing up in different cultures have divergent experiences and adapt to different social norms, the ways that people think can emerge quite differently across cultures. Although human psychology is universal in many ways, reflecting the similarity in people's biology and in many of the challenges they face, a number of important differences have been identified across cultures. Many of these stem from the differences between the experiences that people have in individualistic cultures and those that people have in collectivistic cultures. Cultural differences in psychological processing are not limited to superficial phenomena such as fashion or food preferences, but have been identified in a number of basic and fundamental psychological processes, such as perception, cognition, motivation, and mental disorders. These findings underscore the point that much of how the mind works is a function of how our biological potentials are shaped by our experiences.

## CHAPTER SUMMARY

### What Is Culture?

- **Culture consists of information transmitted through learning:** Culture is any kind of information that is acquired by imitation or social learning.
- **Some aspects of culture are shared by other species, and some are unique to humans:** Some other species have a limited ability to learn by observing others, but cultural learning is part of *all* aspects of human experience.
- **Humans have evolved to accumulate cultural information:** Language and a theory of mind allowed humans to develop high-precision cultural learning. This form of learning has enabled humans to accumulate cultural information in a way and to a degree that no other species can.

### What Is Cultural Psychology?

- **Cultural psychology is the study of how culture shapes psychological processes:** People's brains are largely identical around the world, yet psychological processes frequently emerge in distinct ways across cultures. Cultural psychology strives to understand how cultural experiences shape people's ways of thinking.

### How Does Culture Affect the Mind?

- **Culture and mind are inextricably bound:** People's ways of thinking are shaped by cultural practices. At the same time, cultural practices are shaped by the preferences of people living in those cultures. In this way, culture and mind are fundamentally linked.
- **There is a sensitive period for learning culture:** Humans are biologically prepared to acquire cultural information at a young age. After puberty, people have a more difficult time adjusting to new cultural environments.
- **Cultural differences in psychological processes become more pronounced with age:** Children from different cultures are more similar in their ways of thinking than are adults from those cultures. As people age, their accumulated cultural experiences exert a greater influence on their thinking.
- **The self-concept varies across cultures:** People in individualistic cultures are more likely to develop an independent self-concept, whereas those in collectivistic cultures are more likely to develop an interdependent self-concept. Independent self-concepts remain more similar across situations, whereas interdependent self-concepts are more contextually flexible.

### What Are the Psychological Consequences of Moving to a Different Country?

- **Acculturation requires significant and often stressful adjustment:** People are shaped by their cultural experiences, so when people move to new cultures they undergo much adjustment and often stress. A person will have an easier time acculturating if the new culture is similar to the original one or if his or her personality is a good match with the new culture.
- **Psychological processes change with acculturation:** Because culture shapes people's thinking, the longer that people are exposed to a new culture, the more their thinking will change.
- **People from distinct, minority cultural backgrounds often face discrimination:** A frequent source of stress in acculturation is that people from "minority" cultural backgrounds are discriminated against. Such discrimination can lead to stereotype threat, which perpetuates negative stereotypes.

- **Multicultural people can switch between different selves:** Multicultural people can activate different aspects of their selves in different situations. Some ways of thinking are available to people from different cultures but are activated only when the appropriate situational cue is present.
- **Multicultural people may be more creative:** Exposure to multiple cultures allows one to combine information from more than one perspective, resulting in higher creativity.

### How Does Culture Affect How We Think and Behave?

- **Cultures differ in analytic and holistic thinking:** Westerners are likely to think in analytic terms, focusing on objects and their attributes. East Asians are likely to think in holistic terms, focusing on the relations among objects and on the relation between objects and the surrounding context. This difference affects the ways that people think in many different kinds of tasks.
- **Cultures differ in motivations for control and choice:** People from individualistic cultures are more likely to emphasize primary control, where they strive to change the world to match their desires. People from collectivistic cultures show more evidence of secondary control, where they strive to adjust their desires to existing realities. Likewise, people from individualistic cultures value individual choice more than do people from collectivistic cultures.
- **Cultures differ in the bases of relationships:** Arranged marriages have been common in many cultures, particularly those with strong extended family ties. In individualistic cultures, friendships are typically thought of in positive terms. In collectivistic cultures, friendships are viewed both in positive terms and in negative terms associated with costly obligations and potential threats.
- **Cultures vary in their perceptions of happiness:** Average levels of happiness vary substantially around the world. This is due both to the unequal distribution of factors that universally predict happiness and to cultural differences in the meaning of happiness.
- **Cultures differ in group performance:** Social loafing occurs when individuals try less hard in group contexts. Although common in individualistic cultures, social loafing is rarer in collectivistic cultures. People in collectivistic cultures appear to have stronger motivations to co-operate, and weaker motivations to compete as individuals, in some situations.
- **Cultures differ in moral reasoning:** Postconventional moral reasoning, based on justice and individual rights, is less common outside industrialized Western contexts. Cultural context determines which of three moral ethics people employ: autonomy, community, or divinity. In non-Western contexts, the ethics of community and divinity are emphasized more than they are in Western contexts.
- **Language influences but does not determine thought:** Much recent research indicates that language does not determine thought but does influence it. For example, people perceive colours differently depending on their language's colour labels.

### How Does Culture Influence Mental Health?

- **Culture-bound disorders are largely limited to certain cultural contexts:** Some mental disorders are largely limited to certain cultural contexts. Specific cultural beliefs are necessary for some "culture-bound" disorders to be presented.
- **Some universal mental disorders present differently in different cultures:** Some mental disorders, such as depression, social phobia, anorexia, and schizophrenia, are found in all cultures. However, these disorders present differently across cultures, although cultural variability is weaker for the more biologically grounded disorders, such as schizophrenia.



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## ■ KEY TERMS

acculturation, p. 741	culture-bound disorder, p. 761	ethic of community, p. 757	secondary control, p. 750	taxonomic categorization, p. 748
analytic thinking, p. 748	culture shock, p. 742	ethic of divinity, p. 757	social loafing, p. 754	thematic categorization, p. 748
arranged marriage, p. 751	<i>dhat</i> syndrome, p. 761	frame-switching, p. 744	social striving, p. 755	U-shaped curve, p. 742
cultural distance, p. 743	ethic of autonomy, p. 757	holistic thinking, p. 748	somatic symptoms, p. 762	Whorfian hypothesis, p. 758
cultural fit, p. 743		love marriage, p. 751	<i>taijinkyofushou</i> (TKS), p. 763	
		primary control, p. 749		

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## ■ PRACTICE TEST

- Fritz moved to Germany from Austria and quickly made a number of friends, found a good job, and became engaged to a German woman. Overall, he was very happy with his new life. At the same time, Panadda, from Thailand, also moved to Germany. Panadda felt quite lonely in Germany, made few friends, was unable to find a job, and experienced a great deal of stress in her daily activities. A likely reason for Fritz's and Panadda's different reactions is \_\_\_\_\_.
  - cultural fit
  - the U-shaped curve
  - cultural distance
  - frame-switching
- Azim read in the newspaper that a young man had been caught trying to have sex with a sheep. Azim was outraged as he saw the man's behaviour as a shameful moral violation. Which of the following is reflected in Azim's moral reasoning?
  - preconventional level of moral reasoning
  - the ethic of autonomy
  - the ethic of community
  - the ethic of divinity
- Emi hates to leave her house. She dreads meeting other people, because she fears that she will blush excessively and that her blushing makes others uncomfortable. Emi likely suffers from \_\_\_\_\_.
  - taijinkyofushou* (TKS)
  - social phobia
  - depression
  - dhat* syndrome
- Imagine you are creating an advertising campaign for a new beverage, Cold Snap. The campaign will introduce Cold Snap in collectivistic cultural environments. Which of the following slogans will likely be most effective?
  - Cold Snap tastes better than Pepsi.
  - Everyone loves the taste of Cold Snap.
  - Cold Snap is completely organic and includes seven essential vitamins.
  - Cold Snap costs less than other drinks.
- Winnie and her younger brother Jesse moved from Hong Kong to Toronto when they were 17 and 11 years old, respectively. What might we expect with regard to their acculturation to Canada?
  - Jesse would acculturate to the mainstream society more quickly than Winnie because of his age.
  - Winnie would acculturate to the mainstream society more quickly than Jesse because of her sex.
  - They would both spend the first few years of their time in Canada in the "honeymoon stage."
  - They would both be likely to make situational attributions to explain someone's behaviour when surrounded by Canadian pictures.
- In the workplace, an emphasis on multicultural messages \_\_\_\_\_.
  - makes people focus on what they have in common with others
  - makes majority members feel more proud and patriotic
  - increases a sense of democracy
  - increases the engagement of minority members
- Analytic thinkers \_\_\_\_\_.
  - attend to the background of a scene
  - focus on how things are affected by context
  - consider how something is made up of component parts
  - reason associatively
- Given what we know about the desirability of different positive emotions in different cultures, which kind of leisure activity do you think would be more popular among Chinese than among Americans?
  - playing in amusement parks
  - attending rock concerts
  - relaxing in spas
  - going whitewater rafting

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## ■ PSYCHOLOGY AND SOCIETY

- The world is becoming more integrated, and people are more frequently coming into contact with those from other cultural backgrounds. Based on your understanding of the ideas from this chapter, what are some ways in which people can learn from those from other cultural backgrounds?
- A disproportionately large amount of psychological research has been conducted with participants who are university students from North America and other Western countries. How might the emphasis placed on those particular samples have distorted our understanding of the ways that humans think? Describe how psychological findings might be different if other samples were selected.

The answer key for all the Measuring Up exercises and the Practice Tests can be found at the back of the book.





# GLOSSARY

- absentmindedness** The inattentive or shallow encoding of events.
- accommodation** The process by which a schema is changed to incorporate a new experience that does not easily fit into an existing schema.
- acculturation** The process of adaptation to a culture different from one's own.
- accuracy** The extent to which an experimental measure is free from error.
- acetylcholine (ACh)** The neurotransmitter responsible for motor control at the junction between nerves and muscles; also involved in mental processes such as learning, memory, sleeping, and dreaming.
- acquisition** The gradual formation of an association between the conditioned and unconditioned stimuli.
- action potential** The neural impulse that passes along the axon and subsequently causes the release of chemicals from the terminal buttons.
- activation-synthesis hypothesis** A theory of dreaming that proposes that neural stimulation from the pons activates mechanisms that normally interpret visual input.
- adaptations** In evolutionary theory, the physical characteristics, skills, or abilities that increase the chances of reproduction or survival and are therefore likely to be passed along to future generations.
- additive colour mixing** A way to produce a given spectral pattern in which different wavelengths of lights are mixed. The percept is determined by the interaction of these wavelengths with receptors in the eye and is a psychological process.
- aggression** Any behaviour or action that involves the intention to harm someone else.
- agonist** Any drug that enhances the actions of a specific neurotransmitter.
- agoraphobia** An anxiety disorder marked by fear of being in situations in which escape may be difficult or impossible.
- all-or-none principle** The principle whereby a neuron fires with the same potency each time, although frequency can vary; it either fires or not—it cannot partially fire.
- allostatic load theory of illness** When people are continually stressed, they are unable to return to bodily states that characterize normal stress levels.
- altruism** The providing of help when it is needed, without any apparent reward for doing so.
- amnesia** Deficits in long-term memory that result from disease, brain injury, or psychological trauma.
- amygdala** A brain structure that serves a vital role in our learning to associate things with emotional responses and in processing emotional information.
- analogical representation** A mental representation that has some of the physical characteristics of an object; it is analogous to the object.
- analytic thinking** A system of evaluation in which a person views objects as independent from context and in terms of individual characteristics. The person then uses the resulting assessments to form a set of abstract rules meant to predict and explain the objects.
- anorexia nervosa** An eating disorder characterized by an excessive fear of becoming fat and thus a refusal to eat.
- antagonist** Any drug that inhibits the action of a specific neurotransmitter.
- anterograde amnesia** An inability to form new memories.
- anti-anxiety drugs** A class of psychotropic medications used for the treatment of anxiety.
- antidepressants** A class of psychotropic medications used to treat depression.
- antipsychotics** A class of drugs used to treat schizophrenia and other disorders that involve psychosis.
- anti-social personality disorder (APD)** A personality disorder marked by a lack of empathy and remorse.
- anxious-ambivalent attachment** Attachment style in which infants become extremely upset when their caregiver leaves but reject the caregiver when he or she returns.
- applied behavioural analysis (ABA)** An intensive treatment for autism, based on operant conditioning.
- arranged marriage** A type of marriage in which the bride and groom have been preselected by the bride's and groom's respective families.
- arousal** Physiological activation, such as increased brain activity, autonomic responses, sweating, or muscle tension.
- assessment** In psychology, examination of a person's mental state to diagnose possible psychological disorders.
- assimilation** The process by which a new experience is placed into an existing schema.
- attachment** A strong emotional connection that persists over time and across circumstances.
- attention deficit hyperactivity disorder (ADHD)** A disorder characterized by restless, inattentive, and impulsive behaviours.
- attitudes** The evaluation of objects, events, or ideas.
- attributions** People's causal explanations for why events or actions occur.
- audition** The sense of sound perception.
- autism** A developmental disorder involving deficits in social interaction, impaired communication, and restricted interests.

- autonomic nervous system (ANS)** A major component of the peripheral nervous system; it regulates the body's internal environment by stimulating glands and by maintaining internal organs such as the heart, gall bladder, and stomach.
- availability heuristic** Making a decision based on the answer that most easily comes to mind.
- avoidant attachment** Attachment style in which infants ignore their caregiver when he or she returns after a brief separation.
- axon** A long narrow outgrowth of a neuron by which information is transmitted to other neurons.
- basal ganglia** A system of subcortical structures that are important for the initiation of planned movement.
- behaviour modification** The use of operant-conditioning techniques to eliminate unwanted behaviours and replace them with desirable ones.
- behavioural approach system (BAS)** The brain system involved in the pursuit of incentives or rewards.
- behavioural inhibition system (BIS)** The brain system that is sensitive to punishment and therefore inhibits behaviour that might lead to danger or pain.
- behaviourism** A psychological approach that emphasizes the role of environmental forces in producing behaviour.
- binocular depth cues** Cues of depth perception that arise from the fact that people have two eyes.
- binocular disparity (or retinal disparity)** A cue of depth perception that is caused by the distance between a person's eyes, which provides each eye with a slightly different image.
- biological therapies** Treatment based on medical approaches to illness and to disease.
- biopsychosocial model** A model of health that integrates the effects of biological, behavioural, and social factors on health and illness.
- bipolar disorder** A mood disorder characterized by alternating periods of depression and mania.
- blindsight** A condition in which people who are blind have some spared visual capacities in the absence of any visual awareness.
- blocking** The temporary inability to remember something that is known.
- body mass index (BMI)** A ratio of body weight to height, used to measure obesity.
- borderline personality disorder** A personality disorder characterized by identity, affective, and impulse disturbances.
- bottom-up processing** A hierarchical model of pattern recognition in which data are relayed from one processing level to the next, always moving to a higher level of processing.
- brain imaging** A range of experimental techniques that make brain structures and brain activity visible.
- brain stem** A section of the bottom of the brain, housing the most basic programs of survival, such as breathing, swallowing, vomiting, urination, and orgasm.
- Broca's area** The left frontal region of the brain, crucial for the production of language.
- buffering hypothesis** The idea that other people can provide direct support in helping individuals cope with stressful events.
- bulimia nervosa** An eating disorder characterized by dieting, binge eating, and purging.
- bystander intervention effect** The failure to offer help by those who observe someone in need.
- case study** A research method that involves the intensive examination of one person.
- cell body** In the neuron, where information from thousands of other neurons is collected and processed.
- central nervous system (CNS)** The brain and spinal cord.
- central tendency** A measure that represents the typical behaviour of the group as a whole.
- cerebellum** A large, convoluted protuberance at the back of the brain stem, essential for coordinated movement and balance.
- cerebral cortex** The outer layer of brain tissue, which forms the convoluted surface of the brain.
- change blindness** The common failure to notice large changes in environments.
- chromosomes** Structures within the cell body that are made up of genes.
- chunking** Organizing information into meaningful units to make it easier to remember.
- circadian rhythms** The regulation of biological cycles into regular patterns.
- classical conditioning, or Pavlovian conditioning** A type of learned response that occurs when a neutral object comes to elicit a reflexive response when it is associated with a stimulus that already produces that response.
- client-centred therapy** An empathic approach to therapy; it encourages personal growth through greater self-understanding.
- cognition** Mental activity such as thinking or representing information.
- cognitive dissonance** An uncomfortable mental state due to conflicts between attitudes or between attitudes and behaviour.
- cognitive map** A visual/spatial mental representation of an environment.
- cognitive neuroscience** The study of the neural mechanisms that underlie thought, learning, and memory.
- cognitive psychology** The study of how people think, learn, and remember.
- cognitive restructuring** A therapy that strives to help patients recognize maladaptive thought patterns and replace them with ways of viewing the world that are more in tune with reality.
- cognitive therapy** Treatment based on the idea that distorted thoughts produce maladaptive behaviours and emotions.
- cognitive-behavioural approach** A diagnostic model that views psychopathology as the result of learned, maladaptive cognitions.
- cognitive-behavioural therapy (CBT)** A therapy that incorporates techniques from behavioural therapy and cognitive therapy to correct faulty thinking and change maladaptive behaviours.
- compliance** The tendency to agree to do things requested by others.
- concept** A mental representation that groups or categorizes objects, events, or relations around common themes.
- concrete operational stage** The third stage in Piaget's theory of cognitive development, during which children begin to think about and understand operations in ways that are reversible.
- conditioned response (CR)** A response to a conditioned stimulus that has been learned.
- conditioned stimulus (CS)** A stimulus that elicits a response only after learning has taken place.
- cones** Retinal cells that respond to higher levels of illumination and result in colour perception.
- confabulation** The unintended false recollection of episodic memory.
- conformity** The altering of one's opinions or behaviours to match those of others or to match social norms.

- confound** Anything that affects a dependent variable and may unintentionally vary between the experimental conditions of a study.
- consciousness** The subjective experience of the world and of mental activity.
- consolidation** A hypothetical process involving the transfer of contents from immediate memory into long-term memory.
- continuous reinforcement** A type of learning in which the desired behaviour is reinforced each time it occurs.
- control (or comparison) group** The participants in a study that receive no intervention or an intervention different from the one being studied.
- conventional** Middle stage of moral development, in which rules and the approval of others determines what is moral.
- coping response** Any response an organism makes to avoid, escape from, or minimize an aversive stimulus.
- cornea** The clear outer covering of the eye.
- correlational study** A research method that examines how variables are naturally related in the real world, without any attempt by the researcher to alter them.
- critical periods** Biologically determined time periods for the development of specific skills.
- critical thinking** A systematic way of evaluating information to reach reasonable conclusions.
- cross-sectional studies** A research method that compares participants in different groups (e.g., young and old) at the same time.
- cryptomnesia** A type of misattribution that occurs when a person thinks he or she has come up with a new idea, yet has only retrieved a stored idea and failed to attribute the idea to its proper source.
- crystallized intelligence** Knowledge acquired through experience and the ability to use that knowledge.
- cultural distance** The disparity in customs, traditions, beliefs, and general heritage between two cultures.
- cultural fit** The degree to which one's values and behavioural norms align with those common to another culture.
- culturally sensitive research** Studies that take into account the ways culture affects thoughts, feelings, and actions.
- culture** The beliefs, values, rules, and customs that exist within a group of people who share a common language and environment and that are transmitted through learning from one generation to the next.
- culture-bound disorder** A disorder that is influenced by the specific factors of a particular culture. In other cultures, the disorder manifests itself infrequently or differently.
- culture shock** The feelings of anxiety, estrangement, helplessness, and incongruousness with one's surroundings that often follow emigration to a new cultural environment.
- data** Objective observations or measurements.
- decision making** Attempting to select the best alternative among several options.
- declarative memory** The cognitive information retrieved from explicit memory; knowledge that can be declared.
- deductive reasoning** Using a belief or rule to determine if a conclusion is valid (follows logically from the belief or rule).
- defence mechanisms** Unconscious mental strategies the mind uses to protect itself from conflict and distress.
- defining attribute model** The idea that a concept is characterized by a list of features that are necessary to determine if an object is a member of the category.
- deindividuation** A phenomenon of low self-awareness, in which people lose their individuality and fail to attend to personal standards.
- delusions** False personal beliefs based on incorrect inferences about reality.
- dendrites** Branchlike extensions of the neuron that detect information from other neurons.
- dependent variable** In an experiment, the measure that is affected by manipulation of the independent variable.
- descriptive statistics** Overall summary of data.
- descriptive studies** A research method that involves observing and noting the behaviour of people or other animals in order to provide a systematic and objective analysis of behaviour.
- developmental psychology** The study of changes in physiology, cognition, and social behaviour over the lifespan.
- dhat syndrome** A disorder frequently identified in South Asian cultures, characterized by a belief in young men that they are leaking semen, usually as a result of engaging in sexual activities of which their cultures disapprove. This belief produces feelings of anxiety, guilt, and fear.
- dialectical behaviour therapy (DBT)** A form of therapy used to treat borderline personality disorder.
- diathesis-stress model** A diagnostic model that proposes that a disorder may develop when an underlying vulnerability is coupled with a precipitating event.
- directionality problem** When researchers find a relationship between two variables in a correlational study, they cannot determine which variable may have caused changes in the other variable.
- discrimination** The inappropriate and unjustified treatment of people based solely on their group membership.
- disorganized attachment** Attachment style in which infants give mixed responses when their caregiver leaves and then returns from a short absence.
- disorganized behaviour** Acting in strange or unusual ways, including strange movement of limbs, bizarre speech, and inappropriate self-care, such as failing to dress properly or bathe.
- display rules** Rules learned through socialization that dictate which emotions are suitable to given situations.
- dissociative identity disorder (DID)** The occurrence of two or more distinct identities in the same individual.
- dizygotic twins** Twin siblings who result from two separately fertilized eggs (i.e., fraternal twins).
- dominant gene** A gene that is expressed in the offspring whenever it is present.
- dopamine** A monoamine neurotransmitter involved in reward, motivation, and motor control.
- dreams** The product of an altered state of consciousness in which images and fantasies are confused with reality.
- drive** Psychological state that motivates an organism to satisfy its needs.
- dysthymia** A form of depression that is not severe enough to be diagnosed as major depression.
- eardrum (tympanic membrane)** A thin membrane, which sound waves vibrate, that marks the beginning of the middle ear.
- ego** In psychodynamic theory, the component of personality that tries to satisfy the wishes of the id while being responsive to the dictates of the superego.
- elaboration likelihood model** A theory of how persuasive messages lead to attitude changes.
- electroconvulsive therapy (ECT)** A procedure used to treat depression; it involves administering a strong electrical current to the patient's brain.

- electroencephalograph (EEG)** A device that measures electrical activity in the brain.
- emotion** Feelings that involve subjective evaluation, physiological processes, and cognitive beliefs.
- emotional intelligence (EQ)** A form of social intelligence that emphasizes the ability to perceive, understand, manage, and use emotions to guide thoughts and actions.
- emotion-focused coping** A type of coping in which people try to prevent having an emotional response to a stressor.
- encoding** The processing of information so that it can be stored.
- encoding specificity principle** Any stimulus that is encoded along with an experience can later trigger memory for the experience.
- endocrine system** A communication system that uses hormones to influence thoughts, behaviours, and actions.
- endorphins** A neurotransmitter involved in natural pain reduction and reward.
- epinephrine** The neurotransmitter responsible for adrenaline rushes, bursts of energy caused by its release throughout the body.
- episodic memory** Memory for one's personal past experiences.
- ethic of autonomy** One of Shweder's three codes of ethics, under which a person views his or her actions as right or wrong based on whether those actions directly hurt another person or infringe on another person's rights and freedoms.
- ethic of community** One of Shweder's three codes of ethics, under which a person views his or her actions as right or wrong based on the extent to which those actions conform with his or her role in a community or social hierarchy.
- ethic of divinity** One of Shweder's three codes of ethics, under which a person views his or her actions as right or wrong based on whether those actions cause impurity or degradation to himself or herself, show disrespect to a higher being, or show disrespect to the higher being's creations.
- etiology** Factors that contribute to the development of a disorder.
- evolutionary theory** In psychological science, a theory that emphasizes the inherited, adaptive value of behaviour and mental activity throughout the history of a species.
- exemplar model** Information stored about the members of a category is used to determine category membership.
- experiment** A study that tests causal hypotheses by measuring and manipulating variables.
- experimental (or treatment) group** The participants in a study that receive the intervention.
- experimenter expectancy effect** Actual change in the behaviour of the people or animals being observed that is due to observer bias.
- explicit attitudes** Attitudes that people can report.
- explicit memory** The processes involved when people remember specific information.
- exposure** A behavioural therapy technique that involves repeated exposure to an anxiety-producing stimulus or situation.
- expressed emotion** A pattern of interactions that includes emotional overinvolvement, critical comments, and hostility directed toward a patient by family members.
- extinction** A process in which the conditioned response is weakened when the conditioned stimulus is repeated without the unconditioned stimulus.
- extrinsic motivation** Motivation to perform an activity because of the external goals toward which that activity is directed.
- family systems model** A diagnostic model that considers symptoms within an individual as indicating problems within the family.
- fight-or-flight response** The physiological preparedness of animals to deal with danger.
- five-factor theory** The idea that personality can be described using five factors: openness to experience, conscientiousness, extroversion, agreeableness, and neuroticism.
- fixed schedule** A schedule in which reinforcement is consistently provided after a specific number of occurrences or a specific amount of time.
- flashbulb memories** Vivid memories for the circumstances in which one first learned of a surprising, consequential, or emotionally arousing event.
- fluid intelligence** Information processing in novel or complex circumstances.
- forgetting** The inability to retrieve memory from long-term storage.
- formal operational stage** The final stage in Piaget's theory of cognitive development; it involves the ability to think abstractly and to formulate and test hypotheses through deductive logic.
- fovea** The centre of the retina, where cones are densely packed.
- frame-switching** The shifting of thoughts and behaviours to those appropriate for a given cultural context.
- framing** The effect of presentation on how information is perceived.
- frontal lobes** The region at the front of the cerebral cortex concerned with planning and movement.
- frustration-aggression hypothesis** The extent to which people feel frustrated predicts the likelihood that they will act aggressively.
- functional magnetic resonance imaging (fMRI)** An imaging technique used to examine changes in the activity of the working human brain.
- functionalism** An approach to psychology concerned with the adaptive purpose, or function, of mind and behaviour.
- fundamental attribution error** The tendency to overemphasize personal factors and underestimate situational factors in explaining behaviour.
- GABA** (gamma-aminobutyric acid) The primary inhibitory transmitter in the nervous system.
- gender identity** Personal beliefs about whether one is male or female.
- gender roles** The characteristics associated with males and females because of cultural influence or learning.
- gender schemas** Cognitive structures that influence how people perceive the behaviours of females and males.
- gene** The unit of heredity that determines a particular characteristic in an organism.
- general adaptation syndrome** A consistent pattern of responses to stress that consists of three stages: alarm, resistance, and exhaustion.
- general intelligence (g)** The idea that one general factor underlies all mental abilities.
- generalized anxiety disorder (GAD)** A diffuse state of constant anxiety not associated with any specific object or event.
- genotype** The genetic constitution determined at the moment of conception.
- Gestalt theory** A theory based on the idea that the whole of personal experience is different from simply the sum of its constituent elements.
- glutamate** The primary excitatory transmitter in the nervous system.
- gonads** The main endocrine glands involved in sexual behaviour: in males, the testes; in females, the ovaries.
- gustation** The sense of taste.

- habituation** A decrease in behavioural response following repeated exposure to nonthreatening stimuli.
- hallucinations** False sensory perceptions that are experienced without an external source.
- haptic sense** The sense of touch.
- health psychology** The field of psychological science concerned with the events that affect physical well-being.
- heritability** A statistical estimate of the variation, caused by differences in heredity, in a trait within a population.
- heuristics** In problem solving, shortcuts (rules of thumb or informal guidelines) used to reduce the amount of thinking that is needed to move from an initial state to a goal state.
- hippocampus** A brain structure important for the formation of certain types of memory.
- holistic thinking** A system of evaluation in which a person views objects with regard to context and in terms of the relationships between them. The person then uses the resulting assessments to guide behaviour.
- homeostasis** The tendency for bodily functions to maintain equilibrium.
- hormones** Chemical substances, typically released from endocrine glands, that travel through the bloodstream to targeted tissues, which are subsequently influenced by the hormones.
- humanistic approaches** Approaches to studying personality that emphasize personal experience and belief systems; they propose that people seek personal growth to fulfill their human potential.
- hypnosis** A social interaction during which a person, responding to suggestions, experiences changes in memory, perception, and/or voluntary action.
- hypothalamic-pituitary-adrenal (HPA) axis** The biological system responsible for the stress response.
- hypothalamus** A small brain structure that is vital for temperature regulation, emotion, sexual behaviour, and motivation.
- hypothesis** A specific prediction of what should be observed in the world if a theory is correct.
- id** In psychodynamic theory, the component of personality that is completely submerged in the unconscious and operates according to the pleasure principle.
- idiographic approaches** Person-centred approaches to studying personality that focus on individual lives and how various characteristics are integrated into unique persons.
- immune system** The body's mechanism for dealing with invading micro-organisms, such as allergens, bacteria, and viruses.
- implicit attitudes** Attitudes that influence our feelings and behaviour at an unconscious level.
- implicit memory** The system underlying unconscious memories.
- incentives** External stimuli (as opposed to internal drives) that motivate behaviours.
- independent variable** In an experiment, the condition that is manipulated by the experimenter to examine its impact on the dependent variable.
- inductive reasoning** Using examples or instances to determine if a rule or conclusion is likely to be true.
- infantile amnesia** The inability to remember events from early childhood.
- inferential statistics** A set of procedures used to make judgments about whether differences actually exist between sets of numbers.
- ingroup favouritism** The tendency for people to evaluate favourably and privilege members of the ingroup more than members of the outgroup.
- insight** (1) The sudden realization of a solution to a problem. (2) A goal of some types of therapy; a patient's understanding of his or her own psychological processes.
- insomnia** A disorder characterized by an inability to sleep.
- intelligence** The human ability to use knowledge, solve problems, understand complex ideas, learn quickly, and adapt to environmental challenges.
- intelligence quotient (IQ)** The number computed by dividing a child's estimated mental age by the child's chronological age, and then multiplying this number by 100.
- interactionists** Theorists who believe that behaviour is determined jointly by underlying dispositions and situations.
- interneurons** One of the three types of neurons, these neurons communicate only with other neurons, typically within a specific brain region.
- interpreter** A left hemisphere process that attempts to make sense of events.
- interval schedule** A schedule in which reinforcement is available after a specific unit of time.
- intrinsic motivation** Motivation to perform an activity because of the value or pleasure associated with that activity, rather than for an apparent external goal or purpose.
- introspection** A systematic examination of subjective mental experiences that requires people to inspect and report on the content of their thoughts.
- iris** The coloured muscular circle on the surface of the eye; it changes shape to let in more or less light.
- kinesthetic sense** Perception of our limbs in space.
- latent content** What a dream symbolizes, or the material that is disguised in a dream to protect the dreamer.
- latent learning** Learning that takes place in the absence of reinforcement.
- lateral inhibition** A visual process in which adjacent photoreceptors tend to inhibit one another.
- law of effect** Thorndike's general theory of learning: Any behaviour that leads to a "satisfying state of affairs" will more likely occur again, and any behaviour that leads to an "annoying state of affairs" will less likely recur.
- learned helplessness model** A cognitive model of depression in which people feel unable to control events around them.
- learning** An enduring change in behaviour, resulting from experience.
- longitudinal studies** A research method that measures the same participants multiple times.
- long-term memory (LTM)** The relatively permanent storage of information.
- long-term potentiation (LTP)** The strengthening of a synaptic connection so that postsynaptic neurons are more easily activated.
- loosening of associations** A speech pattern among patients with schizophrenia in which their thoughts are disorganized or meaningless.
- love marriage** A type of marriage in which the bride and groom have selected each other as marriage partners.
- lymphocytes** Specialized white blood cells known as B cells, T cells, and natural killer cells that make up the immune system.
- magnetic resonance imaging (MRI)** A method of brain imaging that produces high-quality images of the brain.

- major depression** A disorder characterized by severe negative moods or a lack of interest in normally pleasurable activities.
- manifest content** The plot of a dream; the way a dream is remembered.
- mean** A measure of central tendency that is the arithmetic average of a set of numbers.
- median** A measure of central tendency that is the value in a set of numbers that falls exactly halfway between the lowest and highest values.
- meditation** A mental procedure that focuses attention on an external object or on a sense of awareness.
- meme** A unit of knowledge transferred within a culture.
- memory** The nervous system's capacity to acquire and retain usable skills and knowledge.
- memory bias** The changing of memories over time in ways consistent with current beliefs.
- mental age** An assessment of a child's intellectual standing relative to that of his or her peers; determined by a comparison of the child's test score with the average score for children of each chronological age.
- mental set** A problem solving strategy that has worked in the past.
- meta-analysis** A "study of studies" that combines the findings of multiple studies to arrive at a conclusion.
- microsleeps** Brief, unintended sleep episodes, ranging from a few seconds to a minute, caused by chronic sleep deprivation.
- mind/body problem** A fundamental psychological issue that considers whether mind and body are separate and distinct or whether the mind is simply the subjective experience of the physical brain.
- mirror neurons** Neurons that are activated during observation of others performing an action.
- mnemonics** Strategies for improving memory.
- modal memory model** The three-stage memory system that involves sensory memory, short-term memory, and long-term memory.
- mode** A measure of central tendency that is the most frequent score or value in a set of numbers.
- modelling** The imitation of behaviour through observational learning.
- monocular depth cues** Cues of depth perception that are available to each eye alone.
- monozygotic twins** Twin siblings who result from one zygote splitting in two and therefore share the same genes (i.e., identical twins).
- motivation** Factors that energize, direct, or sustain behaviour.
- motor neurons** One of the three types of neurons, these efferent neurons direct muscles to contract or relax, thereby producing movement.
- multiaxial system** The system used in the *DSM* that provides assessment along five axes describing important mental health factors.
- multiple intelligences** The idea that people can show different skills in a variety of different domains.
- myelin sheath** A fatty material, made up of glial cells, that insulates the axon and allows for the rapid movement of electrical impulses along the axon.
- narcolepsy** A sleep disorder in which people fall asleep during normal waking hours.
- natural selection** Darwin's theory that those who inherit characteristics that help them adapt to their particular environments have a selective advantage over those who do not.
- naturalistic observation** A passive descriptive study in which observers do not change or alter ongoing behaviour.
- nature/nurture debate** The arguments concerning whether psychological characteristics are biologically innate or acquired through education, experience, and culture.
- need** State of biological or social deficiency.
- need hierarchy** Maslow's arrangement of needs, in which basic survival needs must be met before people can satisfy higher needs.
- need to belong theory** The need for interpersonal attachments is a fundamental motive that has evolved for adaptive purposes.
- negative punishment** Punishment that occurs with the removal of a stimulus and thus decreases the probability of a behaviour's recurring.
- negative reinforcement** The increase in the probability of a behaviour's being repeated through the removal of a stimulus.
- negative symptoms** Symptoms of schizophrenia marked by deficits in functioning such as apathy, lack of emotion, and slowed speech and movement.
- neuron** The basic unit of the nervous system; it operates through electrical impulses, which communicate with other neurons through chemical signals. Neurons receive, integrate, and transmit information in the nervous system.
- neurotransmitter** A chemical substance that carries signals from one neuron to another.
- nodes of Ranvier** Small gaps of exposed axon, between the segments of myelin sheath, where action potentials are transmitted.
- nomothetic approaches** Approaches to studying personality that focus on how people vary across common traits.
- nonverbal behaviour** The facial expressions, gestures, mannerisms, and movements by which one communicates with others.
- norepinephrine** The neurotransmitter involved in states of arousal and awareness.
- object permanence** The understanding that an object continues to exist even when it cannot be seen.
- objective measures** Relatively direct assessments of personality, usually based on information gathered through self-report questionnaires or observer ratings.
- observational learning** Learning that occurs when behaviours are acquired or modified following exposure to others performing the behaviour.
- observational technique** A research method of careful and systematic assessment and coding of overt behaviour.
- observer bias** Systematic errors in observation that occur because of an observer's expectations.
- obsessive-compulsive disorder (OCD)** An anxiety disorder characterized by frequent intrusive thoughts and compulsive actions.
- occipital lobes** Regions of the cerebral cortex, at the back of the brain, important for vision.
- olfaction** The sense of smell, which occurs when receptors in the nose respond to chemicals.
- olfactory bulb** The brain centre for smell, located below the frontal lobes.
- olfactory epithelium** The thin layer of tissue, within the nasal cavity, that is embedded with smell receptors.
- operant conditioning, or instrumental conditioning** A learning process in which the consequences of an action determine the likelihood that it will be performed in the future.
- oxytocin** A hormone that is important for mothers in bonding to newborns.



- panic disorder** An anxiety disorder characterized by sudden, overwhelming attacks of terror.
- parallel processing** Processing multiple types of information at the same time.
- parasympathetic division of ANS** A division of the autonomic nervous system; it returns the body to its resting state.
- parietal lobes** Regions of the cerebral cortex, in front of the occipital lobes and behind the frontal lobes, important for the sense of touch and of the spatial layout of an environment.
- Parkinson's disease (PD)** A neurological disorder that seems to be caused by dopamine depletion, marked by muscular rigidity, tremors, and difficulty initiating voluntary action.
- partial reinforcement** A type of learning in which behaviour is reinforced intermittently.
- partial-reinforcement extinction effect** The greater persistence of behaviour under partial reinforcement than under continuous reinforcement.
- participant observation** A type of descriptive study in which the researcher is actively involved in the situation.
- perception** The processing, organization, and interpretation of sensory signals; it results in an internal representation of the stimulus.
- perceptual constancy** People correctly perceive objects as constant in their shape, size, colour, and lightness, despite raw sensory data that could mislead perception.
- peripheral nervous system (PNS)** All nerve cells in the body that are not part of the central nervous system. The PNS includes the somatic and autonomic nervous systems.
- personal attributions** Explanations that refer to internal characteristics, such as abilities, traits, moods, and effort.
- personality** The characteristic thoughts, emotional responses, and behaviours that are relatively stable in an individual over time and across circumstances.
- personality trait** A characteristic; a dispositional tendency to act in a certain way over time and across circumstances.
- personality types** Discrete categories based on global personality characteristics.
- persuasion** The active and conscious effort to change attitudes through the transmission of a message.
- phenotype** Observable physical characteristics that result from both genetic and environmental influences.
- phobia** An acquired fear that is out of proportion to the real threat of an object or of a situation.
- pituitary gland** Located at the base of the hypothalamus; the gland that sends hormonal signals controlling the release of hormones from endocrine glands.
- placebo effect** A drug or treatment, unrelated to the particular problem of the person who receives it, may make the recipient feel better because the person believes the drug or treatment is effective.
- plasticity** A property of the brain that allows it to change as a result of experience, drugs, or injury.
- population** Everyone in the group the experimenter is interested in.
- positive punishment** Punishment that occurs with the administration of a stimulus and thus decreases the probability of a behaviour's recurring.
- positive reinforcement** The increase in the probability of a behaviour's being repeated following the administration of a stimulus.
- positive symptoms** Symptoms of schizophrenia, such as delusions and hallucinations, that are excesses in behaviour.
- positron emission tomography (PET)** A method of brain imaging that assesses metabolic activity by using a radioactive substance injected into the bloodstream.
- postconventional** Highest stage of moral development, in which decisions about morality depend on abstract principles.
- postdecisional dissonance** The incongruity between one's decision and the undesirable aspects of that decision.
- post-traumatic stress disorder (PTSD)** A mental disorder that involves frequent nightmares, intrusive thoughts, and flashbacks related to an earlier trauma.
- preconventional** Earliest level of moral development, in which self-interest determines what is moral.
- prefrontal cortex** A region of the frontal lobes, especially prominent in humans, important for attention, working memory, decision making, appropriate social behaviour, and personality.
- prejudice** The usually negative affective or attitudinal responses associated with stereotypes.
- preoperational stage** The second stage in Piaget's theory of cognitive development, during which children think symbolically about objects, but reason is based on appearance rather than logic.
- primary appraisal** Part of the coping process that involves making decisions about whether a stimulus is stressful, benign, or irrelevant.
- primary control** Influencing one's environment to achieve one's goals, desires, or wishes.
- primary emotions** Evolutionarily adaptive emotions that humans share across cultures; they are associated with specific biological and physical states.
- proactive interference** When prior information inhibits the ability to remember new information.
- problem solving** Finding a way around an obstacle to reach a goal.
- problem-focused coping** A type of coping in which people take direct steps to confront or minimize a stressor.
- procedural memory** A type of implicit memory that involves motor skills and behavioural habits.
- projective measures** Personality tests that examine unconscious processes by having people interpret ambiguous stimuli.
- prosocial** Tending to benefit others.
- prospective memory** Remembering to do something at some time in the future.
- prototype model** An approach to object categorization that is based on the premise that within each category, some members are more representative than others.
- psychological science** The study of mind, brain, and behaviour.
- psychoanalysis** A method developed by Sigmund Freud that attempts to bring the contents of the unconscious into conscious awareness so that conflicts can be revealed.
- psychodynamic theory** Freudian theory that unconscious forces, such as wishes and motives, influence behaviour.
- psychopathology** A disorder of the mind.
- psychosexual stage** According to Freud, the developmental stages that correspond to the pursuit of satisfaction of libidinal urges.
- psychotherapy** The generic name given to formal psychological treatment.
- psychotropic medications** Drugs that affect mental processes.
- pupil** The small opening in the eye; it lets in light waves.
- random assignment** The procedure for placing research participants into the conditions of an experiment in which each participant has an

equal chance of being assigned to any level of the independent variable.

**ratio schedule** A schedule in which reinforcement is based on the number of times the behaviour occurs.

**reactivity** When the knowledge that one is being observed alters the behaviour being observed.

**reasoning** Using information to determine if a conclusion is valid or reasonable.

**receptive field** The region of visual space to which neurons in the primary visual cortex are sensitive.

**receptors** In neurons, specialized protein molecules, on the postsynaptic membrane, that neurotransmitters bind to after passing across the synaptic cleft.

**recessive gene** A gene that is expressed only when it is matched with a similar gene from the other parent.

**reconsolidation** Neural processes involved when memories are recalled and then stored again for later retrieval.

**reinforcer** A stimulus that follows a response and increases the likelihood that the response will be repeated.

**reliability** The extent to which a measure is stable and consistent over time in similar conditions.

**REM sleep** The stage of sleep marked by rapid eye movements, dreaming, and paralysis of motor systems.

**replication** Repetition of an experiment to confirm the results.

**representativeness heuristic** A rule for categorization based on how similar the person or object is to our prototypes for that category.

**Rescorla-Wagner model** A cognitive model of classical conditioning; it states that the strength of the CS-US association is determined by the extent to which the unconditioned stimulus is unexpected.

**research** Scientific process that involves the systematic and careful collection of data.

**research ethics boards (REBs)** Groups of people responsible for reviewing proposed research to ensure that it meets the accepted standards of science and provides for the physical and emotional well-being of research participants.

**response performance** A research method in which researchers quantify perceptual or cognitive processes in response to a specific stimulus.

**resting membrane potential** The electrical charge of a neuron when it is not active.

**restructuring** A new way of thinking about a problem that aids its solution.

**retina** The thin inner surface of the back of the eyeball. The retina contains the photoreceptors that transduce light into neural signals.

**retrieval** The act of recalling or remembering stored information to use it.

**retrieval cue** Anything that helps a person (or other animal) recall information from memory.

**retroactive interference** When new information inhibits the ability to remember old information.

**retrograde amnesia** The condition in which people lose past memories, such as memories for events, facts, people, or even personal information.

**reuptake** The process whereby a neurotransmitter is taken back into the presynaptic terminal buttons, thereby stopping its activity.

**rods** Retinal cells that respond to low levels of illumination and result in black-and-white perception.

**sample** A subset of a population.

**scatterplot** A graphical depiction of the relationship between two variables.

**schema** A hypothetical cognitive structure that helps us perceive, organize, process, and use information.

**schizophrenia** A mental disorder characterized by alterations in perceptions, emotions, thoughts, or consciousness.

**scientific method** A systematic procedure of observing and measuring phenomena to answer questions about *what* happens, *when* it happens, *what* causes it, and *why*.

**secondary appraisal** Part of the coping process during which people evaluate their options and choose coping behaviours.

**secondary control** Psychologically aligning oneself with another to achieve a sense that one's goals, desires, or wishes are being fulfilled.

**secondary emotions** Blends of primary emotions, including states such as remorse, guilt, submission, and anticipation.

**secure attachment** Attachment style for a majority of infants, who are readily comforted when their caregiver returns after a brief separation.

**selection bias** When participants in different groups in an experiment differ systematically.

**self-actualization** A state that is achieved when one's personal dreams and aspirations have been attained.

**self-fulfilling prophecy** People's tendency to behave in ways that confirm their own or others' expectations.

**self-report method** A method of data collection in which people are asked to provide information about themselves, such as in questionnaires or surveys.

**self-serving bias** The tendency for people to take personal credit for success but blame failure on external factors.

**semantic memory** Memory for knowledge about the world.

**sensation** The sense organs' responses to external stimuli and the transmission of these responses to the brain.

**sensitive periods** Biologically determined time periods when specific skills develop most easily.

**sensitization** An increase in behavioural response following exposure to a threatening stimulus.

**sensorimotor stage** The first stage in Piaget's theory of cognitive development, during which infants acquire information about the world through their senses and respond reflexively.

**sensory adaptation** A decrease in sensitivity to a constant level of stimulation.

**sensory memory** Memory for sensory information that is stored briefly close to its original sensory form.

**sensory neurons** One of the three types of neurons, these afferent neurons detect information from the physical world and pass that information along to the brain.

**serotonin** A monoamine neurotransmitter important for a wide range of psychological activity, including emotional states, impulse control, and dreaming.

**serial position effect** The ability to recall items from a list depends on order of presentation, with items presented early or late in the list remembered better than those in the middle.

**sexual response cycle** A pattern of physiological responses during sexual activity.

**sexual strategies theory** Evolutionary theory that suggests men and women rank the importance of qualities in their relationship partners differently because of gender-specific adaptive problems.

**shaping** A process of operant conditioning; it involves reinforcing behaviours that are increasingly similar to the desired behaviour.

- short-term memory (STM)** A limited-capacity memory system that holds information in awareness for a brief period.
- signal detection theory (SDT)** A theory of perception based on the idea that the detection of a faint stimulus requires a judgment—it is not an all-or-none process.
- situational attributions** Explanations that refer to external events, such as the weather, luck, accidents, or the actions of other people.
- situationism** The theory that behaviour is determined more by situations than by personality traits.
- sleep apnea** A disorder in which a person stops breathing while asleep.
- social development** The maturation of skills or abilities that enable people to live in a world with other people.
- social facilitation** When the mere presence of others enhances performance.
- social integration** The quality of a person's social relationships.
- social loafing** The tendency for people to work less hard in a group than when working alone.
- social norms** Expected standards of conduct, which influence behaviour.
- social psychology** The study of group dynamics in relation to psychological processes.
- social striving** The tendency for a person to work harder in a group than when working alone.
- socio-cultural model** A diagnostic model that views psychopathology as the result of the interaction between individuals and their cultures.
- sociometer** An internal monitor of social acceptance or rejection.
- somatic markers** Bodily reactions that arise from the emotional evaluation of an action's consequences.
- somatic nervous system** A major component of the peripheral nervous system; it transmits sensory signals to the CNS via nerves.
- somatic symptoms** Physical side effects of psychological disorders.
- sound wave** The pattern of the changes in air pressure through time that results in the percept of a sound.
- somatic symptoms** Physical side effects of psychological disorders.
- source amnesia** A type of amnesia that occurs when a person shows memory for an event but cannot remember where he or she encountered the information.
- source misattribution** Memory distortion that occurs when people misremember the time, place, person, or circumstances involved with a memory.
- spatial memory** Memory for the physical environment; it includes things such as location of objects, direction, and cognitive maps.
- split brain** A condition in which the corpus callosum is surgically cut and the two hemispheres of the brain do not receive information directly from each other.
- spontaneous recovery** A process in which a previously extinguished response re-emerges following presentation of the conditioned stimulus.
- standard deviation** A statistical measure of how far away each value is, on average, from the mean.
- stereotype threat** Apprehension about confirming negative stereotypes related to one's own group.
- stereotypes** Cognitive schemas that allow for easy, fast processing of information about people based on their membership in certain groups.
- stimulus discrimination** A differentiation between two similar stimuli when only one of them is consistently associated with the unconditioned stimulus.
- stimulus generalization** Occurs when stimuli that are similar but not identical to the conditioned stimulus produce the conditioned response.
- storage** The retention of encoded representations over time that corresponds to some change in the nervous system that registers the event.
- stream of consciousness** A phrase coined by William James to describe one's continuous series of ever-changing thoughts.
- stress** A pattern of behavioural, psychological, and physiological responses to events that match or exceed an organism's abilities to respond.
- stressor** An environmental event or stimulus that threatens an organism.
- structuralism** An approach to psychology based on the idea that conscious experience can be broken down into its basic underlying components or elements.
- subliminal perception** Information processed without conscious awareness.
- substance P** A neurotransmitter involved in pain perception.
- subtractive colour mixing** A way to produce a given spectral pattern in which the mixture occurs within the stimulus itself and is actually a physical, not psychological, process.
- suggestibility** The development of biased memories when people are provided with misleading information.
- superego** In psychodynamic theory, the internalization of societal and parental standards of conduct.
- symbolic representation** An abstract mental representation that does not correspond to the physical features of an object or idea.
- sympathetic division of ANS** A division of the autonomic nervous system; it prepares the body for action.
- synapse, or synaptic cleft** The site for chemical communication between neurons, which contains extracellular fluid.
- synaptic pruning** A process whereby the synaptic connections in the brain that are frequently used are preserved, and those that are not are lost.
- synesthesia** Cross-sensory experience (in which, e.g., a visual image has a taste).
- taijinkyoufushou (TKS)** A disorder whose sufferers are morbidly afraid of offending others or causing others discomfort from the sufferers' physical flaws, which are likely imagined.
- taste buds** Sensory receptors that transduce taste information.
- taxonomic categorization** A system of grouping stimuli based on perceived similarities of attributes.
- telegraphic speech** The tendency for children to speak using rudimentary sentences that are missing words and grammatical markings but follow a logical syntax.
- temperaments** Biologically based tendencies to feel or act in certain ways.
- temporal lobes** The lower region of the cerebral cortex, important for processing auditory information and for memory.
- tend-and-befriend response** Females' tendency to protect and care for their offspring and form social alliances rather than flee or fight in response to threat.
- teratogens** Environmental agents that harm the embryo or fetus.
- terminal buttons** Small nodules, at the ends of axons, that release chemical signals from the neuron to the synapse.
- thalamus** The gateway to the brain; it receives almost all incoming sensory information before that information reaches the cortex.

**thematic categorization** A system of grouping stimuli based on perceived relationships among them.

**theory** A model of interconnected ideas and concepts that explains what is observed and makes predictions about future events.

**theory of mind** The term used to describe the ability to explain and predict other people's behaviour as a result of recognizing their mental state.

**third variable problem** When the experimenter cannot directly manipulate the independent variable and therefore cannot be confident that another, unmeasured variable is not the actual cause of differences in the dependent variable.

**top-down processing** A hierarchical model of pattern recognition in which information at higher levels of processing can also influence lower, "earlier" levels in the processing hierarchy.

**trait approach** An approach to studying personality that focuses on the extent to which individuals differ in personality dispositions.

**transcranial magnetic stimulation (TMS)** The use of strong magnets to briefly interrupt normal brain activity as a way to study brain regions.

**transduction** A process by which sensory receptors produce neural impulses when they receive physical or chemical stimulation.

**transience** The pattern of forgetting over time.

**Type A behaviour pattern** A pattern of behaviour characterized by competitiveness, achievement orientation, aggressiveness, hostility, restlessness, inability to relax, and impatience with others.

**Type B behaviour pattern** A pattern of behaviour characterized by relaxed, noncompetitive, easygoing, and accommodating behaviour.

**unconditioned response (UR)** A response that does not have to be learned, such as a reflex.

**unconditioned stimulus (US)** A stimulus that elicits a response, such as a reflex, without any prior learning.

**unconscious** The mental processes that operate below the level of conscious awareness.

**U-shaped curve** In psychology, a pattern of acculturation, characterized by three phases: the "honeymoon stage," "crisis" or "culture shock," and "adjustment."

**validity** The extent to which the data collected address the research hypothesis in the way intended.

**variability** In a set of numbers, how widely dispersed the values are from each other and from the mean.

**variable** Something in the world that can be measured and that can vary.

**variable schedule** A schedule in which reinforcement is applied at different rates or at different times.

**vestibular sense** Perception of balance.

**vicarious learning** Learning that occurs when people learn the consequences of an action by observing others being rewarded or punished for performing the action.

**well-being** A positive state that includes striving for optimal health and life satisfaction.

**Whorfian hypothesis** The controversial theory that the language one speaks influences the way one thinks.

**working memory (WM)** An active processing system that keeps different types of information available for current use.

**Yerkes-Dodson law** The psychological principle that performance increases with arousal up to an optimal point, after which it decreases with increasing arousal.

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# ANSWER KEY FOR MEASURING UP EXERCISES AND FOR PRACTICE TESTS

## CHAPTER 1: INTRODUCTION

### Measuring Up, p. 16

For each example below, indicate which of the seven themes of psychological science apply. *Answers: a. 7; b. 2 (could also be 6); c. 1; d. 6 (could also be 4); e. 4; f. 3*

### Measuring Up, p. 25

Identify the school of thought that each of the following statements characterizes. *Answers: a. behaviourism; b. functionalism; c. cognitive; d. social; e. Gestalt; f. structuralism; g. psychoanalysis*

### Measuring Up, p. 30

1. Critical thinking is \_\_\_\_\_. *Answer: b. using specific thinking skills to reach reasonable conclusions*
2. Psychology is relevant \_\_\_\_\_. *Answer: b. in all aspects of life*

### Practice Test, p. 33

1. When you mention to your family that you enrolled in a psychology course, your family members share their understanding of the field. Which comment best reflects the nature of psychological science? *Answer: c. "I think you'll be surprised by the range of questions psychologists ask about the mind, the brain, and behaviour, not to mention the methods they use to answer these questions."*
2. Match each definition with one of the following ideas from evolutionary theory: adaptations, natural selection, survival of the fittest. *Answers: a. adaptations; b. survival of the fittest; c. natural selection*
3. Titles of recent research articles appear below. Indicate which of the four levels of analysis—cultural, social, individual, or biological—each article likely addresses. *Answers: a. social; b. biological; c. cultural; d. individual*
4. True or false? Psychology as a field of inquiry developed almost exclusively from Western thinking. *Answer: false*
5. Indicate which school or schools of thought each of the following scholars is associated with: John Dewey, William James, Wolfgang Köhler, Kurt Lewin, George Miller, B. F. Skinner, Edward Titchener, Edward Tolman, John B. Watson, Max Wertheimer, Wilhelm Wundt. *Answers: a. Titchener, Wundt; b. Dewey, James; c. Köhler, Wertheimer; d. Skinner, Watson; e. Köhler, Miller, Tolman; f. Lewin*
6. Match each description with one of the following theoretical ideas: field theory, information processing theory, introspection, phenomenological approach, stream of consciousness. *Answers: a. introspection; b. field theory; c. phenomenological approach; d. stream of consciousness; e. information processing theory*

7. Imagine you have decided to seek mental health counselling. You mention this to a few of your friends. Each friend shares an opinion with you. Based on your understanding of psychological science, which friend offers the strongest advice? *Answer: c. "That's great! Psychologists do research to figure out which interventions are most helpful for people with different concerns."*
8. Which of the following practices are hallmarks of critical thinking? *Answer: All are correct.*
9. Your brother reads that research shows eating ice cream makes people more intelligent. He starts downing a pint of ice cream every day to increase his intelligence. To help your brother better understand this claim (and avoid obesity), which of the following questions would you ask? *Answers: b. "Does the article say how the researchers measured intelligence?"; d. "I wonder how the researchers designed the study. Were they doing good science?"; e. "I'd want to know who sponsored the study. Would you believe these results if the study was paid for and conducted by researchers at the world's largest ice cream company?"*

## CHAPTER 2: RESEARCH METHODOLOGY

### Measuring Up, p. 39

1. How are theories, hypotheses, and research different? *Answer: b. Theories are broad conceptual frameworks, hypotheses are derived from theories and are used to design research that will support or fail to support a theory, and research is a test of the hypotheses.*
2. How does psychological research differ from relying on personal experience or intuition as a way of understanding thought, emotions, and behavior? *Answer: b. Carefully designed research is the most objective method for understanding thoughts, emotions, and behaviours.*

### Measuring Up, p. 52

1. The main reason researchers randomly assign participants to different groups in an experiment is that \_\_\_\_\_. *Answer: d. random assignment is the only way to ensure that the participants are (on average) equal and that any difference in the dependent variables must have been caused by their being in different groups*
2. Match each of the main methods of conducting research with the advantages and disadvantages listed below. *Answers: a. experimental; b. descriptive; c. correlational; d. cross-sectional; e. descriptive; f. longitudinal; g. experimental; h. correlational*

### Measuring Up, p. 68

For each example below, indicate which data collection method would work best. *Answers: 1. case study; 2. survey or interview; 3. description/observation [in the wild is best]; 4. experience sampling; 5. meta-analysis; 6. brain imaging; 7. transcranial magnetic stimulation*

## Measuring Up, p. 75

1. When researchers want to summarize in a single number all the data they collect, they compute a measure of central tendency. Here are hypothetical data for a study in which 10 women in a sample indicated how many hours they worked that day and then used a rating scale to indicate how much they wanted to have fun. . . . For each set of data, compute the mean, median, and mode. *Answers: Mean for number of hours worked = 5.7; mean ratings of how much they want to have fun = 6.4; median number of hours worked = 5.5; median ratings of how much they want to have fun = 6; mode for number of hours worked = 5, 6, and 8 are all tied for mode—all occur twice; mode for ratings of how much they want to have fun = 5.*

Now, using a grid like the one in Figure 2.24, draw a scatterplot of the data in question 1. When you are finished, look at the plot and decide if it represents a positive, negative, or no (linear) relationship between these two variables. Explain what the scatterplot is showing in your own words. *Answer: There appears to be a positive linear relationship between numbers of hours worked and ratings of fun. This means that as the number of hours the women worked increased, the women gave higher ratings for how much fun they wanted to have. Because this is a correlation, we cannot say that working more hours caused the women to want to have more fun, because there may be a third variable. (Perhaps the women who worked more hours had more money than those who worked fewer hours, or having more money to spend may make women want to have fun.)*

2. Which is an accurate description of the rationale for inferential statistics? *Answer: d. When the means of two sample groups are significantly different, we can infer that the populations the groups were selected from are different.*

## Practice Test, p. 79

1. Which of the following is a technique that increases scientists' confidence in the findings from a given research study? *Answer: c. replication*
2. Which hypothesis is stronger? Why? *Answer: b, because it offers a specific prediction*
3. Which sampling method is strongest? Why? *Answer: a, because it is random*
4. Which set of conditions should be included in the study? Why? *Answer: c, because it includes experimental and control groups*
5. How should participants be chosen for each condition? Why? *Answer: a, because it uses random assignment*
6. Which operational definition of the dependent variable, stress, is stronger? Why? *Answer: b, because it describes how the variable will be measured*
7. Should you conduct the study in a lab or in a natural setting (e.g., in the campus dining hall)? Why? *Answer: natural setting, because you want to know what people do in their daily lives*
8. Should you use written descriptions of what is heard or a running tally of prespecified categories of behaviour? Why? *Answer: prespecified categories of behaviour, because you want to know whether a specific behaviour, discussing politics, occurs; a simple tally of "yes" or "no" would answer this question.*
9. Should participants know you are observing them? Why? *Answer: No, because doing so will create reactivity.*
10. Indicate which quality of good data is violated by each description. *Answers: a. validity; b. reliability; c. accuracy*

## CHAPTER 3: BIOLOGICAL FOUNDATIONS

### Measuring Up, p. 95

1. The difference between genotype and phenotype is that \_\_\_\_\_. *Answer: a. genotype refers to an organism's genetic makeup; phenotype refers to observable characteristics that result from genetic and environmental influences*
2. What is the principle behind knockout gene research? *Answer: b. By rendering a single gene inactive, we can study that gene's effects on behaviour.*

### Measuring Up, p. 108

1. Neurons communicate by firing. Put the following steps in the correct order so they describe this process. *Answer: e, c, d, b, f, g, h, a*
2. Match each major neurotransmitter with its major functions. *Answers: a. 4; b. 3; c. 5; d. 1; e. 6; f. 2; g. 7*

### Measuring Up, p. 118

1. Match each lobe of the brain with its functions. *Answers: a. 2; b. 4; c. 3; d. 1*
2. Match each of the following brain structures with its role or function. *Answers: a. 7; b. 8; c. 6; d. 5; e. 2; f. 1; g. 3; h. 4*

### Measuring Up, p. 124

1. Match each statement with one or more of the following terms: peripheral nervous system (PNS); somatic nervous system; autonomic nervous system (ANS); sympathetic division; parasympathetic division. *Answers: a. sympathetic; b. parasympathetic; c. somatic; d. PNS; e. autonomic*
2. Which of the following statements are true? *Answers: Choices b, d, e, f, and h are true.*

### Measuring Up, p. 134

1. A person's brain changes in response to environment, including all of that person's experiences. Place an X next to the statements below that support this idea. *Answers: Choices b, c, e, and g are all examples of environment's effect on the brain. Choice f is an extreme effect caused by a brain injury.*
2. Indicate whether the following statements, about the ways in which females' and males' brains differ, are true or false. *Answers: a. true; b. false; c. false; d. false; e. false*

### Practice Test, p. 137

1. Complete the following analogy: Genes are to chromosomes as \_\_\_\_\_ are to \_\_\_\_\_. *Answer: c. bricks, walls*
2. Which of the following statements are true regarding the relationship between genetic makeup and environment? *Answers: Choices a, b, and c are true.*
3. Which two labels accurately describe neurons that detect information from the physical world and pass that information along to the brain? *Answers: b. sensory neuron, e. afferent neuron*
4. You witness a major car accident on your way to school. You pull over and rush to help one of the victims, who has severe cuts across his forehead and legs. . . . Which neurochemical is likely keeping the man pain free despite of his obvious injuries? *Answer: d. endorphins*
5. Who do you predict would have a larger hippocampus? *Answer: a. someone who plays computer games requiring the exploration of complex virtual worlds*
6. Someone suffers a stroke that causes damage to the left motor cortex. Which of the following impairments will the person most likely exhibit? *Answer: d. paralysis of the right side of the body*

7. Because it determines other glands' activities, the \_\_\_\_\_ is sometimes called "the master gland." *Answer: a. pituitary*
8. The adage *You can't teach an old dog new tricks* is consistent with which phenomenon? *Answer: b. critical periods*
9. True or false: Differences in the brains of people from different cultures necessarily reveal underlying differences in biology. *Answer: False*

## CHAPTER 4: THE MIND AND CONSCIOUSNESS

### Measuring Up, p. 155

1. Which of the following statements are correct, according to our understanding of consciousness? *Answers: Choices b, e, f, g, and h are correct.*
2. In split-brain patients, the left hemisphere interpreter \_\_\_\_\_ *Answer: c. makes sense of actions directed by the right hemisphere*

### Measuring Up, p. 165

1. When people sleep, \_\_\_\_\_. *Answer: b. brain activity goes through several cycles of different stages, and each stage has its own characteristic pattern of brain waves*
2. Select the hypothesized reasons why we dream. *Answers: b. Dreams are a way of making sense of neural firing patterns.; c. Dreams allow us to rehearse coping strategies for anxiety-producing events.*

### Measuring Up, p. 173

Mark each statement below with an "S" if it supports the conclusion that hypnosis is a real phenomenon. Put an "F" next to any false statement. *Answers a. S; b. F; c. S; d. Neither S nor F; e. F; f. F; g. F*

### Measuring Up, p. 182

1. All drugs work by \_\_\_\_\_. *Answer: d. activating neurotransmitter systems*
2. Match each of the following drugs or drug categories with as many true statements as apply. *Answers: a. alcohol; b. marijuana; c. opiates; d. opiates; e. stimulants; f. MDMA; g. alcohol; h. stimulants; i. MDMA*

### Practice Test, p. 185

1. What is a key distinction between a person in a persistent vegetative state and a person in a minimally conscious state? *Answer: c. The person in the minimally conscious state shows some degree of brain activity, whereas the person in the persistent vegetative state shows no brain activity.*
2. A researcher asks study participants to play a word game in which they unscramble letters to form words. . . . After participants complete the word game, they meet and interact with a stranger. What do you predict participants' behaviour during that interaction will reveal? *Answer: b. Participants in Condition A will be more friendly toward the stranger than will participants in Condition B.*
3. A study participant who has a severed corpus callosum is asked to focus on a dot in the middle of a computer screen. After a few seconds, a car appears on the left half of the screen while an automobile tire appears on the right half of the screen. How will the participant most likely respond if asked to describe the objects in the pictures? *Answer: a. The participant will say he saw a tire and will draw a car.*
4. For each description below, name the sleep disorder: insomnia, apnea, narcolepsy, or somnambulism. *Answers: a. narcolepsy; b. somnambulism; c. insomnia; d. apnea*

5. Which of the following pieces of evidence suggest sleep is an adaptive behaviour? *Answers: b. All animals sleep.; c. It is impossible to resist indefinitely the urge to sleep.; e. Animals die when deprived of sleep for extended periods.*
6. Four students discuss a hypnotist's performance on campus. Which student's claim about hypnotism is most consistent with current evidence? *Answer: d. "It's pretty cool that a hypnotist could help those people enter an altered state of consciousness."*
7. Which of the following instruction sets would a yoga teacher trained in concentrative meditation be most likely to give? *Answer: b. "Lying on your back, rest your hands gently on your abdomen. As you breathe in and out, focus attention on your breath. Notice the rhythmic rise and fall of your abdomen and the slow, deep movement of your chest."*
8. Match each of the following drugs with the appropriate description of a user's typical response: alcohol, marijuana, MDMA, opiates, stimulants. *Answers: a. stimulants; b. marijuana; c. alcohol; d. MDMA; e. opiates*
9. A group of people are talking about their weekend plans. Which of the following statements suggest the most understanding regarding alcohol's effects? *Answers: c. "I won't drink tonight because I really need a good night's sleep and I always wake up insanely early after I drink."; d. "I think a beer or two will give me the liquid courage I need to ask Jordan out on a date."*
10. Which of the following phenomena are best described as symptoms of physical dependence? *Answers: a. strong cravings for the substance; b. elevated tolerance for the substance*

## CHAPTER 5: SENSATION AND PERCEPTION

### Measuring Up, p. 194

1. Suppose you are designing an experiment to determine the absolute threshold for detecting a salty taste. You plan to give participants plain water that \_\_\_\_\_. *Answer: b. sometimes has a small amount of salt in it and sometimes has no salt*  
You plan to have them sip a small amount of water and tell you \_\_\_\_\_. *Answer: a. whether they taste salt or no salt*  
You will use the participants' responses to calculate an absolute threshold for tasting salt by \_\_\_\_\_. *Answer: a. comparing hits and false alarms*
2. What is Weber's law? *Answer: d. The amount of physical energy needed to detect a change in sensation depends on the proportional change from the original stimulus.*

### Measuring Up, p. 220

1. The sensory systems \_\_\_\_\_. *Answer: b. use only a small portion of the available energy in their environment*
2. A general principle regarding sensation is that \_\_\_\_\_. *Answer: a. the combined firing of many different receptors and the neurons they connect with creates our sensations*
3. An intense stimulus, such as a loud sound or a heavy touch, is coded by \_\_\_\_\_. *Answer: b. an increase in the number of neurons that respond to the stimulation*

### Measuring Up, p. 238

1. Match each of the following monocular depth cues with its description: familiar size, linear perspective, occlusion, position relative to the horizon, relative size, texture gradient. *Answers: a. linear perspective; b. occlusion; c. familiar size; d. relative size; e. texture gradient; f. position relative to the horizon*

2. What is binocular disparity? *Answer: b. a cue to depth caused by the formation of a slightly different image in each eye*
3. Perceptual constancy \_\_\_\_\_. *Answer: a. allows us to see objects as stable even when there are large fluctuations in the sensory information we receive*

### Practice Test, p. 241

1. Which answer accurately lists the order in which these structures participate in sensation and perception (except for smell)? *Answer: a. specialized receptors, thalamus, cortex*
2. While listening to a string quartet, you find you can easily decipher the notes played by the violins, by the viola, and by the cello. When you focus on the viola, you find some of the notes especially loud and others barely discernable. Which of the following statements best describes your sensations of the quartet? *Answer: c. You can decipher qualitative differences among the instruments because of the involvement of specific sensory receptors, whereas you can make quantitative distinctions—recognizing variations in the notes' intensity—due to the rate of firing of your sensory neurons.*
3. When the violist plays a solo, you cannot hear it. Which of the following statements is the most likely explanation? *Answer: b. The intensity of the auditory stimulation does not exceed the minimum threshold needed for you to detect a sensation.*
4. Imagine you have a steady, radiating pain across your lower back. No matter how you position yourself, you cannot make the pain go away. Select the answer choices most relevant to this type of pain. *Answers: a. activated by chemical changes in tissue; e. nonmyelinated axons; f. slow fibres*
5. A one-year-old girl skins her knees on a rough sidewalk. The girl cries in pain. Which of the following interventions will most likely calm her? *Answer: d. Directing the girl's hand on a quick touching tour of the nearby environment and saying things such as "Feel this tree's rough bark. Touch the grass; it tickles. Feel how smooth this rock is!"*
6. After hours of waiting, a bird watcher hears the call of rare bird species. The bird watcher instinctively turns his head about 45 degrees to the left and sees the bird. Which of the following statements best describes how the bird watcher knew where to turn his head? *Answer: a. The call reached the bird watcher's left ear before it reached his right ear; the call was less intense in the bird watcher's right ear than in his left ear.*
7. In which lobe of the brain (frontal, occipital, parietal, temporal) does each of the following sensory cortices reside? *Answers: a. temporal; b. parietal; c. occipital*
8. Imagine you are preparing to conduct a brain imaging study of visual processing. Which pathway—dorsal or ventral—do you hypothesize will be activated by each of the following experimental tasks? *Answers: dorsal ("where") pathway activated by a and e; ventral ("what") pathway activated by b, c, d*

## CHAPTER 6: LEARNING

### Measuring Up, p. 258

1. Which of the following are true statements about conditioning? *Answers: Choices a, d, f, and j are true.*
2. John B. Watson had planned to extinguish Little Albert's conditioned response to, for example, the rat. Which of the following techniques would have achieved that goal? *Answer: a. Repeatedly showing Little Albert the rat without making a loud sound.*

### Measuring Up, p. 269

1. Indicate whether each of the following people and phenomena is related to operant or classical conditioning. *Answers: a. classical; b. operant; c. operant; d. operant; e. classical; f. operant; g. operant; h. operant*
2. Suppose a mother is trying to get her eight-year-old to stop cursing. Each time the child curses, the mother waits until the child's father is present before spanking the child. Select the better answers: *Answers: a. The time interval between the cursing and the punishment is \_\_\_\_\_ too long for optimal learning.; b. One likely outcome to the continued use of this punishment is \_\_\_\_\_ the child will curse at times he or she is unlikely to be caught.; c. Generalization is likely to occur such that \_\_\_\_\_ the child comes to fear the father and mother.; d. What is the child likely to learn? \_\_\_\_\_ Do not get caught cursing.; e. A more effective approach would be to \_\_\_\_\_ provide rewards for not cursing.*

### Measuring Up, p. 277

1. How do cultural beliefs about learning affect human performance? *Answer: b. Students from cultures that view learning as the result of persistence work harder and therefore achieve more than students from cultures with other beliefs.*
2. The critical finding from Bandura's Bobo doll research was that \_\_\_\_\_. *Answer: a. children exhibited more aggressive behaviours toward the doll after viewing an actor being rewarded for acting aggressively toward the doll than did children in the control condition*
3. Mirror neurons \_\_\_\_\_. *Answer: a. fire when we are watching motor activity in other people*

### Measuring Up, p. 284

1. What can we learn from the superlearner Doogie mice? *Answer: a. NMDA receptors are important in producing learning.*
2. What is the evidence that dopamine is a critical neurotransmitter for reinforcers' effects on behaviour? *Answer: b. Rats will work continuously to deliver electrical stimulation to a portion of the brain that uses dopamine in its neural processes.*

### Practice Test, p. 287

1. Every night for a few weeks, you feed your pet rat while watching the evening news. Eventually, the rat learns to sit by its food dish when the news program's opening theme song plays. In this example of classical conditioning, what are the US, UR, CS, and CR? *Answers: US is food, UR is going to the food dish to eat the food, CS is the program's theme song, CR is going to the food dish to eat the food when the theme song plays.*
2. At a psychology lecture, each student receives 10 lemon wedges. The professor instructs the students to bite into a lemon wedge anytime a large blue dot appears within her slide presentation. Nearly every time the students bite into lemons, their mouths pucker. The 11th time a blue dot appears on the screen, many students' mouths pucker visibly. In this case, what are the US, UR, CS, and CR? *Answers: US is lemon, UR is a pucker, CS is a blue dot, CR is a pucker at the sight of the blue dot.*
3. A few minutes later in that same psychology lecture, the professor projects the image of a turquoise dot. How will the students likely respond to this image? *Answer: c. The students will experience puckering responses, because of stimulus generalization.*
4. Which pairing of stimuli will most quickly create a learned association? *Answer: b. Eating a box of raisins and experiencing extreme nausea a few hours later.*

- Identify each statement as an example of negative punishment, positive punishment, negative reinforcement, or positive reinforcement. *Answers: a. positive reinforcement; b. positive punishment; c. negative reinforcement; d. negative punishment (removal of affection)*
- Match each scenario with one of the following reinforcement schedules: fixed ratio, variable ratio, fixed interval, variable interval. *Answers: a. fixed interval; b. variable interval; c. fixed ratio; d. variable ratio*
- Recently, Albert Bandura has employed serial television dramas to address global social issues such as illiteracy and overpopulation. He believes principles of social learning should apply when viewers observe fictional characters engaging in behaviours relevant to a particular issue. Based on what you have read about social learning, which of the following factors do Bandura and his collaborators likely consider when creating these shows? *Answers: They likely consider factors a, c, d, f, and g.* (One example of the effectiveness of Bandura's approach is that a million people sought out literacy skills classes after one of these serial dramas addressed the issue of illiteracy in Mexico.)
- Hebb's postulate states that \_\_\_\_\_. *Answer: b. cells that fire together wire together*
- \_\_\_\_\_ is more closely associated with long-term potentiation than with reinforcement. *Answers: b. The hippocampus; c. NMDA*

## CHAPTER 7: ATTENTION AND MEMORY

### Measuring Up, p. 296

- Which statement correctly describes the two stages of attention? *Answer: b. Attention has a rapid process that searches for one feature and a slower, serial process that searches for multiple features one at a time.*
- What happens to information when we are not paying attention? *Answer: a. Some of the unattended information is passed on for further processing, but it is weaker than attended information.*

### Measuring Up, p. 305

- Indicate how long each of the three stages of memory holds information, and indicate its capacity. *Answers: a. Duration: ii, Capacity: iii; b. Duration: iv, Capacity: ii; c. Duration: v, Capacity: iv*
- Which memory system is responsible for your ability to remember the first word in this question? *Answer: b. working memory*

### Measuring Up, p. 309

Indicate whether each of the following examples of memory is prospective, implicit, or explicit; if it is explicit, also indicate whether it is episodic or semantic. *Answers: a. implicit; b. semantic and explicit; c. semantic and explicit; d. explicit and either semantic or episodic, depending on whether you remember when and where you learned it; e. prospective; f. implicit*

### Measuring Up, p. 315

- Which is the best way to teach scuba divers how to surface safely? *Answer: b. Teach them underwater because the situation will provide retrieval cues for when they need to use the knowledge.*
- One strategy for improving memory is to relate something you are learning to information you already know. Why would that strategy be effective? *Answer: a. Because the known information can act as a retrieval cue to help you remember the new information when you need it.*

### Measuring Up, p. 321

- What changes occur at the synapses when people learn and remember? *Answers: a. Neuronal connections are strengthened.; c. Neurons make more synaptic connections.*

- One difference between females' and males' underlying brain mechanisms for memory is found in \_\_\_\_\_. *Answer: b. emotional memory*

### Measuring Up, p. 326

- Indicate whether each of the following is an example of retroactive interference or proactive interference or neither. *Answers: a. retroactive; b. proactive; c. proactive*
- Which of the following examples reflects an accurate understanding of cultural differences in change blindness? *Answer: b. North Americans tend to be more individualistic and therefore tend to notice changes to a central figure faster than East Asians do, whereas East Asians notice changes in background information faster.*

### Measuring Up, p. 335

- Which principles must be balanced in a court of law when considering memories' accuracy? *Answer: d. What are the costs of letting a possible felon go free, and what are the costs of incarcerating someone who may be innocent?*
- Flashbulb memories \_\_\_\_\_. *Answer: c. are often distorted in the same way as other memories, but "feel" true to the people whose memories they are*
- Suppose a teacher accuses you of plagiarizing a term paper. . . . Of course, you did not commit plagiarism—you would never do that. Which of the following phenomena might be cited in your defence? *Answer: a. cryptomnesia*

### Practice Test, p. 339

- The card game Set requires players to attend to four features (shape, colour, shading, and number) across 12 cards in an effort to identify a "Set." . . . Playing this game requires participants to engage in a \_\_\_\_\_, which is \_\_\_\_\_. *Answer: a. conjunction task; effortful*
- Sarah and Anna are chatting at a coffee shop. . . . Which strategy could Anna use to effectively pull Sarah's attention back to the conversation? *Answer: d. Anna should use Sarah's name in a sentence.*
- Imagine you are a manager seeking to hire a new employee. Before leaving work Monday afternoon, you look through a stack of 30 resumés organized alphabetically by last name. When you return to work Tuesday morning, which job applicant are you most likely to remember? *Answer: a. Alvarado*
- You are asked to memorize a list of words. Which encoding strategy will likely result in the best recall performance? *Answer: d. As you read each word, think of a synonym for it.*
- You ask a friend to memorize the following list: bed, rest, night, tired, blanket, pillow, relaxed. . . . In addition to remembering some of the words, your friend lists the word *sleep*, which did not appear on the original list. Which of the following phenomena is most related to your friend's error in recall? *Answer: c. networks of associations*
- Damage to which area of the brain (amygdala, frontal lobe, hippocampus) would most likely lead to each of the following impairments? *Answers: a. hippocampus; b. frontal lobe; c. amygdala*
- Which "sin of memory" is demonstrated in each of the following examples? *Answers: a. absentmindedness; b. blocking*
- Fill in the blanks. People experiencing \_\_\_\_\_ amnesia are unable to recall memories from the past, whereas people experiencing \_\_\_\_\_ amnesia are unable to form new memories. *Answers: retrograde; anterograde*

## CHAPTER 8: THINKING AND INTELLIGENCE

### Measuring Up, p. 351

1. Indicate whether each of the following examples is an analogical or symbolic representation. *Answers: a. analogical; b. symbolic; c. analogical; d. symbolic; e. analogical; f. analogical; g. analogical*
2. Which of the following is an advantage of scripts? *Answer: a. They provide quick and almost effortless guides to behaviour in different situations.*
3. Which of the following is a disadvantage of scripts? *Answer: a. They tend to reinforce stereotypical behaviours.*

### Measuring Up, p. 366

1. For each of the following terms, identify the appropriate definition(s). *Answers: reasoning—c, f; decision making—a; problem solving—b, e*
2. In performing affective forecasting, \_\_\_\_\_. *Answer: a. most people are poor judges of how they will feel about something in the future*

### Measuring Up, p. 384

1. While discussing with his grandmother what he has been studying at university, Dave was impressed by how much she knows. . . . His grandmother's general knowledge exemplifies her \_\_\_\_\_ intelligence, whereas her ability to figure out the cellphone exemplifies her \_\_\_\_\_ intelligence. *Answer: b. crystallized, fluid*
2. If you wanted to reduce the effects of stereotype threat, you could \_\_\_\_\_. *Answer: d. tell test takers that the upcoming test will not reflect group differences.*

### Practice Test, p. 387

1. Which of the following statements reflect incorrect assumptions in the *defining attribute model* of concepts? *Answers: a. All attributes of a category are equally salient.; b. All members of a category fit equally well into that category.; e. Membership within a category is on an all-or-none basis.*
2. Which of the following fruits will most likely be considered prototypical? Which will least likely be considered prototypical? *Answers: a. is most likely; c. is least likely.*
3. On the first day of the semester, students enter a new class. . . . Based on our script for the first day of class, what will students most likely do? *Answer: a. Students will settle into their seats and perhaps glance over the handout. People who already know each other might converse, but they most likely will not discuss the questions.*
4. Label each of the following statements as an example of deductive reasoning or inductive reasoning. *Answers: a. inductive; b. deductive; c. deductive; d. inductive; e. inductive*
5. Label each of the following scenarios as an example of affective forecasting, the availability heuristic, a framing effect, or the representativeness heuristic. *Answers: a. framing effect; b. availability heuristic; c. representativeness heuristic*
6. \_\_\_\_\_ is an indicator of current levels of skill or knowledge, whereas \_\_\_\_\_ is an indicator of future potential. *Answer: a. achievement, aptitude*
7. Casey is very empathic. It is as if he can read the minds of the people around him, knowing instantly if someone is uncomfortable with a topic of conversation, interested in garnering someone's affections, stressed out, and so on. We would expect Casey to score well on which indicators of intelligence? *Answers: b. EQ; e. interpersonal intelligence*

8. Which one of the following comments most accurately reflects the facts about the roles of nature and of nurture in intelligence? *Answer: d. "Group differences in intelligence cannot be attributed to genetic differences if there are environmental differences between the groups."*

## CHAPTER 9: MOTIVATION AND EMOTION

### Measuring Up, p. 401

1. Arrange the levels of Maslow's need hierarchy in the correct order, with lowest needs at the bottom, and then match each example with the correct level. *Answers: c. 1; e. 2; a. 4; d. 3; b. 5*
2. Indicate whether the motivation in each of the following scenarios is intrinsic or extrinsic. *Answers: a. intrinsic; b. extrinsic; c. intrinsic; d. extrinsic*

### Measuring Up, p. 406

Imagine you are asked to design a program for people who need to lose weight. Based on the information in this chapter about the processes that regulate eating, what suggestions would you make in each of the following areas? *Answers: 1. a; 2. a; 3. a; 4. a*

### Measuring Up, p. 415

1. Identify whether each of the following statements about human sexual behaviour best describes a biological, cultural, or evolutionary perspective. *Answers: a. biological and evolutionary; b. evolutionary; c. cultural; d. cultural and evolutionary; e. biological; f. biological; g. biological and evolutionary*
2. Arrange the stages of the human sexual response cycle in order, and match each stage with its description. *Answers: excitement—d; plateau—b; orgasm—c; resolution—e; refractory—a*

### Measuring Up, p. 425

1. A display rule is \_\_\_\_\_. *Answer: b. a rule that specifies when and how certain people can express an emotion*
2. What is a likely explanation for blushing? *Answer: a. It is a nonverbal way of admitting a mistake.*

### Measuring Up, p. 434

For each of the three main theories of emotions—James-Lange, Cannon-Bard, and two-factor—select all of the descriptive statements and examples that apply. *Answers: James-Lange—1, 3, a.; Cannon-Bard—3, 4, d; two-factor—1, 2, 3, b*

### Practice Test, p. 437

1. Students enrolled in a difficult class are preparing to give end-of-term presentations, which will count 50 percent toward final grades. Which student below is likely to perform the best? *Answer: b. Sonya is somewhat anxious about this presentation. She knows her stuff but recognizes how much is riding on the quality of this presentation. This anxious energy motivates her to polish her slides and practice her talk.*
2. A classmate tells you he is having a hard time remembering which eating outcomes are associated with damage to different parts of the hypothalamus. Which of the following verbal mnemonics would be most helpful to your classmate? *Answers: b. Organisms with damage to the lateral area of the hypothalamus (LH) eat little.; d. Organisms with damage to the ventromedial region of the hypothalamus (VMH) eat very much.*
3. Which statement below is backed by empirical findings? *Answer: c. Prenatal exposure to hormones is associated with sexual orientation.*



- Which neurotransmitter is *not* implicated in the sexual response? *Answer: b. GABA*
- Which of these statements likely describe somatic markers? *Answers: b. "I have butterflies in my stomach."; c. "My heart is pounding so hard it is going to jump out of my chest."*
- People [can / cannot] experience positive and negative affect simultaneously. *Answer: can*
- Positive affective states are associated with increased levels of [GABA / dopamine]. *Answer: dopamine*
- Negative affective states are associated with increased levels of [dopamine / norepinephrine]. *Answer: norepinephrine*
- Which of these statements are true regarding involvement of the amygdala in emotion? *Answers: All three choices are true.*
- Would you expect activity in the left or right prefrontal cortex in response to pictures of dead and decomposing livestock? *Answer: b. right*
- The correct answer to the previous question is consistent with the \_\_\_\_\_ of health and illness. *Answer: b. biopsychosocial model*
- Lisa is normally an engaged and satisfied employee. For a few months, she becomes very dissatisfied, grumpy, and uninterested in her job. Shortly after participating in a weekend-long seminar about the secrets of success, Lisa begins enjoying her work life again. Which of the following attributions for her improved satisfaction at work best reflects the concept of regression to the mean? *Answer: a. "Well, I figured I couldn't stay in that funk forever. Things eventually had to start looking up again."*
- Which of the following individuals is most at risk for developing heart disease, assuming equal levels of physiological risk factors such as blood pressure and cholesterol level? *Answer: b. People describe Patti as a complainer. She always finds something to gripe about, whether it is poor service at a restaurant, a driver's failure to use turn signals, or a loud talker on a cellphone.*
- Individuals who are hardy \_\_\_\_\_. *Answers: a. are committed to daily activities; e. see challenges as opportunities for growth; f. see themselves as able to control their own lives*
- Which of the following statements are true? *Answer: All the choices are true.*
- Label each of the following statements as applying to anorexia nervosa (AN) and/or bulimia nervosa (BN). *Answers: a. AN and BN (though BN is seldom fatal); b. BN; c. AN; d. AN; e. BN; f. AN; g. AN; h. BN; i. BN; j. AN and BN*
- Imagine your grandparent is preparing to move to a retirement community. Which of the following might you say if you wanted to help her or him promote physical and mental health? *Answers: b. "Know that I care about you and am here for you if there's anything I can do to help with the transition to your new home."; c. "Make a point of meeting a lot of other residents."; d. "Make sure to stay in touch with your close friends."*
- Which of the following statements are true regarding oxytocin? *Answers: b. Oxytocin is released when people feel empathy.; d. Participants dosed with oxytocin behave more trustingly than control participants do.; e. Women release oxytocin when they breast-feed infants.*

## CHAPTER 10: HEALTH AND WELL-BEING

### Measuring Up, p. 446

- Of the following possibilities, select one way that our behaviours contribute to reduced health. *Answer: a. We can make unhealthy choices such as eating a poor diet and smoking.*
- Which of the following statements exemplifies the biopsychosocial model? *Answer: b. By engaging in healthy behaviours, we can strengthen our immune systems.*

### Measuring Up, p. 456

- Match each stage in the general adaptation syndrome—alarm, resistance, and exhaustion—with one of the following examples. *Answers: alarm—b; resistance—c; exhaustion—a*
- How does long-term stress affect health? *Answer: a. The extended physiological response damages organs such as the heart.*

### Measuring Up, p. 468

- How does exercise affect the brain? *Answer: d. Exercise causes the growth of new neurons and new neural connections, especially in brain areas associated with memory and cognition.*
- Why do restrictive diets rarely work in reducing obesity? *Answer: b. The body learns to conserve calories, so restrictive dieting may lead ultimately to greater weight gain.*

### Measuring Up, p. 475

- Which of the following statements explains how researchers concluded that oxytocin causes people to be more trusting? *Answer: d. When researchers sprayed oxytocin in the noses of people playing the trust game, the players acted in a more trusting way than did the placebo control group.*
- What aspects of social support are most important in creating a positive effect on health? *Answer: c. It is most important that people around you genuinely care about your well-being.*

### Practice Test, p. 479

- Which of the following comments most accurately represents health psychologists' current understanding of illness? *Answer: d. "Genetic predispositions to some illnesses exist. But living healthily can help reduce the chances we'll develop an illness."*

## CHAPTER 11: HUMAN DEVELOPMENT

### Measuring Up, p. 494

- Which of the following research findings would support the idea that humans have sensitive learning periods? *Answers: c. Children with minimal exposure to language before age 12 can learn to speak, but their learning will happen poorly and with great difficulty*
- Identify the type of attachment that each of the following statements describes. *Answers: a. disorganized; b. avoidant; c. secure; d. anxious-ambivalent*

### Measuring Up, p. 514

- Match each of Piaget's stages of cognitive development with its description. *Answers: a. preoperational; b. formal operational; c. sensorimotor; d. concrete operational*
- Indicate whether each of the following statements about language learning is true or false. *Answers: a. false; b. false; c. true; d. false; e. false*

### Measuring Up, p. 523

1. Choose the statement that is true about divorce. *Answer: d. Reduced income and, often, poverty follow divorce and may be responsible for some of the negative effects of divorce on children.*
2. The case study of Bruce/Brenda Reimer shows that \_\_\_\_\_ . *Answer: a. gender identity has a strong biological component*

### Measuring Up, p. 531

1. Erikson proposed that certain challenges typify the passage through adulthood to old age. Which of the following statements represents these challenges? *Answer: c. In adulthood, people face the challenge of creating and maintaining close relationships, giving back to society, and responding well to the lives they have lived.*
2. Indicate whether the following statements describe cognitive aging. Either mark the statement “CA” or leave it blank. *Answers: a. CA; c. CA; e. CA*

### Practice Test, p. 533

1. A one-week-old infant normally can \_\_\_\_\_. *Answers: a. differentiate between sweet and nonsweet tastes; c. grasp a caregiver’s finger; d. make eye contact; e. orient toward loud sounds; i. turn his or her head toward the smell of the mother’s breast milk; j. turn toward a nipple near his or her mouth*
2. Which of the following statements best summarizes the key finding from Harry Harlow’s study of infant rhesus monkeys? *Answer: d. Contact with comforting “mothers” promoted normal social development.*
3. A nine-month-old child watches as three cubes are covered by a panel, then as three more cubes appear to move behind the panel. Once the panel is lifted, only three cubes appear. Which of the following statements describes the infant’s likely reaction? *Answer: d. The infant will stare at the three remaining cubes for a relatively long time.*
4. Imagine reading a young child a story. In the story, Schuyler calls Emma a mean name. Emma retaliates by biting Schuyler. You ask the child what she thinks about the fact that Emma bit Schuyler. Three possible responses appear below. Label each as typical of one of the levels of moral reasoning described by Kohlberg: pre-conventional, conventional, or post-conventional. *Answers: a. pre-conventional; b. post-conventional; c. conventional*
5. Indicate whether each of the following phenomena is associated with the scholarship of Chomsky or with that of Vygotsky. *Answers: c, d, g, h are associated with Chomsky; a, b, e, f are associated with Vygotsky.*
6. Which of the following conclusions about the relationship between parenting style and child well-being is supported by empirical research? Optimal social development occurs when \_\_\_\_\_. *Answer: d. the parenting style fits the child’s temperament*
7. Which of the following comments violate the critical thinking skills addressed in this chapter: understanding that some does not mean all and avoiding either/or thinking? *Answers: b shows a lack of awareness that some does not mean all; c demonstrates either/or thinking*
8. Igor is 83 years old. Which of his behaviours and cognitions are consistent with the socioemotional selectivity theory? *Answers: Choices b, d, e are consistent.*
9. Which of the following characteristics describe most older adults? *Answers: a. happy; b. mentally healthy; c. feeling more positive emotions than negative ones; e. physically well*

## CHAPTER 12: SOCIAL PSYCHOLOGY

### Measuring Up, p. 544

1. Identify the attitude formation(s) or change process(es) described in each of the following examples. *Answers: a. mere exposure; b. persuasion and socialization; c. conditioning; d. cognitive dissonance*
2. For each of the following scenarios, indicate whether the attitude is likely to predict the subsequent behaviour. In a few words, explain why or why not. *Answers: a. No, attitude is not strong; b. Yes, attitude is strong and highly accessible; c. No, attitude lacks specificity.*

### Measuring Up, p. 556

1. Label each of the following statements as an example of stereotyping, prejudice, or discrimination. *Answers: a. stereotyping; b. prejudice; c. discrimination*
2. Max was arrested for driving while under the influence of alcohol. Label each of the following statements as an example of personal attribution, situational attribution, or fundamental attribution error. *Answers: a. situational attribution; b. fundamental attribution error; c. personal attribution*

### Measuring Up, p. 564

1. Label each of the following scenarios as an example of conformity, compliance, or obedience. *Answers: a. conformity; b. obedience; c. compliance*
2. Match each of the following social influence constructs with the correct definition: deindividuation, group polarization, social facilitation, and social loafing. *Answers: a. deindividuation; b. social loafing; c. group polarization; d. social facilitation*

### Measuring Up, p. 571

1. Indicate whether each of the following statements supports a biological, individual-differences, or socio-cultural explanation for aggression. *Answers: Choices a, f, g, h support a biological explanation; b, i support an individual-differences explanation; c, d, e support a sociocultural explanation.*
2. For each of the following scenarios, indicate whether the individuals are likely to evidence bystander apathy. Briefly explain why or why not. *Answers: a. no (no ambiguity, no opportunity to diffuse responsibility, no anonymity); b. yes (high cost-benefit ratio, driver can remain anonymous, opportunity for diffusion of responsibility); c. yes (situation is ambiguous, opportunity for diffusion of responsibility).*

### Measuring Up, p. 578

1. Label each of the following characteristics as an attribute of passionate love or companionate love. *Answers: Choices a, b, e, g are attributes of passionate love; c, d, f, h are attributes of companionate love.*
2. For each of the following situations, select the comment that, according to empirical findings, indicates a lasting relationship. *Answers: Situation 1—b; Situation 2—a*

### Practice Test, p. 580

1. Which of the following scenarios illustrates postdecisional dissonance? *Answer: b. Adrianna wants to go on a community service trip during her spring break. . . . When asked to explain why she made this decision, she says, “The Mexico trip will give me a chance to travel outside Canada, which I’ve always wanted to do. Plus, the Montreal trip sounded pretty stale.”*
2. Which of the following scenarios illustrates justification of effort? *Answer: a. David’s boss regularly asks him to do a lot of extra tasks around*

the office. . . . When asked why he does all these extra tasks, David replies, "I'm happy to do whatever it takes to make our office as welcoming and efficient as possible."

3. Some of the following statements illustrate cognitive or behavioural outcomes of stereotyping. As appropriate, label those statements as examples of illusory correlation, ingroup favouritism, outgroup homogeneity, and self-fulfilling prophecy. *Answers: a. ingroup favouritism; b. illusory correlation; c. outgroup homogeneity*
4. Dorm A and Dorm B have a long-standing rivalry. . . . A couple students from each dorm encourage the students to get together to brainstorm possible strategies for easing the tension. According to the ideas presented in this chapter, which suggestion would be most effective? *Answer: d. "We can hold an all-campus competition, where teams of dorms would compete for prizes. Dorm A and Dorm B could be on one team; Dorm C and Dorm D could be on the other team."*
5. Which of the following examples of social norms marketing would most likely be most effective? *Answer: b. 80 percent of the residents in your neighbourhood recycle. Keep up the great work!*
6. Some of the following scenarios illustrate compliance strategies discussed in this chapter. As appropriate, label each scenario as an example of door in the face, foot in the door, or low-balling. *Answers: a. low-balling, b. door in the face, c. no response choice is appropriate*
7. Which of the following examples most accurately describes the relationship between relationship length and frequency of sex? *Answer: a. After an initial period of frequent sex, there is a negative correlation between relationship length and frequency of sex.*
8. Match each definition below with the appropriate term: altruism, inclusive fitness, kin selection, reciprocal helping. *Answers: a. kin selection; b. altruism; c. reciprocal helping; d. inclusive fitness*
9. Which statement below about Shelly, who is very attractive, is most consistent with the "what is beautiful is good" stereotype? *Answer: b. "Shelly is easily the happiest person I know!"*

## CHAPTER 13: PERSONALITY

### Measuring Up, p. 593

1. Indicate which theorists are associated with each of the following four approaches to studying personality: psychodynamic, humanistic, type and trait, and learning and cognition. *Answers: psychodynamic approaches—c, d, f, j, m; humanistic approaches—a, e, k; type and trait approaches—h, i, l; learning and cognition—b, g, n*
2. Indicate which concepts are associated with each of the four approaches to studying personality (see question 1). *Answers: psychodynamic approaches—a, b, j, m; humanistic approaches—e, l; type and trait approaches—c, g, h, k; learning and cognition approaches—d, f, i*

### Measuring Up, p. 600

1. Match the strengths and limitations listed below to the following assessment methods: California Q-Sort, NEO Personality Inventory, Rorschach ink blot test, Thematic Apperception Test. *Answers: California Q-Sort—a, d, e; NEO Personality Inventory—a, e; Rorschach ink blot test—b, f, g; Thematic Apperception Test—b, c*
2. For each scenario, indicate which person is most likely to engage in the behaviour described and explain why. *Answers: Situation 1—a, because conscientiousness is centrally important to Chad's personality; Situation 2—b, because a bar is a weak situation and thus less likely to dictate behaviour*

### Measuring Up, p. 613

1. Which of the following statements are true regarding the relationships among environment, genes, personality traits, and temperament? *Answers: Choices b, c, and d are true.*
2. Which of the following findings support biological bases of personality? *Answers: Choices a, f, and g support biological bases.*

### Measuring Up, p. 624

1. Imagine that while browsing the shelves of a local bookstore, you discover a series of books about self-esteem. Which of the following three theoretical perspectives is most likely addressed in each book: self-evaluation maintenance theory, sociometer theory, or terror management theory? *Answers: a. self-evaluation maintenance theory; b. terror management theory; c. sociometer theory*
2. Sort the following list of attributes into two groups: those more often evidenced in collectivistic cultures and those more often evidenced in individualistic cultures. *Answers: collectivistic cultures—a, e, f, h, j, k, l; individualistic cultures—b, c, d, g, i*

### Practice Test, p. 627

1. Your psychology instructor asks the students in your class to form groups of five and then take turns answering the question *What do we need to know about you to truly know you?* The people in your group give the following answers; label each as representative of psychodynamic, humanistic, type and trait perspectives, or learning and cognitive perspectives. *Answers: a. type and trait; b. learning and cognition; c. psychodynamic; d. humanistic*
2. June asks people to watch a five-minute recording of a play in which two characters find themselves in a dangerous situation. Then she asks her research participants to write an ending to the story, which she codes to reveal features of each participant's personality. This proposed measure of personality can best be described as \_\_\_\_\_ and \_\_\_\_\_. *Answer: a. idiographic; projective*
3. Which of the following statements might explain why our close acquaintances sometimes are better able to predict our behaviours than we are? *Answers: b. Predictions of our own behaviours may be biased in favour of our subjective perceptions (how we think we act) rather than our objective behaviours (how we do act).; c. We tend to pay more attention to others than to ourselves and thus fail to notice our own behaviour; others notice how we behave and are better able to predict our future behaviours.*
4. Which of the following are associated with the behavioural approach system (BAS), and which are associated with the behavioural inhibition system (BIS)? *Answers: BAS—a, d; BIS—b, c, e*
5. Which of the following statements best describes the distinctions among traits, temperaments, and characteristic adaptations? *Answer: a. Temperaments, which are broader than traits, influence personality throughout development. Situational demands can lead to characteristic adaptations, which, although they do not reflect changes in the underlying dispositions, can reflect changes in how these dispositions are expressed.*
6. By extrapolating from research on self-schemas, indicate which of the following memorization techniques should be most effective in memorizing a list of nouns. *Answer: b. Imagine yourself doing something with each noun (e.g., "I wiggle my toes inside my shoe").*
7. A professional athlete makes the following statements during an interview with a sports reporter. Which statements are most likely to be positive illusions? *Answers: b. "I'm sure that wearing my lucky socks helped."; d. "I'm done with injuries. From here on out, I'll have a clean bill of health."*

8. Braunwin prides herself on her musical ability. Which of the following successes would most likely lead Braunwin to feel bad about herself? Which would most likely lead her to feel good? Why?  
*Answers: Braunwin is most likely to feel bad if c (best friend asked to play a solo) because this person is close to her and is succeeding in a domain that is important to Braunwin; she is most likely to feel good if d (sister receives a prestigious athletic scholarship) because this person is close to her and is succeeding in a domain that is not as important to Braunwin.*

## CHAPTER 14: PSYCHOLOGICAL DISORDERS

### Measuring Up, p. 642

1. Indicate whether each of the following scenarios is best described as a mental status exam, a structured interview, an unstructured interview, a behavioural test, a psychological test, or a neuropsychological test. *Answers: a. neuropsychological test, given the emphasis on memory, a brain function; b. mental status exam; c. structured interview*
2. While at a conference on mental disorders, you attend a symposium titled *Understanding the Origins of Mental Health*. Excerpts from three of the presentations appear below. Match each excerpt to one of the etiological models discussed in this chapter: diathesis-stress model, biological model, family systems model, socio-cultural model, and cognitive-behavioural approach. *Answers: a. biological; b. family systems model; c. diathesis-stress model*

### Measuring Up, p. 648

1. Which of the following symptoms commonly are experienced by people with anxiety disorders? *Answers: a. exaggerated startle response; b. excessive fidgeting; d. feelings of apprehension; e. impaired ability to concentrate; f. muscular tension; h. sleep disruptions*
2. Indicate whether each of the following empirical findings supports a cognitive, situational, or biological underpinning of anxiety disorders. *Answers: a. biological; b. cognitive; c. biological; d. situational; e. cognitive*

### Measuring Up, p. 654

1. Indicate whether each of the symptoms and causes listed below is associated with major depression, bipolar disorder, or both. *Answers: a. major depression; b. major depression; c. major depression; d. bipolar disorder; e. bipolar disorder; f. bipolar disorder; g. major depression and bipolar disorder; h. major depression; i. bipolar disorder; j. major depression and bipolar disorder; k. major depression and bipolar disorder; l. major depression and bipolar disorder*
2. Which of the following statements represent dysfunctional cognitive patterns believed to cause depression? If a statement is an example of dysfunctional cognition, briefly describe why. *Answers: a. shows evidence of overgeneralizing based on a single event; c. shows a perceived powerlessness to avoid negative events*

### Measuring Up, p. 660

1. Indicate whether each of the following phenomena is a negative or a positive symptom of schizophrenia. *Answers: a. negative; b. negative; c. positive; d. positive; e. negative; f. positive*
2. Indicate whether each of the following phenomena is a biological or an environmental factor contributing to schizophrenia. *Answers: a. biological; b. biological; c. environmental; d. biological; e. environmental*

### Measuring Up, p. 667

The *DSM-IV-TR* groups together seemingly different disorders—such as borderline personality disorder, anti-social personality disorder, and

mental retardation. What features of these disorders justify this grouping?  
*Answers: a. They last throughout the lifespan.; c. There is no expectation of significant change.*

### Measuring Up, p. 674

1. Children with autism exhibit deficits in which of the following categories? *Answers: a. awareness of other people; b. communication; e. restricted activities and interests*
2. Compared with people without ADHD, people with ADHD show \_\_\_\_\_ activation in the \_\_\_\_\_ of the brain. *Answer: a. less; frontal lobes and limbic regions*

### Practice Test, p. 677

1. Which of the following questions would a clinician ask to determine whether a behaviour represents psychopathology?  
*Answers: a. Does the behaviour deviate from cultural norms?; b. Is the behaviour causing the individual personal distress?; c. Is the behaviour maladaptive?*
2. Two students visit the campus health centre. Student A describes feeling constantly fearful and anxious. Student B describes feeling persistently agitated and often exhibiting violent outbursts. Student A's symptoms are consistent with an \_\_\_\_\_ disorder, which is more common in \_\_\_\_\_; student B's symptoms are consistent with an \_\_\_\_\_ disorder, which is more common in \_\_\_\_\_. Choose from the following pairs of words to fill in the blanks. *Answer: c. internalizing, females; externalizing, males*
3. Indicate whether each of the following constellations of symptoms is best described as phobic disorder, generalized anxiety disorder, panic disorder, or obsessive-compulsive disorder. *Answers: a. generalized anxiety disorder; b. phobic disorder*
4. Indicate whether each of the following constellations of symptoms is best described as major depression, dysthymia, or bipolar disorder. *Answers: a. dysthymia; b. major depression*
5. Match each of the following statements with the correct label for that symptom of schizophrenia: delusion of grandeur, delusion of persecution, flat affect, hallucination, loosening of associations, social withdrawal. *Answers: a. loosening of associations; b. delusion of persecution; c. hallucination*
6. Which of the following statements describe key objections to categorizing personality disorders as true mental disorders? *Answers: b. Overlap in the characteristics of different disorders suggests that the categories may not be conceptually clear cut.; c. Some features of personality disorders are not as stable as researchers once thought.; d. The features of personality disorders are merely extreme versions of normal personality traits.*
7. Royce takes swimming lessons at the community pool. . . . Based on this description, which of the following disorders does Royce most likely have? *Answer: b. attention deficit hyperactivity disorder*
8. Are females or males more likely to be diagnosed with each of the following disorders? *Answers: Females are more likely to be diagnosed with d. borderline personality disorder, e. depression, f. generalized anxiety disorder, g. obsessive-compulsive disorder, h. panic disorder; males are more likely to be diagnosed with a. anti-social personality disorder, b. attention deficit hyperactivity disorder, c. autism.*

## CHAPTER 15: TREATMENT OF PSYCHOLOGICAL DISORDERS

### Measuring Up, p. 691

1. Identify the psychotherapeutic orientation each of the following scenarios typifies. *Answers: a. cognitive-behavioural therapy; b. psychodynamic therapy; c. client-centred therapy*
2. Identify the disorder most commonly treated with each medication. *Answers: a. schizophrenia; b. depression; c. anxiety*

### Measuring Up, p. 709

Indicate whether cognitive-behavioural therapy, drug therapy, or a combination of the two is the recommended treatment for each disorder listed. *Answers: Drug therapy is most effective for choices a, g; CBT is most effective for c, d, e, f; a combination of drug therapy and CBT is most effective for b.*

### Measuring Up, p. 713

Why are personality disorders so difficult to treat? *Answers: a. People with personality disorders are difficult to engage in therapy because they do not believe their actions cause their problems; b. People with personality disorders believe their problems are caused by their environments.*

### Measuring Up, p. 723

Label each point below as an argument either for or against the practice of prescribing SSRI medications to adolescents with depression. *Answers: Choices b, d, e, and f support the use of SSRIs in treating adolescent depression; a and c argue against the use of SSRIs in this population.*

### Practice Test, p. 725

1. Which of the following statements are true regarding how culture can affect the therapeutic process? *Answers: Choices a, b, and e are true.*
2. Which of the following statements are true regarding pseudotherapies? *Answers: Choices a, b, c, and d are true.*
3. Barlow advocates distinguishing between psychological treatments and general talk therapy. Which of the following attributes characterize psychological treatments? *Answers: a. Treatments should be based on evidence of their effectiveness.; b. Treatments should be appropriate for the particular disorders.; c. Specific techniques for treatment should be developed in the laboratory by psychological scientists.*
4. Dialectical behaviour therapy takes place in three stages. Place the descriptions of the three stages below in the correct order. *Answer: The correct order is c, a, b.*
5. During his early adult years, Joshua was diagnosed with anti-social personality disorder. Joshua is now 40. Over the coming years, his friends and family will likely see a decrease in which of the following behaviours? *Answer: c. Joshua's tendency to get into fist fights.*
6. Label each point below as an argument either for or against the practice of prescribing Ritalin (methylphenidate) to children with ADHD. *Answers: Choices a and d support the use of Ritalin in treating ADHD; b, c, and e argue against the use of Ritalin in this population.*
7. Three-year-old Marley recently received a diagnosis of autism. Which of the following are true about her likely treatment? *Answers: Choices a, b, and d are likely true.*
8. Imagine you are asked to evaluate the quality of the following two methodologies for an empirical evaluation of a new treatment for ADHD. Label each of the methodologies as strong or weak. If a methodology is strong, briefly explain why. If a methodology is weak, provide a brief recommendation for strengthening it. *Answers: a. weak, would be improved if random assignment to condition were used; b. strong because of the use of treatment and control groups*

## CHAPTER 16: CULTURAL PSYCHOLOGY

### Measuring Up, p. 732

1. Which of the following statements is true regarding the cognitive abilities of nonhuman primates and young children? *Answer: c. Young children are similar to apes in their problem solving abilities, but are better than apes in their social learning abilities.*
2. Which of the following statements are true about culture in humans and other animal species? *Answers: a. Only humans accumulate cultural information over generations; d. Only primate species (including humans) show evidence for culture.*

### Measuring Up, p. 734

A cultural psychologist might study \_\_\_\_\_. *Answer: d. the way that a psychological process occurs in different cultures*

### Measuring Up, p. 740

1. When a person moves to a new culture, \_\_\_\_\_. *Answer: b. if the person is younger than 15 years of age, he or she will identify with the new cultural practices more easily than a person older than 15 will*
2. Self-consistency differs across cultures in that \_\_\_\_\_. *Answer: d. people from collectivistic cultures experience the self more differently across situations than do those from individualistic cultures*

### Measuring Up, p. 747

1. Which of the following stages is not typically associated with the acculturation experience? *Answer: a. negotiation stage*
2. People who are exposed to multiple cultures tend to \_\_\_\_\_. *Answer: d. switch between different cultural frames depending on what situation they are in*

### Measuring Up, p. 761

1. Which of the following is not more characteristic of North American cultures than of East Asian cultures? *Answer: b. North Americans attend more to the backgrounds in scenes.*
2. The moral reasoning of North American university students tends to be dominated by \_\_\_\_\_. *Answer: d. the ethic of autonomy*

### Measuring Up, p. 764

1. What of the following statements is true about cultural differences in depression? *Answer: c. Somatic symptoms are more common in depressed Chinese than in depressed North Americans.*
2. The study of schizophrenia across cultures reveals \_\_\_\_\_. *Answer: a. that people with schizophrenia in developing countries fare better than those in developed countries*

### Practice Test, p. 767

1. Fritz moved to Germany from Austria and quickly made a number of friends, found a good job, and became engaged to a German woman. Overall, he was very happy with his new life. At the same time, Panadda, from Thailand, also moved to Germany. Panadda felt quite lonely in Germany, made few friends, was unable to find a job, and experienced a great deal of stress in her daily activities. A likely reason for Fritz's and Panadda's different reactions is \_\_\_\_\_. *Answer: c. cultural distance*
2. Azim read in the newspaper that a young man had been caught trying to have sex with a sheep. Azim was outraged as he saw the

- man's behaviour as a shameful moral violation. Which of the following is reflected in Azim's moral reasoning? *Answer: d. the ethic of divinity*
3. Emi hates to leave her house. She dreads meeting other people, because she fears that she will blush excessively and that her blushing makes others uncomfortable. Emi likely suffers from \_\_\_\_\_. *Answer: a. TKS*
  4. Imagine you are creating an advertising campaign for a new beverage, Cold Snap. The campaign will introduce Cold Snap in collectivistic cultural environments. Which of the following slogans will likely be most effective? *Answer: b. Everyone loves the taste of Cold Snap.*
  5. Winnie and her younger brother Jesse moved from Hong Kong to Toronto when they were 17 and 11 years old, respectively. What might we expect with regard to their acculturation to Canada? *Answer: a. Jesse would acculturate to the mainstream society more quickly than Winnie because of his age.*
  6. In the workplace, an emphasis on multicultural messages \_\_\_\_\_ *Answer: d. increases the engagement of minority members*
  7. Analytic thinkers \_\_\_\_\_. *Answer: c. consider how something is made up of component parts*
  8. Given what we know about the desirability of different positive emotions in different cultures, which kind of leisure activity do you think would be more popular among Chinese than among Americans? *Answer: c. relaxing in spas*

# PERMISSIONS ACKNOWLEDGEMENTS

## TEXT AND FIGURES

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