Review Article

The Effectiveness of Music Therapy for Terminally Ill Patients: A Meta-Analysis and Systematic Review

Yinyan Gao, MM, Yanping Wei, MM, Wenjiao Yang, MM, Lili Jiang, MM, Xiuxia Li, PhD, Jie Ding, MM, and Guowu Ding, PhD

School of Public Health (Y.G., W.Y., L.J., X.L., J.D., G.D.), Lanzhou University, Gansu, China; Department of Gastroenterology (Y.W.), the First Affiliated Hospital of Lanzhou University, Gansu, China; Evidence-Based Medicine Center (X.L.), School of Basic Medical Sciences, Lanzhou University, Gansu, China; and Key Laboratory of Evidence Based Medicine and Knowledge Translation of Gansu Province (X.L.), Gansu, China

Abstract

Context. The quality of death has increasingly raised concern because of the physical and psychological suffering of patients with advanced disease. Music therapy has been widely used in palliative care; however, its physical and mental effectiveness remains unclear.

Objective. To assess the effectiveness of music therapy during palliative care in improving physiology and psychology outcomes.

Methods. Randomized controlled trials evaluating music therapy for terminally ill patients were searched and included from inception up to April 25, 2018. The quality of the studies was assessed using the risk of bias tool recommended by the Cochrane Handbook V.5.1.0.

Results. In this study, 11 randomized controlled trials (inter-rater agreement, $\kappa = 0.86$) involving 969 participants were included. The quality of the included studies ranged from moderate to high. Compared with general palliative care, music therapy can reduce pain (standardized mean difference: -0.44, 95% confidence interval: -0.60 to -0.27, $P < 0.00001$) and improve the quality of life (standardized mean difference: 0.61, 95% confidence interval: 0.41 to 0.82, $P < 0.00001$) in terminally ill patients. In addition, anxiety, depression, and emotional function are improved as well. However, no significant differences were found in the patient's physical status, fatigue, and social function.

Conclusion. This meta-analysis study demonstrated that music therapy served as an effective intervention to alleviate pain and psychological symptoms of terminally ill patients. However, considering the limitation of the quantity of the studies included, these results would need to be further confirmed.   J Pain Symptom Manage 2019;57:319−329. © 2018 American Academy of Hospice and Palliative Medicine. Published by Elsevier Inc. All rights reserved.

Introduction

Terminally ill patients are characterized by the existence of an incurable illness, with limited possibilities of response to standard of care treatments and a poor survival prognosis.[1] Patients with advanced disease are always subjected to various physical and psychological issues caused by their disease, such as pain, anxiety, depression, sadness, and other symptoms. Palliative care represents an effective approach to reduce the suffering of these patients.[2] Palliative care initially focused on advanced cancer but in recent years has increasingly extended to the early stage of serious illness, and it has proliferated around the world.[3−5] The World Health Organization delimited that

Y. G and Y. W. contributed equally to this work and should be considered co-first authors.

Address correspondence to: Guowu Ding, PhD, School of Public Health, Lanzhou University, Gansu, China, 730000. E-mail: dinggw2018@126.com

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palliative care is a way to improve the quality of life (QoL) of patients and their families facing a life-threatening illness, through the prevention and relief of suffering by early identification and impeccable assessment and treatment of pain and other symptoms.[6]

Music therapy is defined as "the clinical and evidence-based use of music interventions, a trained music therapist provides the indicated treatment after assessing the needs of patients, including creating, singing, moving to, and/or listening to music."[7] Music therapy is one of the most frequently used complementary therapies in palliative care.[8] It is a method of treating patients with physiological or psychosocial diseases by tones and rhythms and is considered one of the most effective methods of spiritual healing.[9] Music therapy can promote health in critically ill patients, and it can serve as an aid to eliminate psychosomatic disorders.[10] Markedly, psychotherapists believe that music can improve the mental state of patients, as a medium, music can help patients to better express their feelings and promote the exchange of inner moods and emotions.[11]

At present, music therapy as a complementary approach to standard of care or palliative care programs is widely used in the clinical management of disease, especially in advanced cancer and other terminal illnesses.[12] Numerous studies have suggested that music therapy plays a beneficial role in patients with serious diseases. For example, in certain cases, it has been demonstrated that music therapy has the power to promote emotional functions in terminally ill patients.[13] In addition, a pilot study demonstrated that music therapy was able to reduce stress, anxiety, and depression in patients enrolled in palliative care.[14] A controlled trial of 14 participants also showed that palliative care that included music therapy significantly reduced the pain level of patients.[15]

Before this meta-analysis, two related systematic reviews[2,16] on music therapy were published in 2010 and 2016, respectively. Dr. Joke Bradt and her team analyzed indexes that included pain, anxiety, depression, QoL, functional, psychophysiological, and social/spiritual well-being [2]. However, these results were based on a small sample size, for example, the outcomes of pain, anxiety, and depression were based on only 45 patients, the outcome of QoL was based on 125 patients, and the remaining outcomes were based on 100 patients. In addition, a review performed by McConnell et al., the effectiveness of music therapy on pain was evaluated in 243 patients with advanced disease, which was found to be an effective nonpharmacological approach to managing distressing symptoms [16]. Nonetheless, the effectiveness of music therapy on patients with advanced disease or terminal illnesses has not yet fully been elucidated. Based on the findings of the above two systematic reviews,[2,16] this meta-analysis was conducted to comprehensively evaluate the effectiveness of music therapy in improving physiology and psychology outcomes.

Methods

Literature Search

Online databases, including PubMed, Embase, Web of Science, the Cochrane Library, and China Biology Medicine (CBM), were searched from inception to April 25, 2018. In addition, references of related literature were retrieved. To build the search strategy, the following search terms were used: (music* OR melod* OR improvis* OR sing* OR song OR rhy* OR lyric OR sound* OR acoustic OR vibroacoustic OR voice OR vocalise) AND (palliative OR hospice OR terminal* OR dying OR "end of life" OR "end stage") AND (random* OR "controlled clinical trial*" OR "single blind" OR "double blind" OR placebo OR RCT).

Inclusion and Exclusion Criteria

The inclusion criteria for our analysis were 1) randomized controlled trials (RCTs); 2) enrolled participants who were diagnosed with incurable terminal illness or who were receiving palliative care; 3) patients who were 18 years or older; 4) the control group received palliative care, which included the following forms: general nursing, breathing relaxation, muscle relaxation, and conversation, and so forth, whereas the experimental group received music therapy based on palliative care; and 5) full study text was written in English or Chinese. The exclusion criteria were 1) conference proceedings or abstracts; 2) psychotherapy and art therapy; 3) duplicate reports of a study; and 4) data that were incomplete or could not be obtained.

Data Extraction and Quality Assessments

Two evaluators independently screened the medical literature and extracted the data. If one of the evaluators presented an opinion different from the other, a third evaluator resolved disagreement by consulting. A Risk of Bias (RoB) tool recommended by the Cochrane Handbook V.5.1.0 (Cochrane Collaboration, London, UK) was used to assess the quality of the trials. The quality factor was classified as yes (low risk of bias), no (high risk of bias), or unclear (moderate risk of bias). Assessment principles included the following aspects: generation of random sequence, allocation concealment, blinding of participants and assessment, integrity of the data, selective reporting, and other bias.

Statistical Analysis

Meta-analysis was performed to integrate the outcomes of the RCTs. The primary outcomes included pain, QoL, and physical status. Secondary outcomes included anxiety, depression, fatigue, emotional function, and social function. Outcomes were presented as continuous variables. In cases where studies used different instruments to measure the same parameter (e.g., pain), we reported the standardized mean difference (SMD) with a 95% confidence interval (CI). The Higgins I^2 test was used to evaluate the heterogeneity between studies. A fixed-effects model was used when absence of marked heterogeneity ($I^2 < 50\%$). Otherwise, a random-effects model was implemented ($I^2 \geq 50\%$), and subgroup analysis was used to measure heterogeneity. Sensitivity analysis was conducted to test the robustness of the results by omitting any single study. Data were pooled and analyzed using Excel (Microsoft, Redmond, WA) and Review Manager (RevMan) Software (Cochrane, London, UK), respectively. In addition, Kappa coefficient for inter-rater agreement was calculated manually.

Results

Literature Search

The detailed retrieval and screening process are presented in Fig. 1. A total of 3423 relevant records were identified, of which 1135 records were excluded as duplicates. After browsing the titles and abstracts of the related references, 2236 records were excluded. The full text of the remaining 52 articles was browsed, and 43 studies were excluded. In addition, two studies were included by hand-searching references of related literature. Finally, a total of 11 studies[17–27] were included in our meta-analysis. Inter-rater agreement was $\kappa = 0.84$.

Study Characteristics

The clinical trials included in this meta-analysis spanned between the years 2003 and 2017. The average sample size was 88, ranging from 20 to 198 patients. Six studies were performed in China, three in America, one in Australia, and one in Germany. The average patient age was more than 55 years, and most of the patients were diagnosed with advanced cancer. Of all included studies, the average number of sessions was 2, ranging from 1 session up to 13 sessions. Single intervention of music therapy generally took between 15 or 40 minutes. In addition, three music therapy interventions were most commonly used—instrument playing, live music playing, and recorded music playing. More detailed characteristics of the 11 studies were shown in Table 1.

Quality Assessment

The RoB of included studies is presented in Fig. 2. Six clinical trials described the randomization procedures in detail, whereas the remaining trials only
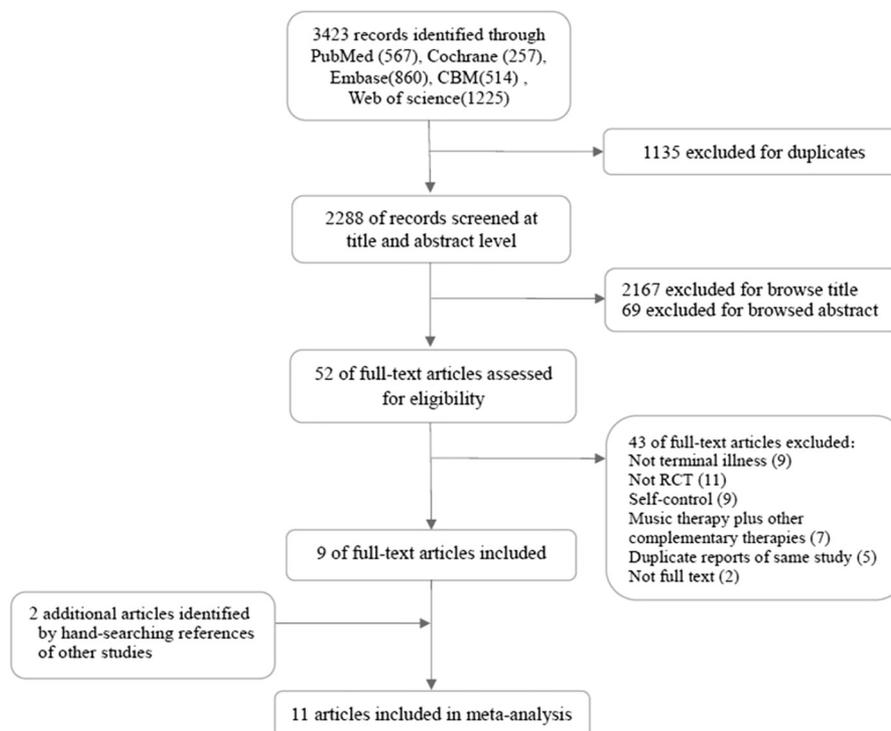

Fig. 1. Literature screening process and results.

Table 1
Characteristics of the Included Studies

Study	Population	No. of Patients (E/C)	Mean Age, Years	Intervention		Outcomes
				Experimental Group	Control Group	
Nguyen 2003, American	Congestive heart failure, chronic renal failure, different types of cancer, and other terminal illness.	10/10	64.5	Two sessions The first session involved singing music chosen by the patient, finding out the patient's favorite songs. The second session conducted an end-of-life celebration.	Did not receive any music and consented only to participating in the study	Pain (VAS), anxiety (VAS), depression (VAS), QOL (HRQOL), social function (HRQOL)
Hilliard 2003, American	Advanced cancer	40/40	65.5	Least two sessions up to 13 sessions Music therapy with palliative care: song choice, music-prompted reminiscence, singing, live music listening, lyric analysis, instrument playing, song parody, etc. Music therapists used subject-preferred, live music	Routine palliative care	QOL (HRQOL), physical status (PPS), emotional function (HRQOL), social function (HRQOL)
Thompson 2008, Australia	Terminal cancer and other diseases	13/12	73.9 ± 13.32	Single session A music therapist provided a range of techniques that included singing, playing familiar live or recorded music, music and relaxation, music and imagery, improvisation, and music-assisted counseling.	A single volunteer session consisting of conversation	Pain (ESAS), anxiety (ESAS), depression (ESAS)
Gutgsell 2013, American	Advanced cancer (87%)	99/99	56.09 ± 15.08	Single session Music therapy with standard care: The music therapist used an ocean drum, followed by a harp. The music played at a low volume in a slow tempo.	Standard care	Pain (NRS)
Liao 2013, China	Advanced cancer	29/14	63.5 ± 13.3	Three sessions music therapy with standard care: patients receive music therapy by CD players	Standard care	QOL (HRQOL), physical status (KPS)

Leng 2014, China	Patients receiving palliative care	50/50	73.4 ± 10.2	Single session Music therapy with palliative care: patients receive music therapy by MP3 headphones	Palliative care	Pain (SF-MPQ), physical status (KPS)
Liao 2014, China	Advanced cancer	57/31	62.9 ± 12.9	Three sessions Music therapy with standard care: patients receive music therapy by CD player	Standard care	Physical status (KPS)
Zhang 2015, China	Advanced cancer	58/97	75.5	Single session Music therapy with palliative care: recorded music	Palliative care	Pain (EORTC QLQ-C30), QOL (EORTC QLQ-C30), physical status (EORTC QLQ-C30), emotional function (EORTC QLQ-C30), social function (EORTC QLQ-C30)
Warth 2015, Germany	Malignant tumor except two cases	40/38	63 ± 13.4	Two sessions Live music based on relaxation exercise: music played live on a monochord, then vocal improvisation was begun in Ionian or Mixolydian mode	Verbal relaxation exercise	Pain (VAS), QOL (EORTC QLQ-C15), fatigue (EORTC QLQ-C15), emotional function (VAS)
Liao 2016, China	Advanced cancer	39/37	60.8 ± 1.3	Single session Music therapy with progressive muscle relaxation training: recorded music	Progressive muscle relaxation training	Anxiety (HADS), depression (HADS)
Zhai 2017, China	Gastrointestinal cancer	53/53	58.3 ± 10.2	Single session Music therapy with standard care: recorded music	Standard care	Physical status (KPS), depression(HAMD)

Abbreviations: VAS = Visual Analog Scales; HRQOL = Health-Related Quality of Life scales; PPS = Palliative Performance Scale; ESAS = Edmonton Symptom Assessment System; NRS = Numeric Rating Scale; KPS = Karnofsky Performance Status; SF-MPQ = Short Form-McGill Pain Questionnaire; EORTC QLQ-C15/30 = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 15/30 palliative questionnaire; HADS = Hospital Anxiety and Depression Scale; HAMD = Hamilton Depression Scale.
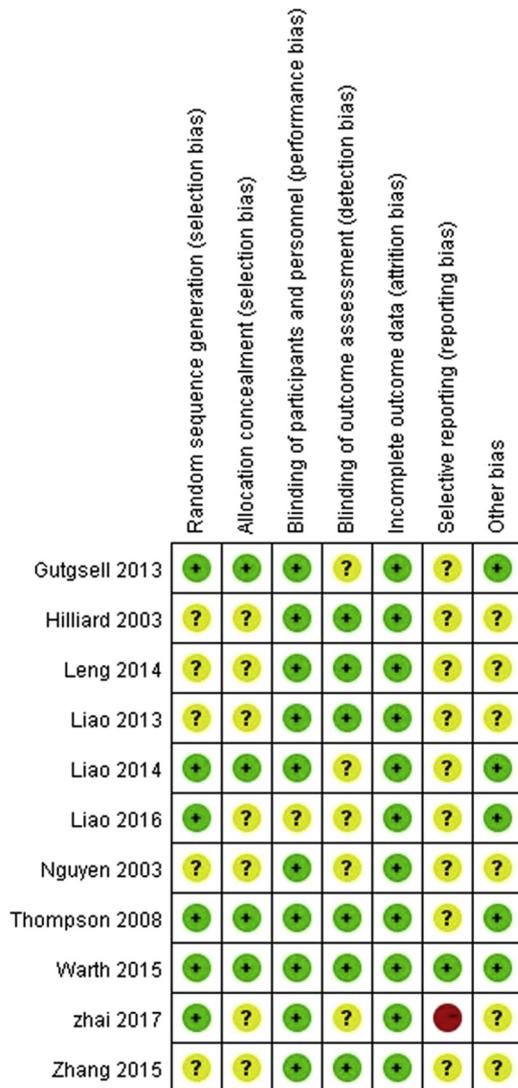
Fig. 2. The risk of bias of included studies. Green plus circle = low risk of bias; red minus circle = high risk of bias; yellow ? circle = unclear risk of bias. (For interpretation of the references to color in this figure legend, the reader is Referred to the web version of this article.)

mentioned the randomization without any introduction of the procedures. Moreover, four studies concealed the allocation sequence through sealed

opaque envelopes, and others not reported. Because of the particularity of music therapy, blinding of participants cannot be implemented. Two studies reported blinding of outcome assessment. In two studies, a few participants withdrew, resulting in a dropout rate of 0.1 and 0.7, respectively, and the authors explained the reasons for withdrawal without intentionality analysis. In addition, one study has high risk of bias of selective reporting.

Primary Outcomes

In our analysis, six studies including 576 patients reported the effect of music therapy on pain intensity of terminally ill (Fig. 3). A fixed model was applied to these studies, presenting a significant difference between the music therapy group and the control group (SMD: -0.44, 95% CI: -0.60 to -0.27, $P < 0.00001$; heterogeneity: $\chi^2 = 7.19$, $I^2 = 37\%$, $P = 0.16$). In addition, we performed sensitivity analysis by omitting any single-choice study, and the result did not change, indicating that this result was robust and reliable. Accordingly, music therapy was found to significantly relieve pain of terminally ill patients.

Moreover, QoL was used as one of the outcomes in five of the studies. When dividing the 421 participants of the five studies into two subgroups based on different scales (European Organization for Research and Treatment of Cancer [EORTC] and the Health-Related Quality of Life [HRQOL]), homogeneous results were obtained. Pooling the outcomes of two scales resulted in statistically significant results. Our meta-analysis (Fig. 4) showed that participants who received music therapy exhibited significant improvement in QoL (SMD: 0.61, 95% CI: 0.41 to 0.82, $P < 0.00001$; heterogeneity: $\chi^2 = 14.96$, $I^2 = 73\%$, $P < 0.05$), compared with participants who received general palliative care. Subgroup analysis of EORTC scale showed that music therapy can improve QoL of terminally ill patients (SMD: 0.29, 95% CI: 0.03 to 0.55, $P = 0.03$; heterogeneity: $\chi^2 = 0.56$, $I^2 = 0\%$, $P = 0.46$), and the results of HRQOL subgroup analysis were even more remarkable (SMD: 1.07,
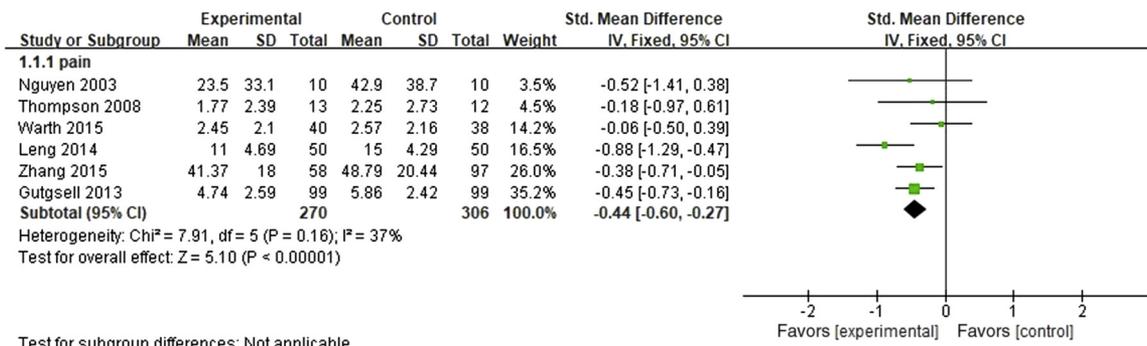

Fig. 3. The effectiveness of music therapy versus standard care for pain of terminally ill patients.
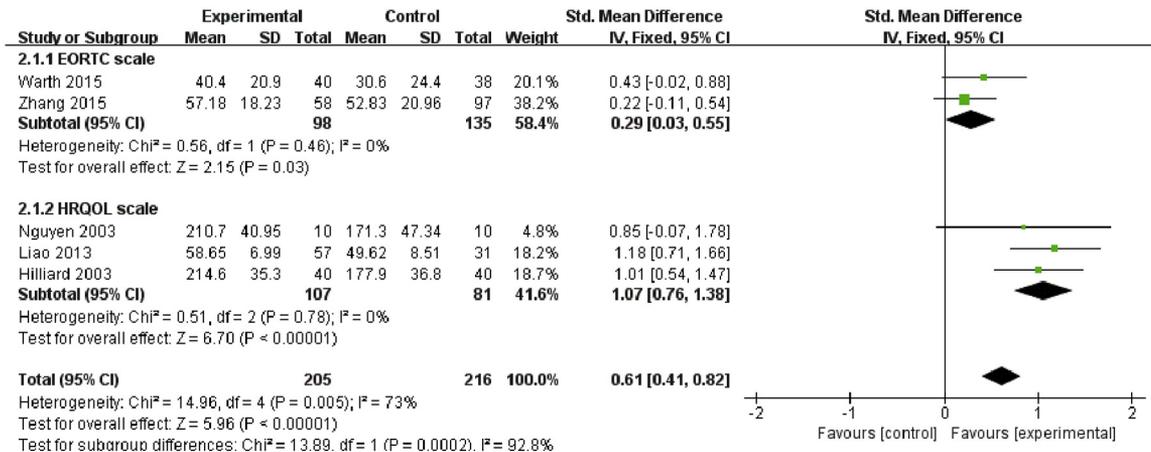
Fig. 4. The effectiveness of music therapy versus standard care for QOL of terminally ill patients.

95% CI: 0.76 to 1.38, $P < 0.0.00001$; heterogeneity: $\chi^2 = 0.51$, $I^2 = 0\%$, $P = 0.78$). Statistical difference was observed between the two subgroups ($\chi^2 = 13.89$, $I^2 = 92.8\%$, $P = 0.0002$). A sensitivity analysis was conducted by omitting a single-choice study, and the result of the subgroups did not change, suggesting that the result obtained was stable.

Moreover, six studies involving 572 patients assessed their physical status. Fig. 5 shows the results of our meta-analysis examining the effect of music therapy on the physical status of terminally ill patients. Overall, meta-analysis showed no statistical difference between experimental and control groups in physical status (SMD: 0.68, 95% CI: 0.01 to 1.34, $P = 0.05$). Notably, high heterogeneity was seen among the meta-analysis results ($I^2 = 93\%$, $P < 0.05$). A sensitivity analysis was also conducted, and the result changed when we omitted Zhang's study,[21] suggesting that this result was unstable.

Secondary Outcomes

The pooled estimates of anxiety, depression, and fatigue are represented in Fig. 6. In three trials, anxiety of 121 participants was evaluated. The results of meta-analysis indicated that music therapy relieved anxiety in these patients (SMD: −0.68, 95% CI: −1.35 to −0.02, $P = 0.04$, heterogeneity:$\chi^2 = 5.25$,

$I^2 = 62\%$, $P = 0.07$). In four trials, depression among 227 patients was evaluated. In meta-analysis, depression exhibited significant relief compared to patients undergoing general palliative care (SMD: −1.08, 95% CI: −1.64 to −0.53, $P = 0.0001$; heterogeneity: $\chi^2 = 9.34$, $I^2 = 68\%$, $P = 0.03$). In two trials, fatigue of 233 participants was assessed. Meta-analysis demonstrated that there were no significant differences between experimental and control groups (SMD: −0.17, 95% CI: −0.95 to 0.61, $P = 0.67$). Sensitivity analysis was not carried out because of the limited number of studies in each group.

The pooled effects of emotional function and social function are represented in Fig. 7. In three trials, emotional function of 313 participants was evaluated. Meta-analysis showed that emotional function of patients who received music therapy significantly improved (SMD: 0.58, 95% CI: 0.27 to 0.90, $P = 0.0003$; heterogeneity: $\chi^2 = 3.58$, $I^2 = 44\%$, $P = 0.17$). Finally, in three trails, social function of 255 patients was assessed. Our pooled estimate indicated a lack of strong evidence for an effect of music therapy in social function (SMD: 0.51, 95% CI: −0.17 to 1.19, $P = 0.14$). Sensitivity analysis was not carried out because of the limited number of studies in each group.
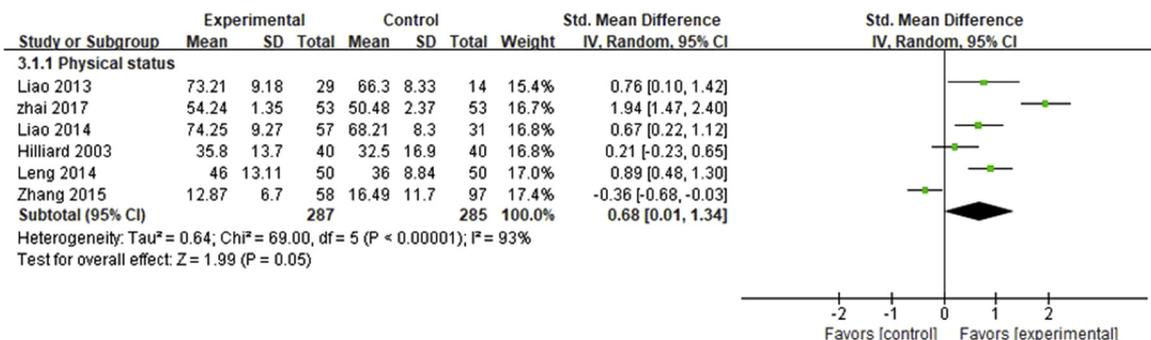

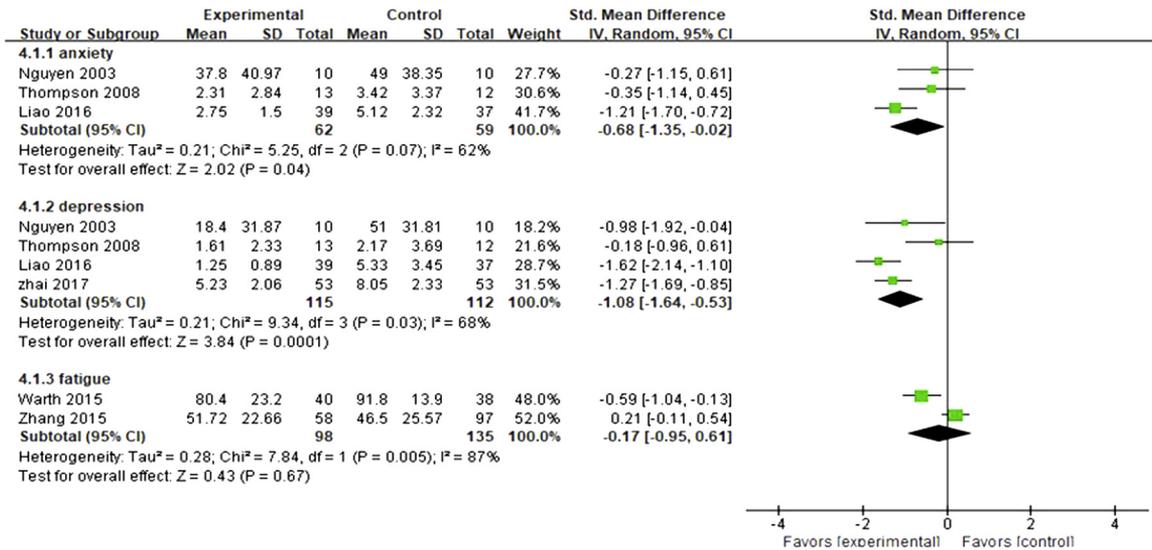Fig. 5. The effectiveness of music therapy versus standard care for physical status of terminally ill patients.

Fig. 6. The effectiveness of music therapy versus standard care for anxiety, depression, and fatigue of terminally ill patients.

Discussion

Summary of Results

This systematic review and meta-analysis provides a comprehensive analysis of the effects of music therapy on terminally ill patients, including their physical and psychological symptoms. Markedly, pain is one of the most unbearable symptoms of dying patients; therefore, clinicians pay more attention to pain remission in these patients.[28] Moreover, according to our retrieval process, there were plenty of researches on QoL, physical status, and other symptoms of terminally ill patients.

Our meta-analysis results suggested that music therapy can significantly relieve pain intensity in terminally ill patients. In the systematic review performed by McConnell et al.,[16] similar results were presented,

whereas in the systematic review by Bradt and her team,[2] the results were opposite. The difference between these three reviews may be due to the small sample size of the meta-analysis performed by Bradt et al. ($n = 45$). In addition, Bowers et al.[29] reported that music therapy reduced pain of adult patients undergoing palliative care. Bro et al.[30] also presented a similar outcome after giving an evaluation of the application of music therapy in cancer treatment. The mitigation effect of music therapy on physical pain was in line with the expected conjecture and the general public's cognition. Notably, two theories may account for the effects of music therapy from a patient's perspective. First, listening to music can distract the concentration of patients from pain.[31] Second, modern pain theory suggests that painful experiences are affected by both physical and mental factors,[32] so patients
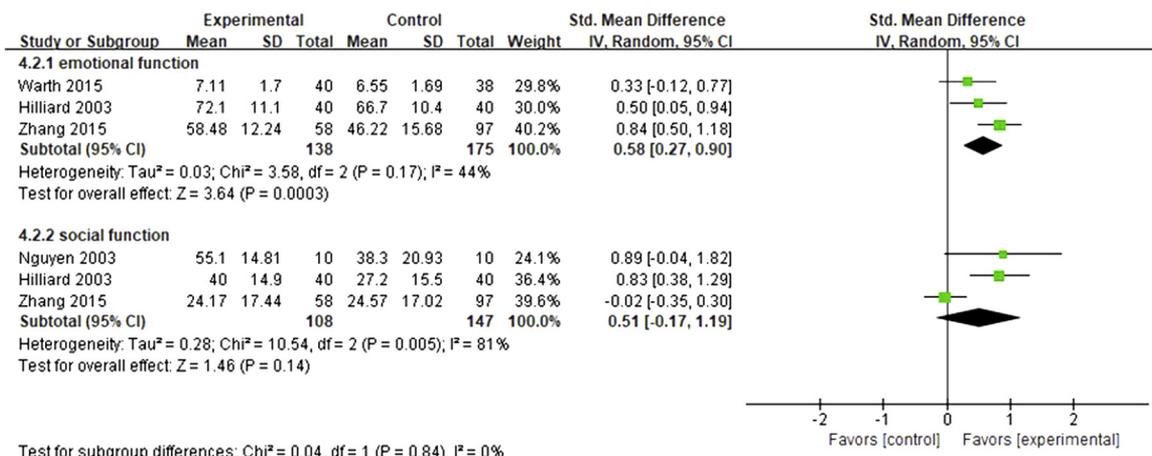

Fig. 7. The effectiveness of music therapy versus standard care for emotional function and social function of terminally ill patients.

experience psychological pleasure through music, which relieves pain correspondingly.

Our findings showed that music therapy creates a favorable improvement in the QoL of terminally ill patients, when compared with patients subjected to the general palliative care. However, high heterogeneity was found in meta-analysis between the two scales analyzed (EORTC and HRQOL) for terminally ill patients. The reason may be that the specific scale indexes and specific measurement standards used in the two scales were inherently different. Nevertheless, in both subgroups, positive results on the QoL of the patients receiving music therapy were demonstrated. Similar results were obtained in the analysis of Bradt et al. based on three trials ($n = 125$). Several clinical reports and nonrandomized control trials have also indicated that music therapy played a positive role in improving QoL of patients.[14,33,34] It is well accepted that the QoL of a patient is generally affected by physical, psychological, and social factors.[35] In this study, music therapy was able to improve the mental and spiritual state, including anxiety, depression, and emotional function, thereby improving the QoL of patients as a whole.

In our review, no statistical differences in physical status improvement were observed between experimental and control groups, and a high heterogeneity was found between groups. Sensitivity analysis demonstrated that the results were unstable when Zhang's study[25] was included. Therefore, we analyzed the original data reported by Zhang et al. and concluded that the lower levels of physical status at the baseline of the experimental participants may represent an alternative explanation for the outcome observed. Other related reviews did not analyze the patient's physical status, making it obvious that more high-quality RCTs are needed before conclusions can be convincingly drawn.

In the secondary outcome results, we observed that music therapy play an active role in relieving anxiety, depression, and in improving emotional function. However, no statistical significance was observed in the effect of music in reducing fatigue and improving social functions. In several reviews and clinical reports evaluating these effects, similar results were obtained. For instance, Azoulay et al. concluded that music therapy may greatly relieve anxiety in critically ill patients.[36] Another report performed by Gallagher et al. stated that music therapy improved anxiety and emotional function in patients.[37] Fatigue was not found to be appreciably affected by music therapy in another trial evaluated by Clark et al.[38]

Our meta-analysis evaluating the effectiveness of music therapy in terminally ill patients demonstrated sufficient evidence to support its implementation in clinical practice. Fortunately, we found no identified side effects in any of the included trials, as reported in previous reviews. Summarizing all of our results, we found that most of the improvement obtained from music therapy in terminally ill patients was mainly reflected in their psychological status. In terms of their physical status, no improvement was observed other than pain relief. This may be because the body of terminally ill patients is already in an incurable statement, and supplementary care is basically ineffective in improving their body function. Therefore, their physical symptoms can only be relieved, to some extent, through drugs or other clinical means. In addition, clinical studies of cancer have reported that a greater impact on their emotional response variables than physical symptoms,[38,39] as other studies outside of cancer have previously observed.[40] The findings of this review echoed the theories mentioned previously, indicating that music therapy is more likely to play a positive role in the mental health of a terminally ill patient than the physical symptoms of the disease.

Overall Completeness and Applicability of Evidence

Although a comprehensive search strategy was conducted, it may still be possible that relevant published or unpublished studies were missed. Because the trails of music therapy in fatigue, anxiety, emotional function, and social function were based on small sample size, more high-quality RCTs are needed.

In addition, the personality traits and sensitivity to music of participants can also affect the effectiveness. As a whole, the studies included in this review only involved finite information about the music, except for mentioning general music types (e.g., live or record, fast or slow, jazz or classical). However, these types of music can vary widely in their specific application process, including the particular emotions released by songs, the venue for listening, whether relatives of participants present, and other factors. These details could help music therapists make reasonable music selection after assessing preferences of patients. A review of music therapy suggested that allowing patients to select their favorite music type may enhance the sense of control of them.[41] In several of the trials included, the experimenter selected music, which they felt would be beneficial to patients, but the music provided may cause the patients uncomfortable. Therefore, how to appropriately select music for patients needs to be evaluated in more all-round studies.

Strengths, Limitations, and Future Research

There were two strengths in this meta-analysis. First, our study included more trials than previous reviews, and the trials included were all RCTs. Second, our study comprehensively analyzed the role of music therapy for terminally ill patients, including multiple physiological and psychological indicators. However, there were also some limitations. First, we only included

studies that were written in English or Chinese, and it was possible that we excluded relevant studies written in other languages. Second, two of the included trials[17,19] were based on small samples. It is generally well accepted that studies with relatively small sample sizes are more likely to lack sufficient statistical power to detect a true association, and their results are more likely to be attributed to chance.

In the future, it will be essential to assess the cost-effectiveness of music therapy for terminally ill patients. The cost of listening to music through a device is extremely low, whereas the cost of music therapy in the form of live music or sonic equipment treatment can be costlier. However, it is still unclear whether these various music perception methods have different effectiveness on patients. Cost-effectiveness research can certainly help music therapists select more suitable and cost-effective music treatment approaches. Furthermore, more high-quality RCTs are needed to precisely evaluate the effectiveness of music therapy in palliative care setting.

Conclusion

Based on the included studies, we confirmed the positive role of music therapy in alleviating the pain, anxiety, and depression of terminally ill patients, as well as in improving their QoL. The effectiveness of music therapy in physical status, fatigue, and social functions of terminally ill patients requires further investigation. Overall, this meta-analysis suggested that music therapy was more effective in improving psychological symptoms than physical symptoms of terminally ill patients. In the future, better designed RCTs of music therapy in palliative care should be conducted.

Disclosures and Acknowledgments

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