Original

Effects of Music Intervention on Anxiety, Depression Symptoms and Quality of Life in Breast Cancer Patients: A Meta-Analysis

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Abstract

Background: Music therapy is often used to relieve anxiety and depression in breast cancer patients, but the clinical effect of music therapy on breast cancer patients is still controversial. This study was a systematic review to investigate the effects of music intervention on anxiety, depression, pain, and quality of life in breast cancer patients.

Method: A computer search of PubMed, Embase, Web of Science, and The Cochrane Library repositories was conducted. We searched for randomized controlled trials (RCTs), published in English until October 2023, on the effects of music interventions on anxiety, depressive symptoms, pain levels, and quality of life in breast cancer patients. The Cochrane Manual of Systematic Review 5.3 was used to evaluate the quality of the included references, and Stata15.0 software was selected for meta-analysis of the study indicators.

Results: A total of 10 articles were included in this study, including 593 patients. Meta-analysis showed that music intervention could effectively alleviate anxiety symptoms [standardized mean difference (SMD) = –2.12, 95% confidence interval (CI): –3.17~–1.07], depression symptoms (SMD: –0.77, 95% CI: –1.47~–0.07), and pain degree (SMD: –3.47, 95% CI: –6.45~–0.48). There was no significant difference in the improvement of patients' quality of life (SMD: –0.07, 95% CI: –0.48~0.34).

Conclusion: Music intervention can effectively relieve anxiety and depression symptoms in patients with breast cancer, and reduce the degree of pain, but demonstration of its ability to improve the quality of life of patients requires additional research.

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Introduction

Breast cancer is one of the most common gynecological tumors and one of the most common causes of death in cancer patients [1]. Studies have shown that breast cancer patients account for about 2% of all cancer patients, but breast cancer accounts for about 25% of female cancer patients who die [2]. The treatment of breast cancer patients is mainly based on surgery, and chemotherapy, radiotherapy and immunotherapy are also used as auxiliary treatments. However, patients often suffer great pain in the treatment process and are prone to relapse during a long treatment cycle; as a result, they are also prone to anxiety and depression, which seriously affects the quality of life [3,4]. At present, the treatment of anxiety and depression in cancer patients is generally through behavioral intervention, psychological intervention and artistic intervention [5–7]. Among them, art intervention is more widely used in breast cancer patients, which mainly includes music therapy, dance therapy, movement therapy, and art therapy using visual art materials.

Music therapy refers to the use of music as a therapeutic method to restore, maintain, and improve the physical and mental health of patients. The implementation of this method is mainly carried out by experienced music therapists. Research has shown that art therapy can significantly improve the negative emotions and quality of life among breast cancer patients, but in this study, music therapy was only considered as a part of art therapy [8]. In 2018, Wang X *et al*. [9] conducted a meta-analysis on the therapeutic effect of music therapy on breast cancer patients, and the results showed that music therapy could improve the symp-
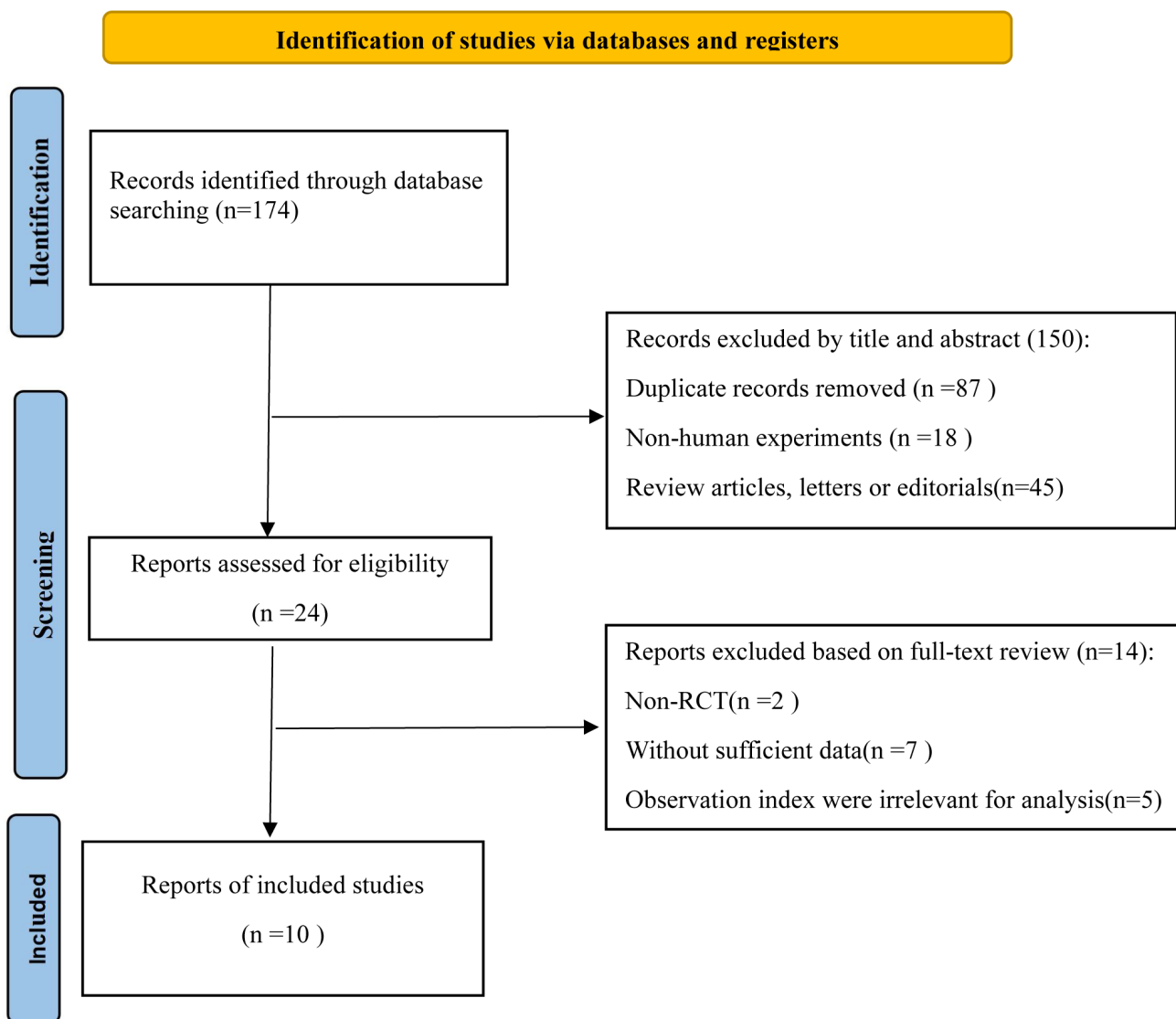
Fig. 1. Literature screening flow chart. RCT, randomized controlled trial.

toms of anxiety and depression in some breast cancer patients. However, the impact on patients' quality of life and pain degree was not reported, and the overall quality of the articles included in this study was relatively low. Moreover, the article was published over 5 years ago, possibly making this conclusion less relevant for current clinical treatment.

Based on this, the present study supplemented and updated the previous meta-analysis; That is, we report on the effects of music therapy on anxiety, depression symptoms, and quality of life of breast cancer patients based on recent studies, in order to provide more effective evidence for the efficacy of music therapy in breast cancer patients.

Data and Methods

Research Design

Since this study was a meta-analysis of published articles, ethical approval and informed consent was not required. This meta-analysis follows the Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) [10] statements (See **Supplementary File 1**).

Literature Search Strategy

A systematic search of PubMed, Embase, Web of Science, and other databases for articles published in English since the establishment of each database to October 2023
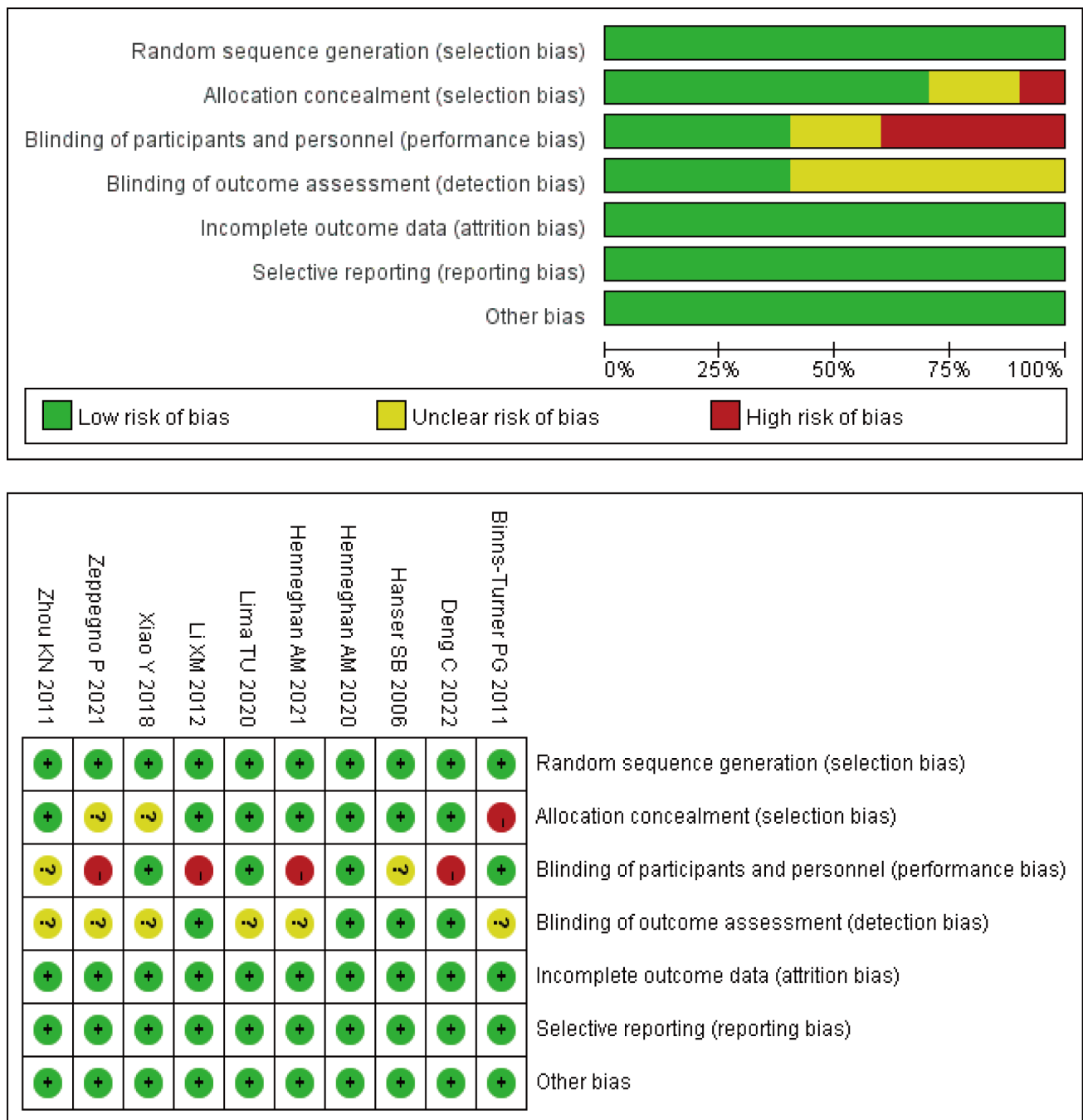
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Fig. 2. Risk assessment diagram of included literature.

was conducted. The key words of the literature retrieval were selected by combining PubMed MeSH terms with free words, including "breast neoplasms", "breast carcinomas", "breast cancer", "breast tumor" and "music". In addition, all the articles were selected manually, so as not to exclude those that met the inclusion criteria.

Inclusion Criteria and Exclusion Criteria

Inclusion criteria: (1) Patients were diagnosed with breast cancer; (2) The studies included music as an intervention; (3) The studies were randomized controlled trials (RCTs); (4) The complete outcome was reported; (5) The studies were published in English; (6) There was no music intervention in the control group.

Exclusion criteria: (1) The studies were non-RCTs, such as conference reports or semi-randomized controlled trials; (2) The ending of the article was incomplete; (3) The studies were not fully read and the article data were not extracted; (4) The patients had other diseases besides breast cancer.

Literature Selection and Quality Assessment

References were screened independently by two researchers according to the inclusion and exclusion criteria. If there was a disagreement between two researchers in the process of literature screening, it was discussed and decided by the two researchers, or a third researcher participated and decided. The included literature was evaluated using the Cochrane Systematic Review Manual 5.3 [11]. If there was disagreement in the quality assessment process, a third party participated in the negotiation. The quality evaluation includes 6 items: (1) The generation of the random sequence and whether the article chooses to conceal allocation; (2) Whether the blind method is included; (3) Whether the article describes the impact of loss-to-follow-up; (4) Whether the article contains complete outcome indicators; (5) Whether the research results are selectively reported; (6) Whether there are other biases. For each item, the researchers selected "high bias", "unclear", and "low bias".

Data Extraction

In order to ensure the accuracy of literature data, two researchers extracted data independently. If there was a dispute in the process of data extraction, the third researcher participated and discussed whether to extract the study. The extraction content included first author name, publication time, sample size, study type, intervention, follow-up duration, outcome measures, etc.

Statistical Analysis Methods

Stata15.0 (StataCorp research and development, College Station, TX, USA) was selected for meta-analysis. The standardized mean difference (SMD) and 95% confidence interval (CI) were used to present measurement data. The chi-square test was used to test the heterogeneity of all data. If Chi-square test results showed heterogeneity ($p < 0.1$, $I^2 > 50\%$), a random-effects model was selected. If the results showed no heterogeneity ($p \geq 0.1$, $I^2 \leq 50\%$), a fixed-effect model was selected. The significance level of the meta-analysis was $\alpha = 0.05$, and $p < 0.05$ indicated that the com-parative difference between the results of each study was statistically significant.

Results

Literature Screening Results

A total of 174 articles were identified and, of these, 24 articles passed the initial screening after reading the title and abstract. After reading the full text of the 24 articles, 10 articles were finally included, and all were randomized controlled experiments. The flow chart of literature screening is shown in Fig. 1. Quality assessment of the 10 articles finally included was conducted using the Cochrane Systematic Review Manual 5.3, as shown in Fig. 2.

Basic Features of the Included Literature

The 10 articles included a total of 593 patients; 9 articles reported anxiety scores (6 articles reported anxiety scores after treatment, 3 articles reported anxiety scores before and after treatment), 6 articles reported depression scores, 3 reported quality of life scores, and 3 articles reported pain degree scores. The basic characteristics of the patients included in the study are shown in Table 1 (Ref. [12–21]).

Results of Meta-Analysis

Anxiety Score

A total of six studies reported patients' anxiety scores after the intervention, including a total of 382 patients, 192 in the control group and 190 in the experimental group. Meta-analysis of the control group (no music) and the experimental group (music intervention) revealed high heterogeneity among the six articles ($I^2 = 93.6\%$, $p < 0.001$). Random-effects model analysis showed that music intervention could alleviate anxiety symptoms in breast cancer patients (SMD = –2.12, 95% CI: –3.17~–1.07), as shown in Fig. 3.

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Table 1. General characteristics of included studies.

Author		Deng C [12]	Henneghan AM [13]	Zeppegno P [14]	Lima TU [15]	Henneghan AM [16]	Xiao Y [17]	Li XM [18]	Binns-Turner PG [19]	Zhou KN [20]	Hanser SB [21]
Year		2022	2021	2021	2020	2020	2018	2012	2011	2011	2006
Simple size		80	27	60	33	31	50	120	30	120	42
Case	Con	40	12	30	17	16	25	60	15	60	22
	Exp	40	15	30	16	15	25	60	15	60	20
Age	Con	50.2 ± 10.6	52.22 ± 10.18	66.6 ± 10.9	50.76 ± 9.45	NA	NA	44.88 ± 9.37	NA	NA	NA
	Exp	54.2 ± 9.8	52.22 ± 10.18	63.0 ± 10.7	49.50 ± 10.65	NA	NA	45.13 ± 9.48	NA	NA	NA
Follow-up time, week	Con	NA	8	NA	NA	8	NA	NA	4	NA	6
	Exp	NA	8	NA	NA	8	NA	NA	4	NA	6
Intervention	Con	Usual Care	Meditation	Usual Care	Meditation	Meditation	Usual Care	Usual Care	Usual Care	Usual Care	Usual Care
	Exp	Usual care + Listen to 30 minutes of music	Listen to classical music for 12 minutes a day	Listen to Italian songs	Listen to music for 30 minutes before chemo	Listen to 12 minutes of classical music every day	Usual care + Listen to music 60 minutes before surgery or 30 minutes after tracheal catheter removal	Usual Care + usual care + Listen to music twice a day for 30 minutes each time	Listen music	Listen to 30 minutes of music in the morning and evening every day	Listen to music for 40 minutes at a time
Outcome		Anxiety, Pain	Anxiety, Pain, Depression, Quality of Life	Anxiety, Depression	Anxiety, Depression, Quality of Life	Anxiety, Depression, Quality of Life	Anxiety, Pain	Anxiety	Anxiety	Depression	Anxiety, Depression
Evaluation tool		VAS	PROMIS-Short Form 8a, PROMIS Pain Interference-Short Form 6, WHOQOL	STAI, BDI-II	BAI, BDI-II, WHOQOL	PROMIS, WHOQOL	VAS, NRS	SAI	SAI	SDS	HADS

Note: Exp was the experimental group; Con was the control group; VAS, Visual analog scale; PROMIS-Short Form 8a, Reporting Results Measurement Information System-Short Form 8a; STAI, State Trait Anxiety Scale; WHOQOL, Summary of the World Health Organization Quality of Life Scale; BAI, Baker Anxiety Scale; BDI-II, Baker Depression Scale; NRS, Numerical Rating Scale for Pain Intensity; SAI, Spielberg Anxiety Scale; SDS, Depression Self-rating Scale; HADS, Hospital Anxiety and Depression Scale; NA, not available or not applicable.
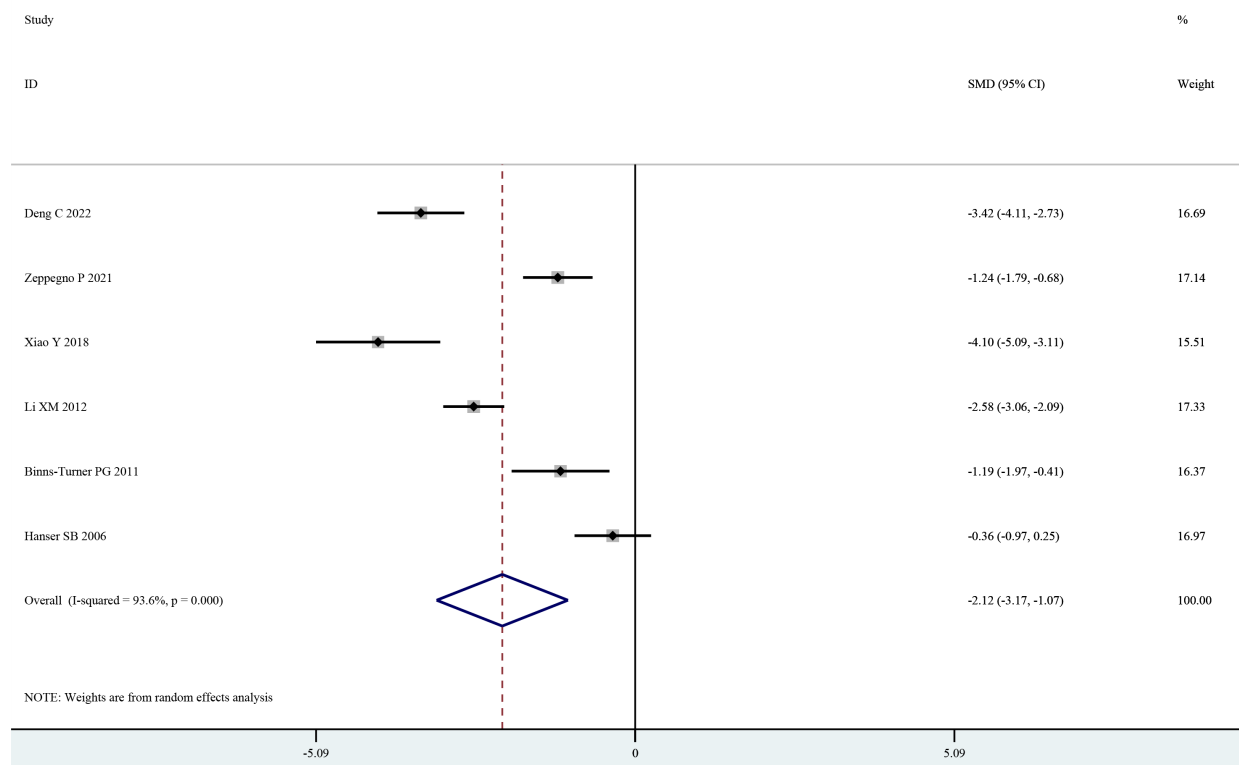
Fig. 3. Summary analysis of anxiety scores before and after the intervention of the experimental group (music intervention) and the control group (no music intervention). Note: SMD, standardized mean difference; CI, confidence interval.

Anxiety Difference

A total of three articles involving 91 patients with breast cancer (45 in the control group and 46 in the experimental group) reported the difference in anxiety scores between the control group and the experimental group before and after the intervention. The anxiety score difference before and after intervention was included in the meta-analysis. The pooled analysis showed no heterogeneity (I^2 = 0%, p = 0.548), and the fixed-effect model was selected. The results showed that the anxiety score difference before and after intervention in the experimental group (music intervention) was significantly higher than that in the control group (no music intervention) (SMD: –0.50, 95% CI: –0.92~–0.08), as shown in Fig. 4.

Depression Score

A total of 6 articles, including 313 patients (157 cases in the control group and 156 cases in the experimental group), reported post-intervention depression scores. The meta-analysis summary of post-intervention depression scores in the control group and the experimental group showed high heterogeneity among the 6 articles (I^2 = 87.3%, p < 0.001). The results showed that depression scores in the experimental group (music intervention) were significantly lower than those in the control group (no music intervention) (SMD: –0.77, 95% CI: –1.47~–0.07), suggesting that music intervention was more effective in alleviating depression symptoms in breast cancer patients than usual care or meditation, as shown in Fig. 5.

Pain Rating

A total of three studies involving 157 patients with breast cancer (77 in the control group and 80 in the experimental group) reported pain severity scores after the intervention. The pain degree scores of the control group and the intervention group were included in the meta-analysis. The heterogeneity test showed high heterogeneity (I^2 = 97.1%, p < 0.001), and the random-effects model was selected. Meta-analysis results showed that music intervention had a significant effect on pain relief in breast cancer patients (SMD: –3.47, 95% CI: –6.45~–0.48), as shown in Fig. 6.

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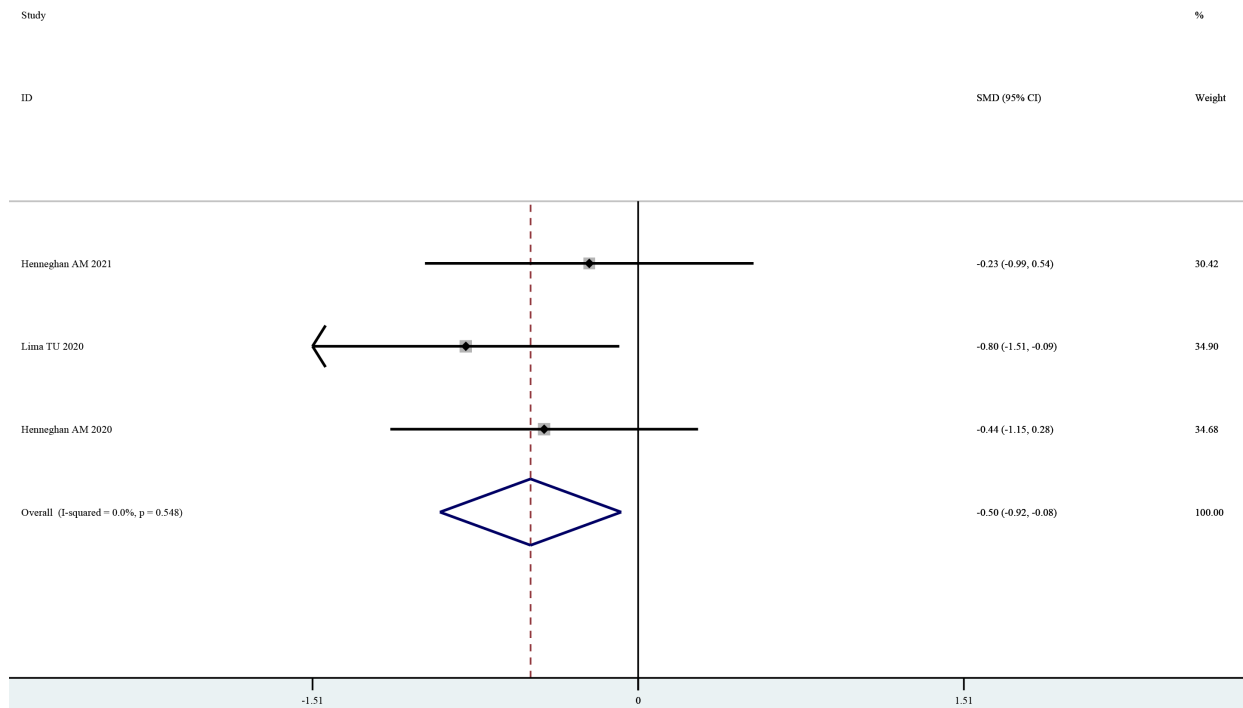
Fig. 4. Summary analysis of anxiety score difference between the experimental group (music intervention) and the control group (no music intervention) before and after the intervention.
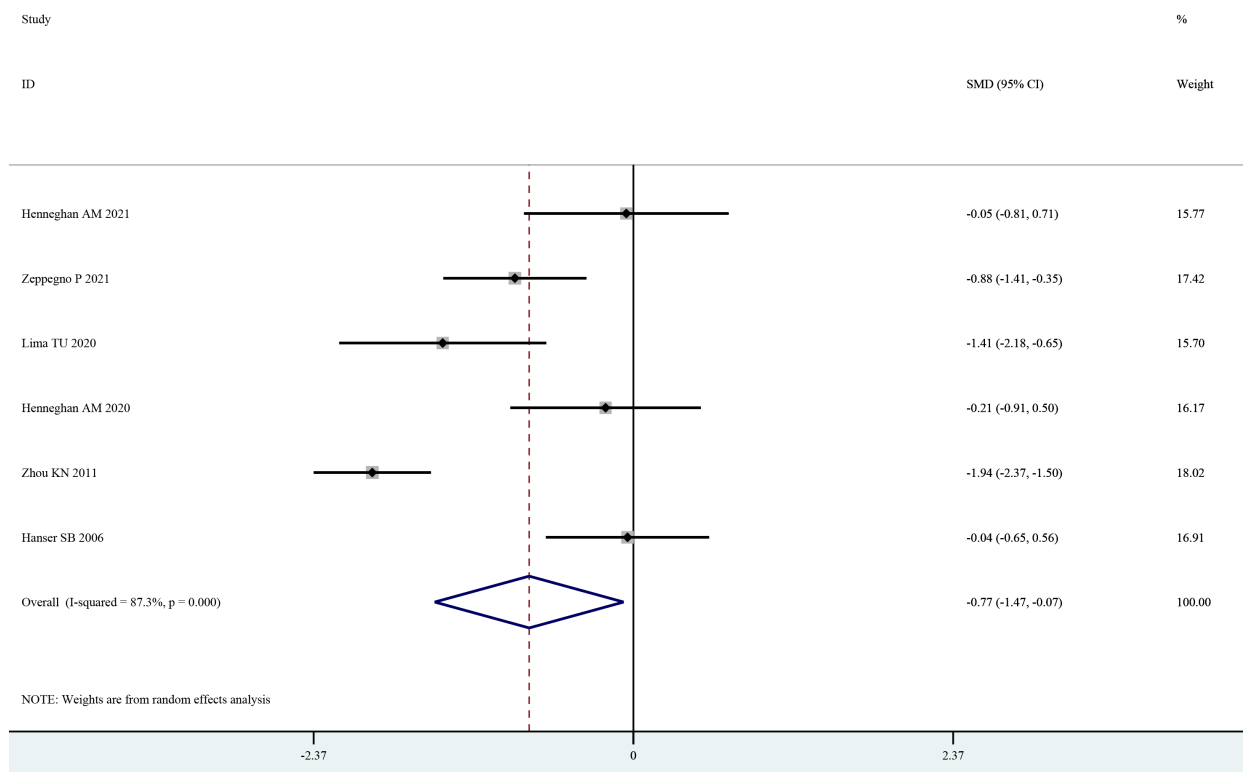

Fig. 5. Summary analysis of depression scores before and after intervention in the experimental group (music intervention) and the control group (no music intervention).
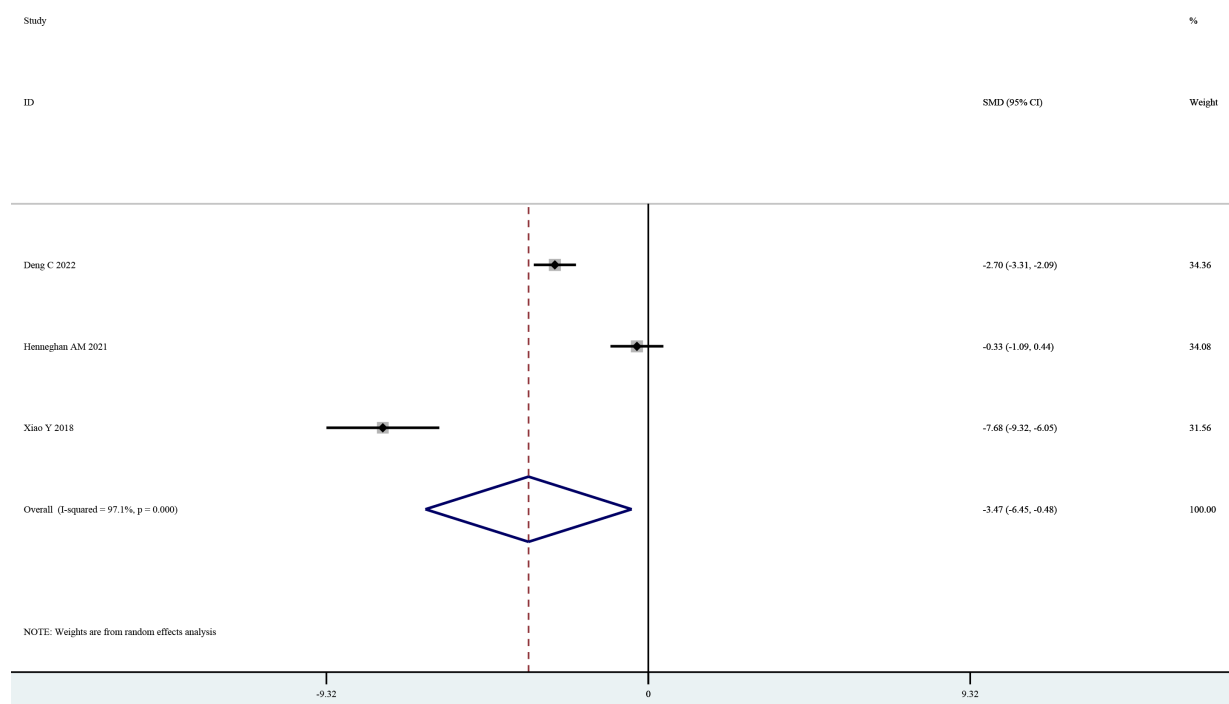
Fig. 6. Summary analysis of pain degree scores before and after intervention in the experimental group (music intervention) and the control group (no music intervention).

Quality of Life Score

A total of 3 articles involving 91 breast cancer patients (45 cases in the control group and 46 cases in the experimental group) analyzed the difference in life quality scores before and after intervention. The difference in life quality scores pre- and post-intervention between the control group and the experimental group was included in the meta-analysis, and the summary showed no heterogeneity (I^2 = 0%, p = 0.945). A fixed-effect model showed no significant difference between music intervention and meditation in improving quality of life in breast cancer patients (SMD: –0.07, 95% CI: –0.48~0.34), as shown in Fig. 7.

Discussion

Female malignant tumors, including those associated with breast cancer, are characterized by high incidence and mortality. With continuous economic development and changes in people's lifestyle and living environment, the incidence of breast cancer has increased compared with previous years [22]. At present, among breast cancer patients, most of them take comprehensive treatment based on surgery in clinic, but complications caused by surgery and adverse reactions in subsequent treatment seriously affect the psychological status and quality of life of patients [23].

Studies have pointed out that due to the increased fear of postoperative recurrence, some breast cancer patients will experience anxiety, depression, and other conditions before surgery, as a result, they will have symptoms such as increased blood pressure and accelerated heart rate during the operation, increasing the risk of anesthesia, even being life-threatening in severe cases [24,25]. Therefore, in the comprehensive treatment of breast cancer, clinicians have gradually added alternative medical therapy, which mainly refers to the process of patients receiving surgery, radiotherapy, and chemotherapy, and the development of appropriate intervention measures according to the physical and mental status of patients, so as to reduce the adverse emotions or adverse reactions of patients in the treatment process and improve the quality of life of patients [26,27].

Music therapy is one of the alternative medical therapies. It integrates medicine, music, psychology, special education, physics, and other disciplines, and is a borderline discipline [28]. At the same time, it is also a safe, economical, non-invasive, non-drug nursing intervention. Music therapy can have a great positive impact on patients' blood pressure, heart rate, and respiration, and it can mitigate patients' pain and pain generated during treatment by changing patients' cognition, emotion, and sensation; this, in turn, may improve patients' anxiety and depression symptoms and increase patients' quality of life [29–31]. Huang E *et*

Study

ID

SMD (95% CI)   Weight

Henneghan AM 2021   -0.02 (-0.78, 0.74)   29.47

Lima TU 2020   -0.16 (-0.85, 0.52)   36.31

Henneghan AM 2020   -0.01 (-0.72, 0.69)   34.22

Overall (I-squared = 0.0%, p = 0.945)   -0.07 (-0.48, 0.34)   100.00
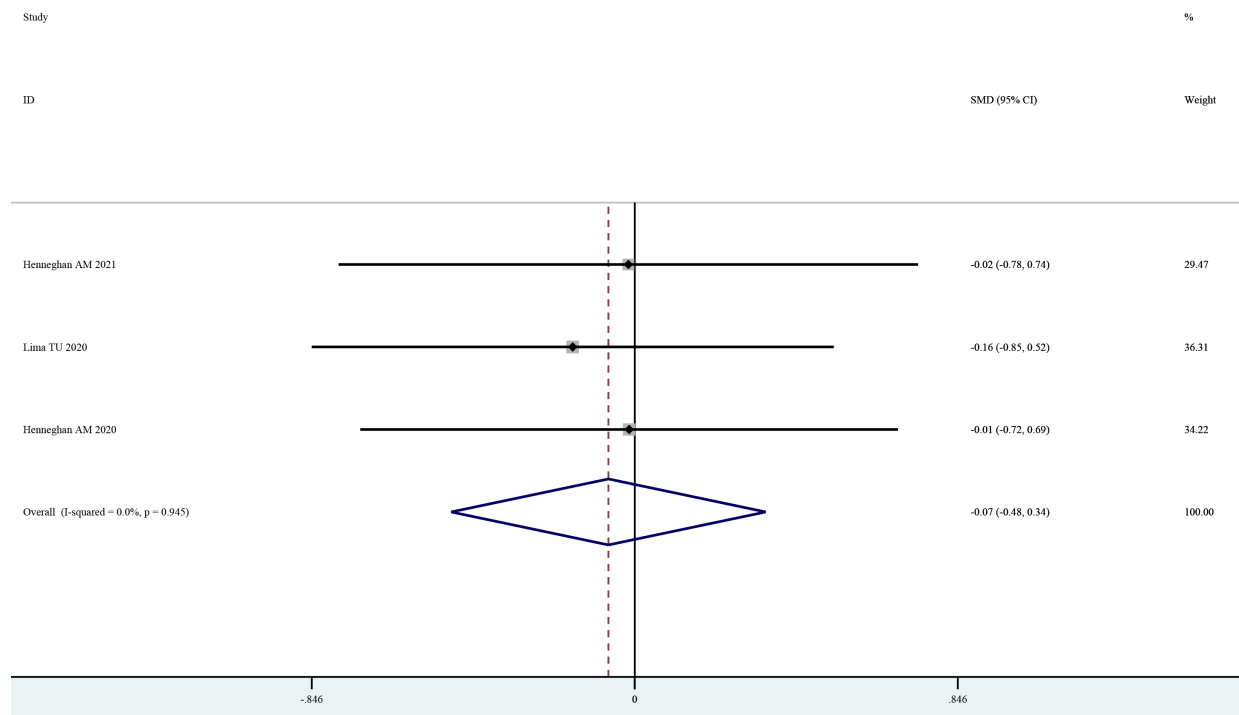
-.846   0   .846

Fig. 7. Summary analysis of the difference of life quality scores before and after intervention between the experimental group (music intervention) and the control group (no music intervention).

al.'s [32] study showed that music intervention in patients with colorectal cancer could improve their anxiety symptoms and relieve pain during treatment. Rennie C *et al.* [33] compared the effects of music therapy alone or combined with other cancer treatments on patients' physical and mental states, and the results showed that music therapy can have a positive impact on the physical and psychological aspects of cancer patients regardless of whether it is combined with other cancer treatments. The above research shows that music intervention is beneficial to the physical and mental state of some cancer patients. Based on the application of music therapy in many fields, Wang X *et al.* [9] systematically evaluated the effect of music therapy in breast cancer patients, and found that music intervention could improve patients' heart rate, blood pressure, and psychological status, but the study did not evaluate patients' quality of life or pain degree; moreover, the study is not recent. Although Ashour ASA *et al.*'s [34] meta-analysis reported that music intervention could reduce the anxiety symptoms of patients during breast biopsy, it was only for patients with breast biopsy, and the pain generated during biopsy was not alleviated. Based on this, the present study systematically evaluated the effects of music therapy on anxiety, depressive symptoms, quality of life, and pain degree of patients with breast cancer.

In this study, six articles reported the anxiety scores of breast cancer patients after music intervention. Through meta-analysis, the results showed that the anxiety scores of patients after music intervention were significantly lower (SMD = –2.12, 95% CI: –3.17~–1.07). Three articles reported the difference in anxiety scores before and after music intervention, and a meta-analysis of them found that patients who underwent music intervention had a significant reduction in anxiety scores after the intervention (SMD: –0.50, 95% CI: –0.92~–0.08). In this study, the reduction in depressive symptoms in breast cancer patients who received music intervention was significantly greater than in those who did not receive music intervention (SMD: –0.77, 95% CI: –1.47~–0.07). These results are consistent with the research conclusions of Eseadi C *et al.* [35], suggesting that the anxiety and depression symptoms of breast cancer patients can be alleviated by music intervention. Hsieh FC *et al.*'s [36] study showed that music intervention could reduce patients' pain degree. The randomized controlled trial conducted by Deng C *et al.* [12] also showed that music therapy in perioperative breast cancer patients could reduce the degree of pain. In the present study, we found that breast cancer patients who received music therapy had better pain relief than those who received usual care or meditation (SMD: –3.47, 95% CI: –6.45~–0.48). The main reason is that music therapy can alter the autonomic nervous

response of the thalamus, relax the tense muscles, and reduce sympathetic nervous activity; At the same time, it can also cause the pituitary to release β-endorphin, arouse the patient's sense of pleasure, reduce the patient's sense of pain, improve the patient's psychological feelings, and reduce the symptoms of anxiety and depression. However, there was no significant difference in the improvement of the quality of life of breast cancer patients who received music intervention in this study compared with those who did not receive music intervention (SMD: –0.07, 95% CI: –0.48~0.34), which is consistent with the conclusions of Lima TU *et al.* [15]. This may be due to the fact that both groups of patients received routine nursing intervention, while patients who did not receive music intervention may have received other therapies on the basis of routine nursing, and these therapies can also improve the anxiety and depression symptoms of patients, resulting in no significant difference in the quality of life of patients who received music intervention and those who did not receive music intervention. However, Rodriguez-Wolfe M *et al.* [37] believed that routine care combined with musical intervention for breast cancer patients could improve the quality of life of patients. Future studies should investigate this possibility.

This study also has some limitations: (1) The sample size of some trials included in this study is small; (2) The follow-up time of the included studies is inconsistent; (3) Some results of this study have high heterogeneity; although the random-effects model is used for them, it may still have an impact on the research results; (4) Tsai HF *et al.*'s [38] study pointed out that the effect of music intervention on patients is related to age, but the present study did not conduct subgroup analysis on the age of patients, which may have impacted the result.

Conclusion

In conclusion, music intervention can reduce anxiety and depression symptoms of breast cancer patients, reduce the pain of patients, and may improve the quality of life of patients.

Availability of Data and Materials

The data used to support the findings of this study are available from the corresponding author upon request.

Author Contributions

RR and WPZ designed the research study. YYY and RR performed the research. WPZ analyzed the data. All authors contributed to editorial changes in the manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

Not applicable.

Acknowledgment

Not applicable.

Funding

Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://actaspsiquiatria.es/index.php/actas/article/view/1549.

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