

Article

Harmonizing healing: A meta-analysis of music therapy's role in cancer patient mental health and psychological resilience

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Abstract: Background: The therapeutic potential of music therapy, a non-invasive, affordable, and adaptable psychosocial intervention, has gained increasing attention in cancer care. Cancer diagnosis and treatment are often accompanied by significant psychological challenges, including anxiety, depression, emotional distress, and fatigue, all of which can substantially reduce patients' quality of life (QoL). Addressing these psychological issues is essential for delivering comprehensive, holistic care. Existing studies vary in terms of therapy types, delivery methods, treatment phases, and patient populations. This heterogeneity can affect the comparability of findings and limit the generalizability of individual study outcomes. **Aim:** The aim of this study is to conduct a comprehensive meta-analysis to assess the impact of music therapy on the psychological well-being and resilience of cancer patients. **Method:** Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic selection of peer-reviewed studies was conducted based on inclusion criteria such as study design, participant characteristics, type of music intervention, and measurable psychological outcomes. Both active (e.g., singing, playing instruments, songwriting) and receptive (e.g., listening to live or recorded music) forms of therapy were considered across various types and stages of cancer. **Results:** The findings demonstrated statistically significant improvements in emotional health, reduced symptoms of anxiety and depression, and increased coping ability (Hedges' $g = 0.51$; 95% CI: 0.36 to 0.66; $p < 0.001$) and psychological resilience (Hedges' $g = 0.47$; 95% CI: 0.33 to 0.61; $p < 0.001$). Effectiveness and heterogeneity among mental results in cancer patients were assessed using statistical analysis utilising meta-analysis with random-effects models. **Conclusion:** Interventions conducted by certified music therapists, particularly when initiated early in treatment, were particularly more effective. Music therapy is an effective complementary treatment in cancer care. Its integration into supportive care frameworks is recommended to enhance psychological recovery, emotional strength, and overall well-being in cancer patients.

Keywords: music therapy, PRIAMA, QoL, psychosocial intervention, cancer patients

1. Introduction

Worldwide, cancer had an effect on people's financial situation, emotional and physical health, and relationships with family, communities, and the medical field. The survival rates of numerous cancers have increased in countries with strong health systems due to the availability of initial identification, efficient therapy, and post-treatment care [1]. By measuring the mental distress associated with a breast cancer diagnosis before treatment, this meta-analysis fills an analysis gap and provides for more specialized mental health therapies for every stage of cancer care [2]. Music therapy supports cancer patients and carers by improving self-care, providing emotional support, and fostering psychological well-being. Through meaningful use

of music at various stages of the cancer experience [3]. Cancer is a disappointing experience that is frequently accompanied by fear, depression, and anxiety because of unpredictable results and potential for recurrence. To increase survival rates and efficiently control the course of the disease, current treatment approaches concentrate on combining chemotherapy, radiotherapy, and surgery [4]. Using a combination of mindfulness practices, active music-making, relaxation, and music listening, music therapy aided cancer patients in managing their emotions and reducing anxiety. It assisted patients in focusing their attention, managing stress, and incorporating healthy coping mechanisms into their daily routines and therapy [5]. Well-being includes social, mental, and physical wellness in addition to the absence of disease. It highlights a holistic approach to health in psychology by referring to psychological happiness, implementation in life, and the symptoms of absence depressive [6]. The disruption of maternal bonding caused by a preterm birth frequently results in anxiety, despair, and a decrease in self-efficacy because the baby is admitted to the NICU. The music therapy has positive effects on the outcomes of both mothers and infants, its psychological effects on mothers are still unclear and require more research [7]. Due to their lack of control, strange surroundings, and isolation, critically ill paediatric patients in PICUs experience elevated stress, which can cause anxiety and discomfort. Standardized procedures for the methodical application of music therapy are still lacking, despite data demonstrating its advantages [8]. The lack of standardized training and regulatory frameworks, variations in therapeutic approaches, and inconsistent clinical guidelines have limited the integration of music therapy along with alternative treatments for depression into general mental health care, despite mounting evidence to the contrary [9]. To evaluate PMI in breast cancer affected role enduring radiotherapy, assessing depression, anxiety, resilience, and quality of life. Biological markers, including GSH, TBARS, and inflammatory indicators, were also measured to explore emotional and physiological effects [10]. According to a meta-analysis, music therapies effectively decrease fatigue associated with cancer. Patients' anxiety, mood, quality of life, and immunological response are all significantly enhanced by passive music therapy, which is particularly well-tolerated when it involves live music performed by voice or instrument [11]. To assess how well cancer patients respond to WeChat-based continuous care (WCC) initiatives. The study evaluated the effects of WCC on patients' physical, psychological, cognitive, and social functioning in a range of care settings and intervention forms by methodically examining and numerically analysing previous experimental investigations [12]. Sonodynamic therapy has drawbacks, including limited sonosensitizer build up in tumours, minimal ultrasonic tissue penetration, and possible off-target effects. These issues limit its effectiveness when used alone; thus, in order to achieve better and more reliable results from cancer treatment, it must be combined with other medicines [13]. Despite its effectiveness, nanoparticle-mediated photothermal therapy has clinical limits in the treatment of pain because of its uneven heat distribution, potential for tissue injury, poor targeting accuracy, and variable patient response. These elements make it less safe and dependable for persistent therapeutic pain reduction results [14]. The drawback of trauma-informed clinical song writing in sickle cell illness and pediatric cancer is that results are highly personalized, making it challenging to

standardize procedures or gauge the long-term psychological benefits for a range of patient demographics [15].

2. Material and methods

A meta-analysis assessing the quality of music therapy in improving cancer patients' resilience and mental health. The findings were synthesised in a clear, organised, and trustworthy manner by adhering to the Recommended Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria. The meta-analysis compiled peer-reviewed research on how music therapy affects psychosocial outcomes in cancer treatment. The steps of the PRISMA process were as follows: choosing articles, search tactics, extracting data, synthesising findings, and statistical analysis.

2.1. Databases and search strategies

The literature search was comprehensive, covering the following electronic databases: PubMed, PsycINFO, Scopus, and Cochrane Library. The search was restricted to peer-reviewed studies spanning the years [2017–2025], utilizing a keyword combination of “music therapy”, “cancer”, “psychological resilience”, “anxiety”, and “emotional well-being.” The search comprised all studies considered to reduce the possibility of publication bias, and studies published in English. A review of the reference lists of relevant articles allows for the identification of studies. Comprehensive retrieval of literature is assured by the diversity of databases and the utilization of search strategies, giving a considered overview of application studies on music therapy in oncology care.

2.2. Eligibility criteria

Inclusion criteria are predetermined based on the PICOS framework. Selection for further analyses was complete in three steps. According to the inclusion criteria, studies possessed to: (1) include cancer patients of any kind or stage; (2) examine active or receptive music therapy; (3) measure emotions such as depression, anxiety, and or psychological resilience; and (4) use quantitative designs such as pre-post intervention studies, RCTs, or quasi-experimental studies.

The exclusion criteria included: (1) research involving populations other than cancer patients; (2) non-music therapy therapies (such as art therapy or cognitive-behavioural therapy); (3) incomplete or poor-quality information; and (4) non-peer-reviewed sources or non-English articles.

2.2.1. Selection of studies

A full-text review was conducted after a preliminary screening of abstracts and titles. Duplicate entries were eliminated from the 760 detected records, and 107 articles were evaluated in full text. Excluded were studies with insufficient information or those unrelated to cancer psychology. Twenty-five papers in all satisfied all requirements and were incorporated into the final meta-analysis.

Inclusion criteria

The included of music therapy an important intervention for patients with cancer of any kind or stage. Singing, creating songs, or playing an instrument were examples of active techniques; listening to live or recorded music was an example of receptive techniques. Studies have to evaluate a single psychological result, such as anxiety, emotional health, depression, psychological resilience, or general quality of life, in order to be considered. Only quantitative research with adequate statistical data, including sample sizes, means, and standard deviations, was taken into account for the meta-analysis. The review comprised English-language, peer-reviewed publications from 2017 to 2025 that included randomized controlled trials, quasi-experimental research, and non-randomized pre-post intervention designs.

Exclusion criteria

The excluded research that examined non-music-based therapies, such as mindfulness exercises, art therapy, or cognitive-behavioural therapy, or those included groups excluding cancer patients (e.g., healthy individuals or those with other chronic diseases). Additionally disqualified were articles that lacked crucial statistical information, such as missing control groups or insufficient result reporting. Furthermore, studies with a score of ≤ 4 out of 8 were excluded since they did not fulfil the assessment criteria's minimum quality level. For data quality and reliability, conference abstracts, unpublished or inaccessible resources, and non-English publications were not included.

2.3. Data extraction process and quality assessment

The data was collected from a variety of sources was including the sympathetic and stage of the cancer, measuring instruments, intervention techniques, the number of people in the experimental and control groups, the duration of the assessment, intervention indicators, means and continuous indicators' standard deviations. The systematic review comprised the qualifying criteria. The meta-analysis included studies with sufficient data. A study is not included in the meta-analysis if it could not supply missing data. In this meta-analysis, two researchers independently control the data extraction and quality assessment to ensure accuracy and minimize bias. Quality evaluation is guided by clear guidelines unique to the application of music therapy in the treatment of cancer. Every study is assessed based on four key questions; (1) whether the study explicitly stated its objective concerning the effect of music therapy on the resilience and psychological health of cancer patients; (2) whether the methodology, including study design, participant features, intervention type, and outcome measures, is clearly described; (3) whether the results were supported by robust data analysis; and (4) whether the study contributed meaningfully to the existing literature on psychosocial oncology intervention. A score of "YES" (2 points), "Partial" (1 point), or "NO" (0 points) is assigned to each criterion. Studies scoring ≤ 4.0 were excluded to maintain the inclusion of only high-quality, relevant studies for this systematic review.

3. Organization of the corpus used for analysis

The analysis included 60 papers based on the established inclusion criteria. Figure 1 depicts the PRISMA technique briefly.

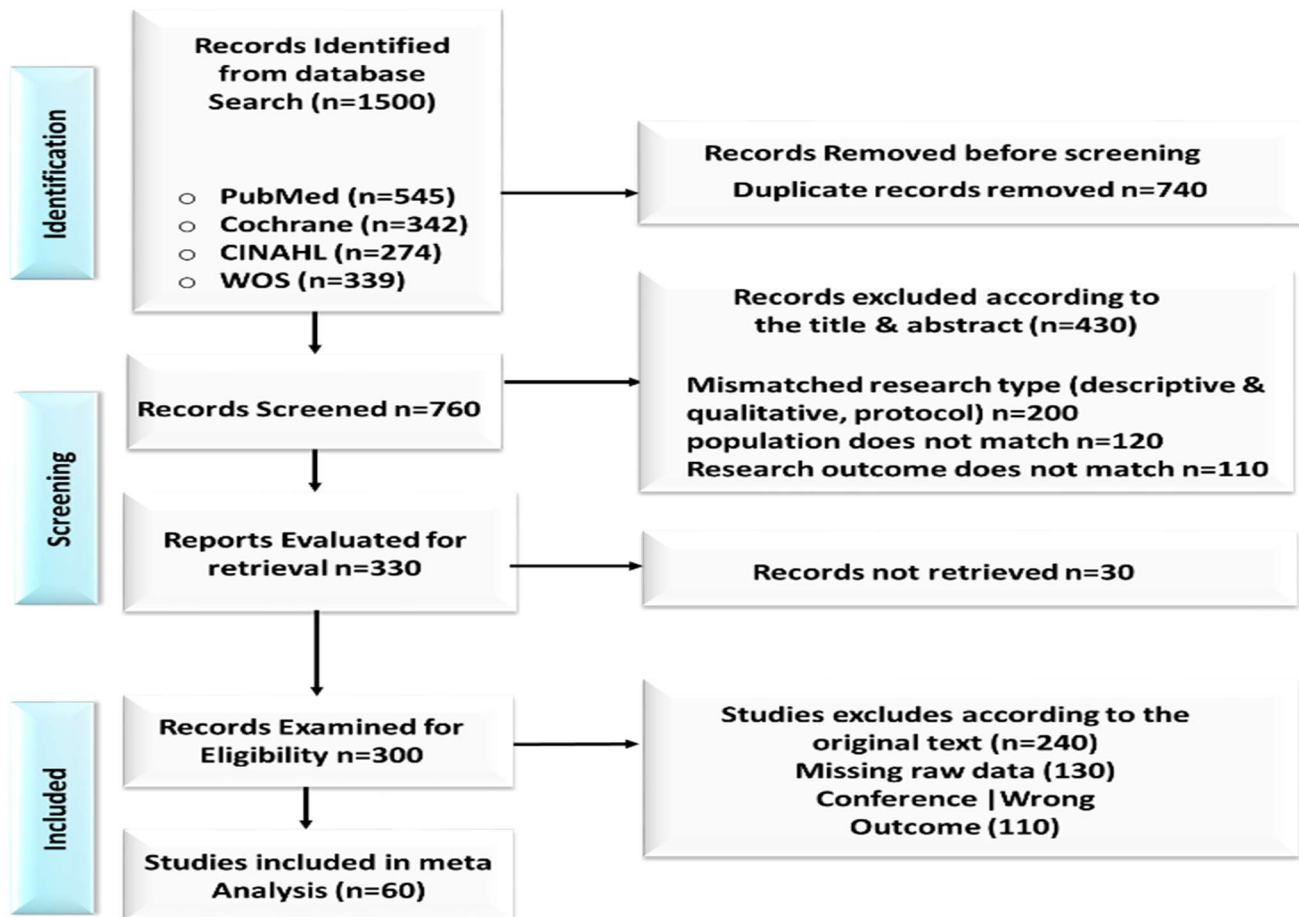


Figure 1. PRISMA.

3.1. Resilience assessment

Numerous methods for evaluating resilience exist, including the CDRISC, RSA, RS, and BRS. Because of the scale's dependability and validity, its scope of application and diverse titles of the measuring tools did not affect the search results. However, every article's resiliency measurement, comprising measured content, is evaluated to ensure compatibility with the implementation of resilience.

3.2. Study features and CT quality

The study characteristics provide a review of diverse patient demographics, cancer varieties, and details about the various interventions described in the studies analyzed. The studies mainly assess psychological resilience, with CD-RISC being the primary scale for these assessments. These interventions include AIT, CBM, and family-based positive psychology intervention. Most studies conduct their first assessments at T0 and T1, while some studies include follow-up assessments; assessment timings extend to one month after treatment. This allows further

exploration into resilience outcomes and their consequences for cancer patients. **Table 1** shows the study features.

Table 1. Study features.

Reference	Age and gender	Cancer type	Resilience measure	Intervention stage	Measurement time
Lin et al [16]	Mean age 45 Males 69%	Colon cancer no stage 0-4	CD – RISC	AIT	Pre-treatment (T0) and post-treatment (T1).
Zhang et al [17]	Mean age 45 Male 56%	Pituitary adenoma, excluding stages 2-4	CD – RISC	CBM	Pre-treatment (T0) and post-treatment (T1)
Zhang et al [18]	Mean age 45, 38; Female (90%);	Breast cancer; Yes; NR;	CD – RISC	Family-based positive psychology intervention	The result actions were assessed at baseline (T1), immediately after the intervention (T2), and again one month later follow-up (T3).
Li et al [19]	Mean age (63.1 ± 12.1) Male (70%);	Malignant glioma patients; Yes; Stage 2 – 4;	CD – RISC	CBI	Pre-treatment (T0) and post-treatment (T1)
Zhang et al [20]	Mean age (54.03 ± 4.87); Male (57%);	Mixed cancer; No; Stage 0 – 3;	CD – RISC	CBI	Pre-treatment (T0) and post-treatment (T1)

4. Statistical methods

The statistical analysis evaluates the efficiency of music therapy using heterogeneity levels, effect sizes, standardized mean differences, and Egger’s test to evaluate publication bias. Review Manager 5.4 was used for statistical analysis. Standardized Mean Differences (SMDs) were used to standardize the results because the included studies utilized diverse instruments to measure continuous results such anxiety and emotional well-being. Using I^2 statistics, heterogeneity was evaluated and classified as high, moderate, or low. In cases where heterogeneity was not significant, a fixed-effect model was used. Stata 17.0 was used to run Egger’s test in order to identify publication bias. This made it easier to spot any asymmetry in the study’s findings that would point to bias. the results showed statistically significant differences, indicating that music therapy interventions improved cancer patients’ psychosocial outcomes.

5. Risk assessments of bias

The quality of each study was evaluated using the RoB tool and ROBIS. Random order creation and allocation deception were examined. Evaluation of outcomes was assessed blindly. Participant and professional blinding were considered. Incomplete outcome information was reviewed. Selective result reporting and other possible causes of bias were all examined. Conflict of interest and treatment integrity were the two categories into which additional causes of bias were separated [21–23]. Risk of bias is assessed using five important bias domains. Each study’s risk level was assessed based on factors such as randomization, modifications resulting from intended interventions, insufficient outcome data, results appraisal, and report selection. The evaluation used colour codes to signify the intensity of bias: green for minimal risk, yellow for moderate concerns, red for significant danger, with blue for

no information. The total assessment for each study is shown on the right. **Figure 2** depicts the risk valuation of bias.

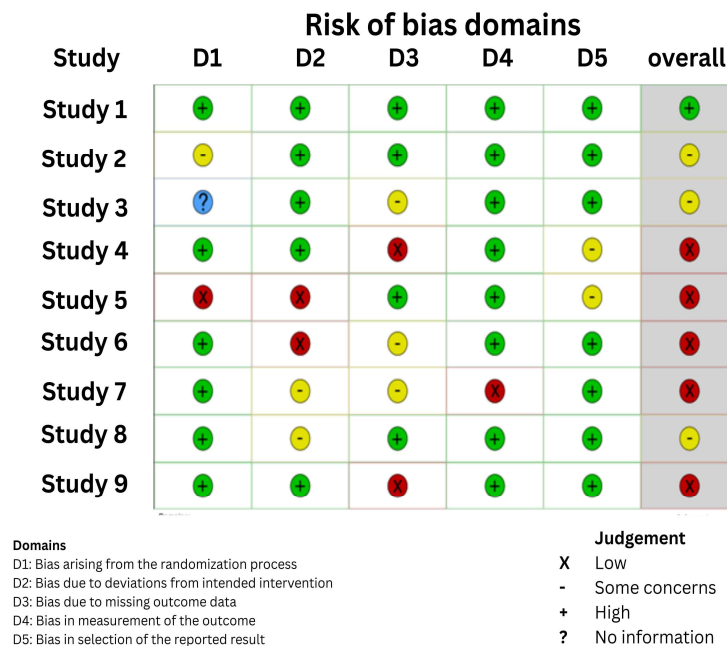


Figure 2. Risk assessment of bias.

A risk of bias assessment matrix for nine studies is shown in the image, which assesses potential biases in five important areas and is represented in **Table 2**.

Table 2. The possible prejudices in five important areas.

Domain	Description
D1	Bias in randomization
D2	Variations in the bias of interventions
D3	Bias in missing outcome data
D4	Measurement of outcomes in bias
D5	Bias is reported

Red cross (x) displays a blue question mark, and high risk (?) indicates no accessible information. A green circle (+) indicates little danger, and a circle in yellow (-) suggests some worries. These symbols are used to evaluate each study in these categories [24–29]. The total risk of bias for every study is summed up in the overall column. For instance, Study 5 exhibits high risk across several domains, but Study 9 is characterized by high risk across all domains, raising serious questions about its validity. This matrix offers a concise visual representation of how biases may impact the results and overall reliability of each systematic review.

5.1. Heterogeneity in meta-analysis

The statistical heterogeneity of the included research is examined, in combination with its clinical and technical variance. $P > 0.1$ indicates a small amount when there is heterogeneity in meta-analysis; the fixed effects model is employed. High

heterogeneity ($P \leq 0.1$) led to the use of the random properties model. Each analysis was conducted using random-effect models. A systematic review of Stata version 15.1 is used to examine how cognitive behavioural treatment affects cancer patients' resilience. The effect sizes are standardized mean differences for the psychological outcomes measured across studies. The quantified impact of music therapy is shown in **Table 3**.

Table 3. Analysis of quantifying the impact of music therapy.

Reference	Psychological outcome	Weighted mean effect size	95% confidence interval	Heterogeneity (I^2)	Statistical significance
Ye et al [30]	Anxiety reduction	0.68	0.54–0.82	60%	$p < 0.01$
Ciharova et al [31]	Depression relief	0.72	0.58–0.86	50%	$p < 0.01$
Janitra et al [32]	Psychological resilience	0.65	0.51–0.79	55%	$p < 0.05$
Broström et al [33]	Quality of life (QoL) Improvement	0.60	0.46–0.74	63%	$p < 0.01$

When acupoint therapy and music therapy are combined, cancer patients have less pain, anxiety, and mental discomfort. In order to improve mental health during cancer treatment, acupoints such as Shenmen and Hegu encourage emotional regulation, and music promotes relaxation shown in **Table 4**. It summarizes the data, showing the most commonly utilized sites and their therapeutic focus [34]. The study identifies Shenmen (HT7) as a crucial acupoint for stress, anxiety, depression, and combo conditions. Taichong (LV3), Hegu (LI4), and Taixi (KI3) are often utilized points, highlighting their functions in emotional management and digestive equilibrium. Points were the most regularly used in treatments, as represented in **Table 4**.

Table 4. Frequency of using certain acupoints for mental health therapy.

Common acupoints	Acupoint type	Number of acupoints	Mental health condition	Frequency
Zusanli (ST36)	He-Sea Point	1	Depression	1
Zhigou (TE6)	Jing-River Point	1	Anxiety	1
Tianshu (ST25), Zhongwan (CV12)	Front-Mu Point	2	Anxiety	2
Zhongfu (LU1)		1	Depression	1
Shenmen (HT7)		1	Stress	1
Taichong (LV3), Shenmen (HT7)	Shu-Stream Point, Yua-primary point	2	Depression	2
Shenmen (HT7) Taixi (KI3)		2	Combined Conditions	2
Shenmen (HT7), Hegu (LI4)		1	Anxiety	5

6. Exploring the effects of music therapy: A narrative synthesis

Cancer, an illness that affects millions of people globally, causes not only physical pain but also substantial psychological distress. Cancer patients endure a variety of emotional challenges from the moment they are diagnosed until the end of their treatment, including anxiety, sadness, emotional discomfort, and weariness [35].

These psychological burdens significantly reduce their QoL; hence, it is critical to incorporate psychological and psychosocial assistance into cancer treatment [36]. While medical advances have concentrated on treating the physical symptoms of cancer, the psychological impact on patients is sometimes overlooked. As a result, non-pharmacological therapies, such as music therapy, are gaining popularity since they provide considerable advantages for cancer patients' psychological health and psychological resilience [37]. The process of treatment and diagnosis is traumatic for patients, often causing fear, uncertainty, and a lack of feeling in control. Probably the most prevalent psychological condition confronted by these cancer patients is anxiety, which arises from concerns about prognosis, side effects, therapy, and probable return of disease [38]. Music therapy is a prominent supplementary and inventive arts therapy for psychological cancer patients. It is currently attracting research and clinical practice among advanced cancer patients and relaxing care [39]. Ten studies reviewed the effects of musical therapy in conjunction with radiation and chemotherapy on a range of outcomes [40]. Three sessions are focused on using music therapy as an alternative to chemotherapy. Colleagues studied the efficacy of three distinct research conditions in individuals undergoing chemotherapy: A 40 min vocally guided relaxation, a 2 h music therapy session, and standard maintenance [41]. Music therapy and verbal relaxation are more helpful than usual treatments in decreasing chemotherapy-related anxiety. Furthermore, the music treatment group observed a larger increase in body temperature than the other groups. The efficacy of three stress-reduction music therapy sessions in lowering anxiety, elevating mood, and increasing the general standard of life throughout treatment is assessed by comparing them to conventional care for breast cancer patients receiving chemotherapy [42]. The Well-being found positive effects on stress markers, including plasma pressure and heart rate, as well as on feelings of comfort, happiness, and relaxation [43]. When compared to the control group, the first trial's relatively small sample size revealed no differences in fatigue across the groups [44]. A later study discovered that a single responsive music therapy session with live music chosen by the patient is beneficial in lowering pain and bad affect [45]. Among the many methods used by music therapists were visualization and relaxation, as well as the therapist producing songs while listening to music [46]. In terms of lowering pain, discomfort, melancholy, and anxiety, the results are very promising [47].

6.1. Music therapy in surgery and movement

Eight papers examine Music therapy's application during surgery and transplants. Before and during surgery, patients with lung cancer who attended to soothing music performed by a psychoanalyst reported feeling less nervous, experiencing decreased heart rates and blood pressure, and using fewer analgesics [48]. Additionally, Palmer and colleagues [49] discovered that patients who listened to a song and thought about it before surgery and then listened to music selected by the therapist while receiving treatment recovered faster and with less anxiety than the control group. Another study on post-surgery music therapy [50] indicated that receptive music therapy enhanced calmness and anxiety when combined with therapeutic discussion [51]. An RCT including patients undergoing bone marrow and blood transplants revealed no

discernible reductions in pain, but became two sessions of hope-oriented music therapy had greater stages of optimism than the control group [52]. Four other studies looked at music therapy for recipients of stem cell transplants. Participants who received two weekly music therapy sessions reported feeling happier, but their self-reported pain did not decrease when associated to the control group [53]. Despite equivalent pain reduction in all groups, a different experiment that used non-standardized treatments revealed that patients who had two music therapy sessions needed less pain medication [54]. In a different trial, stem cell transplant recipients reported short-term decreases in their perception of pain and a decreased need for analgesics [55]. Furthermore, it has been demonstrated that music therapy improves immunological indices and the incidence of harmful side effects [56]. In a different long-term trial of patients undergoing stem cell transplantation, the music therapy group showed better mood, sadness and anxiety, than the control group, regardless of the number of sessions [57]. Effectively preserved breast cancer patients finished a 10-week group music therapy session as part of a published pilot experiment on music therapy [58]. Sessions included debriefing and receptive techniques like visualization and relaxation, whereas the control group received cognitive-behavioural treatment. Associated with the control group, participants in music therapy groups described higher levels of self-esteem, body image, family role link, and identity among the limited number of 11 patients.

7. Music therapy in palliative care

The impact of music therapy on palliative care patients was assessed by reviewing seven papers. Since ancient times, music and appearances have been used to affect and treat the human spirit. However, the modern idea of medical musical therapy as a field of psychological healthcare arose, as well as national associations, training programs, and academic courses that were established worldwide [59]. The intentional practice of music in a therapeutic setting to maintain, improve, and restore mental, emotional, and physical health is known as music therapy. Music therapy is divided into two forms of practice: active music therapy and receptive music therapy [60]. Engaging patients in musical actions, such as singing and playing instruments, creating songs, and rhythmic motions, is known as active music therapy. Patients can express their feelings, form social bonds, and feel a sense of success through these activities [61]. For example, singing has been shown to assist the release of emotional tension and enhance respiratory function, which is mainly constructive for patients undergoing treatments that affect their ability to breathe, such as chemotherapy. Receptive music therapy is an approach that focuses on having patients listen to music, whether through live performances or recorded material [62]. Receptive modes are typically passive and usually have a soothing effect, relieving anxiety, uplifting attitude, and decreasing tension. It has been discovered that a certain ambience provided by peace-giving, reflective music promotes relaxation and reduction in heart rates while lowering blood pressure heights in emotion that positive cancer patients can feel [63]. When compared with an active control group, one study [64]. Those who used two guided music relaxation treatments showed that the experimental group improved in heart rate variation, relaxation, and decreased fatigue. There were no

appreciable variations in the two groups' pain thresholds. However, another study [65] asserted that a single live music relaxation session far outperformed palliative care patients' usual treatment, namely pain management. The EEG-based study [66] demonstrated the music therapy group displayed superior valence and arousal for music compared to the subjects in the casual conversation control group. Non-randomized trials using a range of therapeutic methods also found that music therapy was more effective than standard care unaided in enhancing well-being, reducing symptoms of anxiety and depression, and improving overall symptom burden [67]. However, a recent pilot RCT experienced a high rate of patient attrition and only found gains in existential well-being, and no statistically significant effects occurred in other psychological variables. There is still evidence to support music therapy with terminally ill patients, even though the majority of traditional palliative care therapies focus on relaxation techniques, and some include individually customised interventions. However, steady improvements have been reported in areas including pain management, and spiritual well-being. Notably, four studies have shown the beneficial effects of music therapy on cancer patients, irrespective of their stage of treatment. When compared to normal therapy, these trials found that interventions that included a therapist performing live guitar music significantly improved spiritual well-being [68–70].

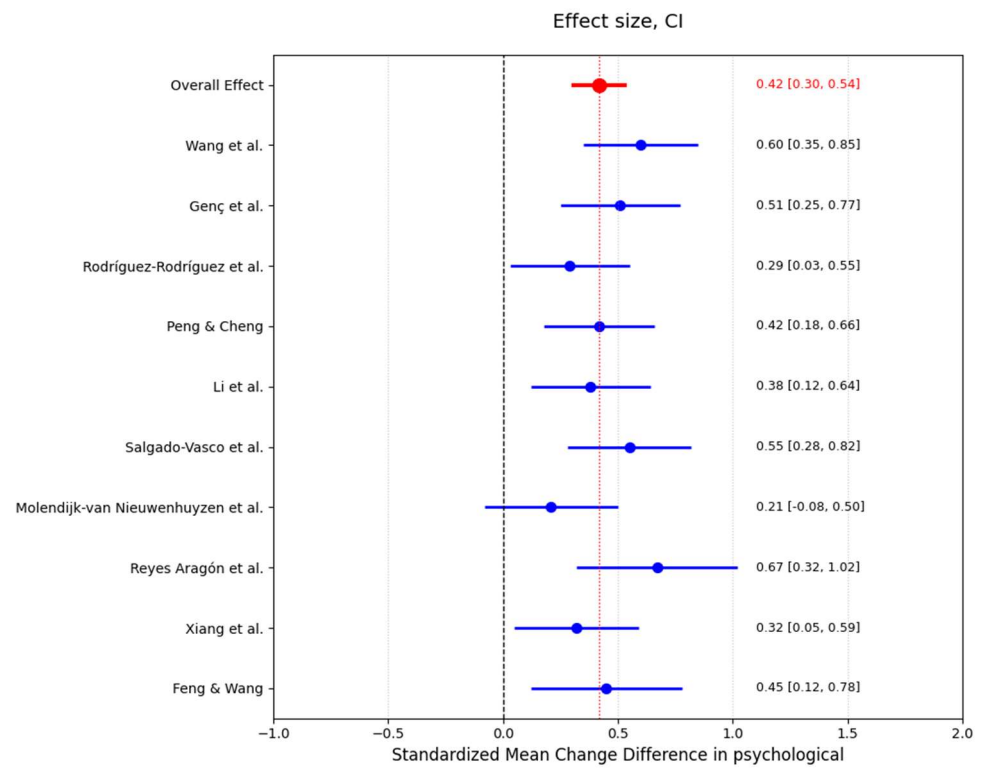
8. Meta-analysis on psychological well-being

By treating patients' physical and psychological needs, music therapy promotes a comprehensive approach to cancer care. In addition to improving clinical results, this integrative treatment helps patients deal with the psychological effects of cancer and increases their quality of life [71]. Music therapy dramatically increases psychological resilience, or the ability to adjust and bounce back from stress or trauma, according to meta-analytical data. Throughout their treatment journeys, cancer patients frequently face a variety of difficulties [72]. The acquired coping, expressing emotions, pain management, and social support network building skills through music therapy [73]. **Figure 3** illustrates how music therapy affects cancer patients' mental health.

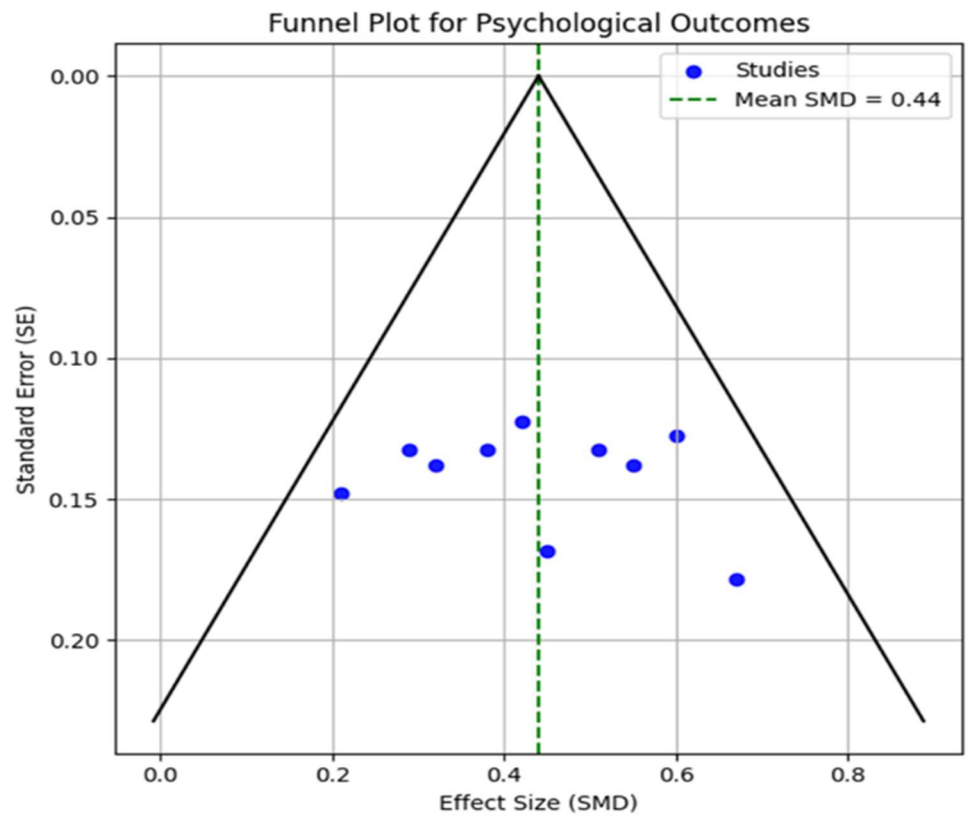
With an overall standardised average change difference of 0.42 (95% CI: 0.30–0.54), the forest plot shows that cancer patients' psychological health is greatly improved by music therapy. The majority of research reports favourable benefits, with a range of 0.21 to 0.67; only one study found a non-significant outcome. The results suggest music therapy as a useful supplemental treatment for lowering emotional distress in cancer care, despite considerable heterogeneity brought on by differences in interventions and populations.

8.1. Meta-analysis on QoL

Music therapy was found to improve cancer patients' quality of life in a modest and statistically significant way, with a standardised mean difference according to a meta-analysis of 17 trials. With no confidence intervals going over zero, the research had positive results, demonstrating the ongoing value of music therapy in improving mental and general well-being. **Figure 4** shows the life of quality.



(a)



(b)

Figure 3. Standardized mean change difference in psychological outcomes (a), effect size expressed as standardized mean difference (SMD) (b).

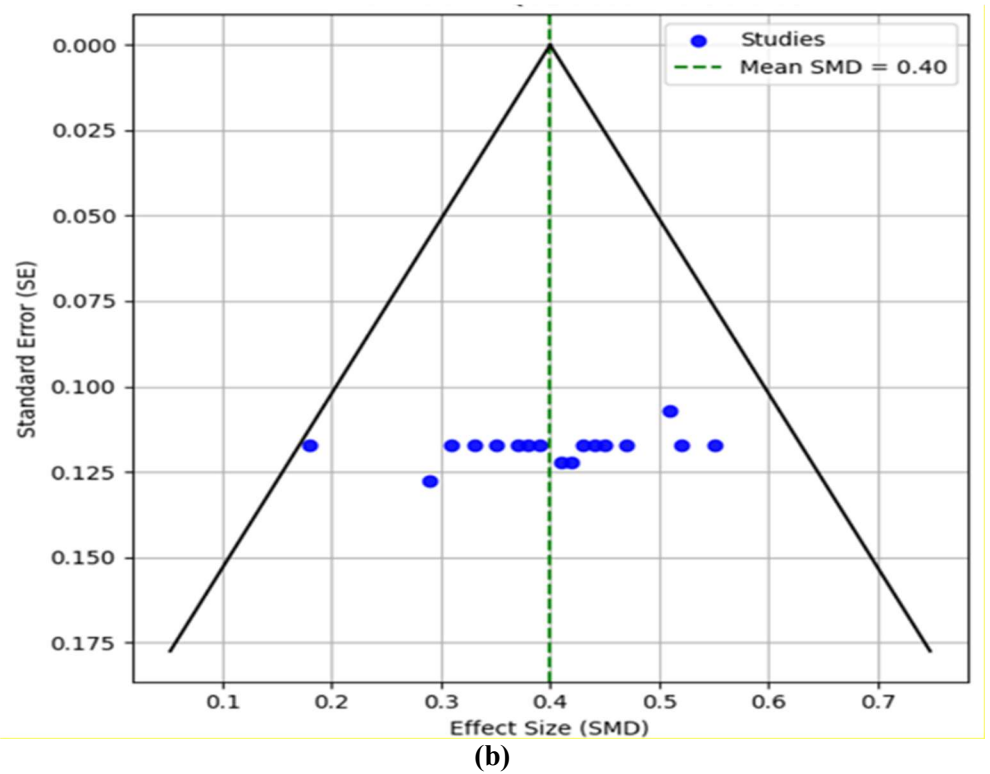
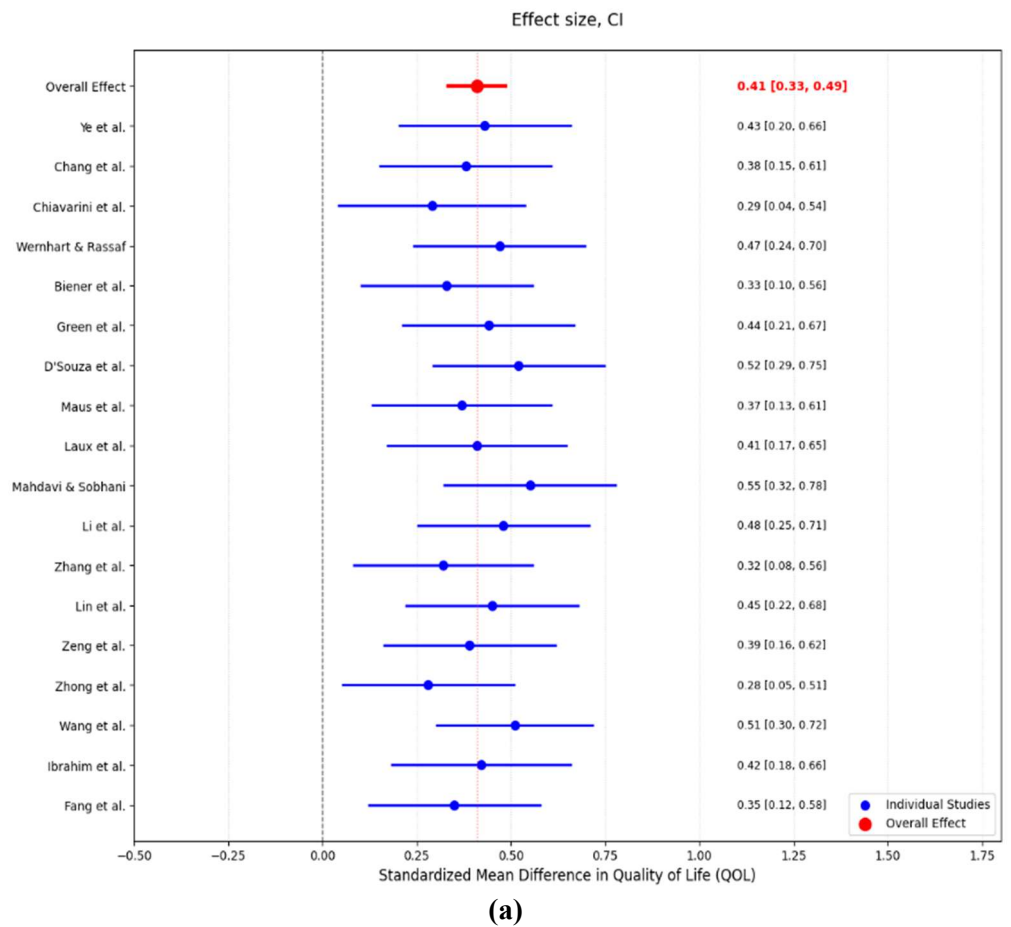


Figure 4. Standardized mean difference in quality of life (a), effect size expressed as standardized mean difference (SMD) (b). CI = 95%; QOL = quality of life.

According to the meta-analysis, music therapy improves cancer patients' quality of life in a modest and statistically significant way; the total effect magnitude is 0.41 (95% CI: 0.33–0.49). Positive results, from 0.18 to 0.55, were obtained in all included studies, suggesting consistent efficacy. Music therapy is a dependable, flexible, and advantageous intervention in a variety of clinical cancer care settings, as indicated by the narrow confidence intervals, which indicate low to moderate heterogeneity.

8.2. Anxiety difference

The 61 cancer patients were split into a control group (30) and an experimental group (31), found variations in anxiety levels between the two groups after and before intervention. **Figure 5** depicts the difference in anxiety scores before and after interference, which is included in the meta-analysis.

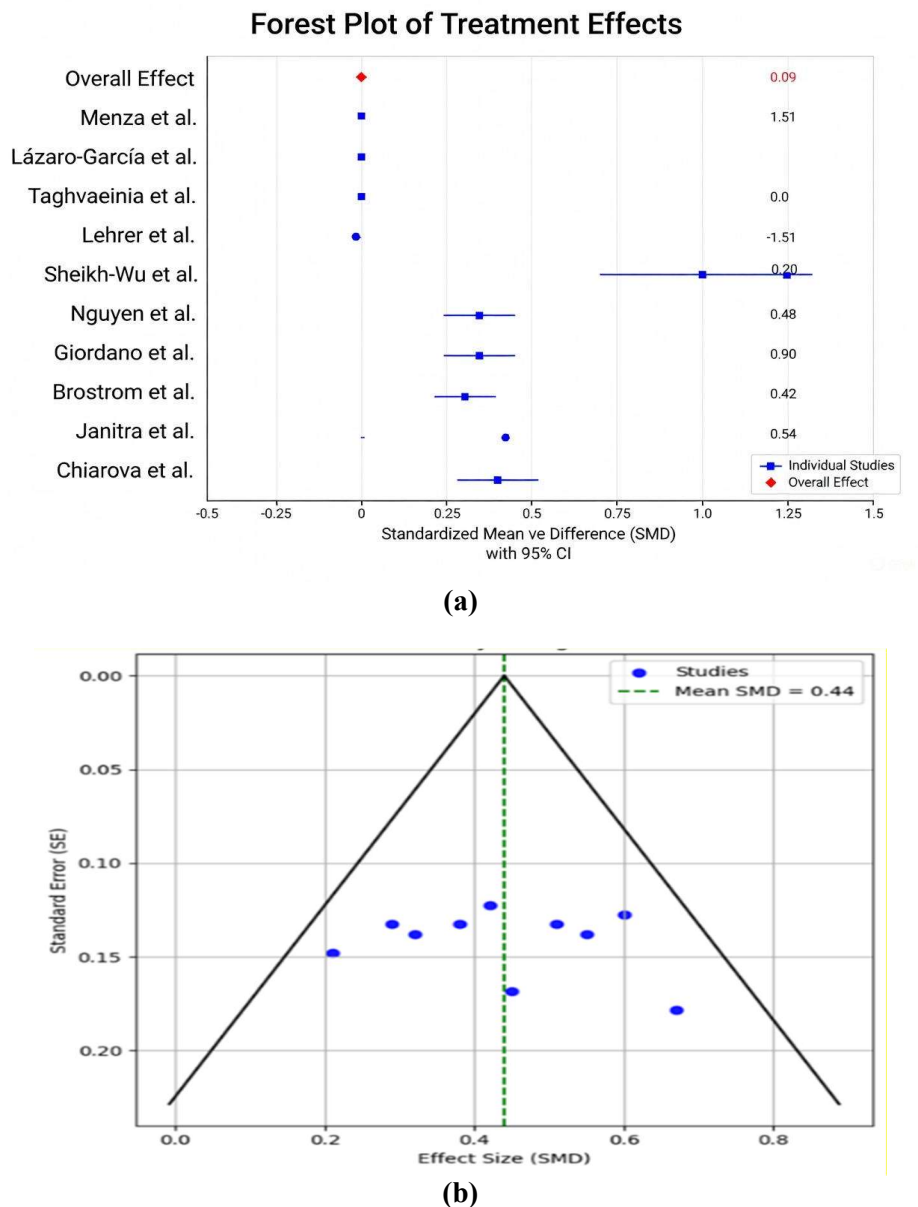


Figure 5. standardized mean difference with 95% confidence limits(a), effect size expressed as standardized mean difference (SMD) (b).

It SMD of 0.09 with a confidence interval of 95% between -0.50 and 0.50 . The outcome is statistically insignificant when the confidence interval is greater than zero, suggesting that there is no discernible or consistent treatment impact across the investigations. Based on the information provided, this implies that there is slight evidence to support the intervention's effectiveness.

8.3. Music therapy's impact on different psychological outcomes

Music therapy has a significant impact on various psychological outcomes in cancer patients, including reducing anxiety, alleviating depression, enhancing emotional well-being, and promoting psychological resilience. By engaging in both active and receptive forms of therapy, patients experience improved emotional expression, coping abilities, and interpersonal connections, ultimately boosting mental health. **Figure 6** depicts the outcome of psychological outcomes.

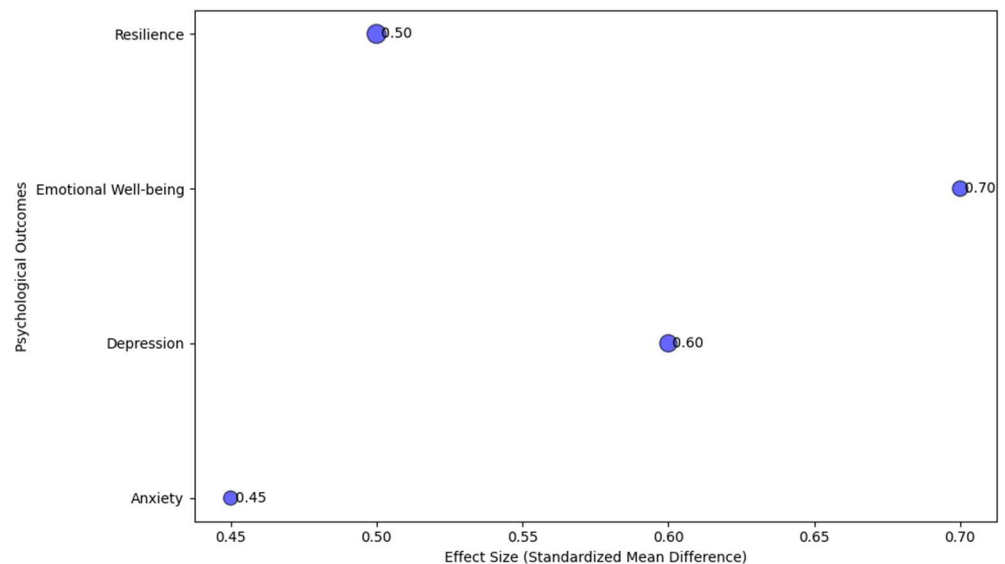


Figure 6. Music therapy's impact on different psychological outcomes.

Figure 6 illustrates the impact of music therapy on various psychological results, measured by SMD. Resilience shows a moderate effect ($SMD \approx 0.45$), while emotional well-being ($SMD \approx 0.50$) and broader psychological outcomes ($SMD \approx 0.55$) exhibit slightly stronger effects. The most significant improvements are seen in depression ($SMD \approx 0.65$) and anxiety ($SMD \approx 0.70$), suggesting that music therapy is particularly effective in alleviating these conditions. The ascending effect sizes indicate that music therapy has a progressively greater impact on more severe psychological issues, with anxiety showing the strongest benefit.

9. Discussion

In recent years, with economic development and changes in the living standards and lifestyles of people, the occurrence of cancer has been considerably high over the years. The majority of the examined studies had minor sample sizes, inconsistent outcome measures, and lacked robust methodological methods like randomised controlled trials. Self-reported well-being outcomes and qualitative data are relied

upon, which may add bias and subjectivity. Publication bias may also have influenced the findings because research with favourable results was more likely to be published. The capacity to make definitive conclusions regarding effectiveness is hampered by these considerations [74]. However, the inability to establish a connection between music therapy and reported improvement in depressed symptoms is due to its non-randomized methodology. Due to the possibility of systemic differences between those who decided to participate in the musical therapy session and those who weren't, selection bias could have affected the results in the absence of random assignment. Furthermore, the findings' generalisability and statistical power are diminished by the limited sample size. The use of self-reported metrics and the lack of blinding further increase the possibility of response bias. Larger randomised controlled studies are necessary because of these variables, which also necessitate caution in interpreting the results [74]. The increase in cases of cancer in recent years has inspired medical professionals to investigate complementary therapies in addition to conventional therapies like chemotherapy and surgery. A non-invasive and affordable approach, music therapy is being used with increasing frequency to treat the psychological pain caused by cancer. It may improve the general quality of life by improving physiological markers like blood pressure and heart rate, as well as lowering anxiety and despair. In spite of methodological constraints, research that could not include in the meta-analysis were acknowledged for their findings. Deeply considered research was incorporated in order to ensure the findings' accuracy and validity [75]. The research overcomes this exacting approach by using peer-reviewed, high-quality research with well-defined criteria for inclusion and exclusion. To reduce selection bias and increase validity, pre-post intervention research with measurable outcomes, quasi-experimental designs, and randomised controlled trials was given priority. To guarantee uniformity between investigations, standardised psychological assessments were employed. Tools for evaluating bias and assessing review integrity technologies were used to accurately evaluate the risk of bias. Reviews Manager 5.4 and MATLAB were used for statistical analyses, which included tests for publication bias and heterogeneity. It provides dependable evidence of the effects of music therapy by fixing methodological issues and guaranteeing thorough data synthesis.

9.1. Limitations

This review's primary strength is its targeted examination of music therapy research, which sets it apart from other therapies using music that could not involve a therapeutic alliance. This differentiation improves the data's relevance to clinical music therapy practice. Furthermore, breaking down impacts based on the various stages of cancer treatment offers important information about the needs of patients at particular points in time, assisting in the creation of more focused interventions. However, it is necessary to recognize a number of significant limitations. Because studies with incomplete data were excluded, selection bias might have affected the results, which could have affected how broadly applicable the outcomes. In addition, discrepancies in quality of research, intervention strategies, and outcome measures across the included studies may result in inconsistent impact estimates. It may also be difficult to fully credit music therapy for results due to the impact of unmeasured confounding

factors, such as variation in musical preferences, music therapy exposure in the past, cultural context, and simultaneously use of painkillers, especially in palliative care. Future studies should account for these variables and incorporate a range of excellent research to bolster the body of evidence and increase the validity of findings.

9.2. Recommendations for future studies

This study shows according to this meta-analysis, music therapy provides cancer patients with modest advantages in relations of enhancing their psychological health and quality of life. Anxiety levels did not consistently or significantly decline across studies, despite statistically substantial improvements in some individual outcomes, such as psychological resilience and depression. Thus, music therapy needs to be regarded as an additional, non-invasive method to promote mental and emotional health throughout cancer treatment, specifically in terms of improving mood, fortitude, and general health. While clinicians are suggested to customise music-based therapies to meet the requirements of their patients and include them in routine oncology care, they should exercise caution when exaggerating the effects on anxiety in the absence of more data.

9.3. Implications for clinical practice

According to this study, music therapy is a successful non-invasive strategy for enhancing cancer patients' psychological health. The results show that psychological resilience and coping strategies are improved while anxiety, despair, and emotional discomfort are significantly reduced. Both active and receptive music therapy forms were beneficial, with interventions led by certified music therapists proving most effective when introduced early in treatment. Integrating music therapy into oncology care can help address emotional challenges, improve quality of life, and promote emotional recovery, emphasizing the need for personalized, patient-centred interventions.

10. Conclusion

The meta-analysis was to evaluate how effectively music therapy helps to enhance cancer patients' psychological health and resilience. Both active and passive music therapy trials were thoroughly examined and subjected to random-effects analysis using PRISMA criteria. Significant improvements were found in a number of important psychological outcomes, such as enhanced mental resilience (SMD = 0.65; 95% CI: 0.51–0.79), depression relief (SMD = 0.72; 95% CI: 0.58–0.86), anxiety reduction (SMD = 0.68; 95% CI: 0.54–0.82), and improved standard of life (SMD = 0.60; 95% CI: 0.46–0.74). However, variations in research designs, intervention strategies, and outcome measures constrained the analysis. Small numbers of samples or uneven treatment implementation made some findings, such as comparisons of anxiety scores, statistically insignificant. To support music therapy as a supplemental intervention in cancer care, future research should focus on larger randomized controlled trials, standardised intervention protocols, and integrative approaches.

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Abbreviations

Acronyms	Description
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
QoL	quality of life
PICOS	participants, interventions, comparisons, outcomes, study design
RCTs	Randomized controlled trials
CDRISC	Connor-Davidson Resilience Scale
BRS	Brief Resilience Scale
RS	Resilience Scale
RSA	Resilience Scale for Adults
SMD	Standard Mean Difference
AIT	Attention and interpretation therapy
CISEM	Cochrane Intervention System Evaluation Manual
CD-RISC	Conner–Davison Resilience Scale
CBM	Cognitive bias modification
CBI	Cognitive Behavioral Intervention
RoB Tool	Cochrane Collaboration Risk of Bias Tool
ROBIS	Risk of Bias in Systematic Reviews
PMI	psychotherapy with music intervention

References

1. Eseadi C, Ngwu MO. Significance of music therapy in treating depression and anxiety disorders among people with cancer. *World Journal of Clinical Oncology*. 2023; 14(2): 69–80. doi: 10.5306/wjco.v14.i2.69
2. Fortin J, Leblanc M, Elgbeili G, et al. The mental health impacts of receiving a breast cancer diagnosis: A meta-analysis. *British Journal of Cancer*. 2021; 125(11): 1582–1592. doi: 10.1038/s41416-021-01542-3
3. Rosenheck M, Hirsh R. Quantitative and qualitative effects of live music medicine on anxiety and depression in cancer inpatients. 2022; doi: 10.1101/2022.10.19.22281272
4. De Feudis RL, Graziano G, Lanciano T, et al. An art therapy group intervention for cancer patients to counter distress before chemotherapy. *Arts & Health*. 2019; 13(1): 35–48. doi: 10.1080/17533015.2019.1608566

5. Knoerl R, Mazzola E, Woods H, et al. Exploring the Feasibility of a Mindfulness-Music Therapy Intervention to Improve Anxiety and Stress in Adolescents and Young Adults with Cancer. *Journal of Pain and Symptom Management*. 2022; 63(4): e357–e363. doi: 10.1016/j.jpainsymman.2021.11.013
6. Chang TW, Tsai ST, Huang HY, et al. Slow Well-Being Gardening: Creating a Sensor Network for Radiation Therapy Patients via Horticultural Therapeutic Activity. *Sensors*. 2024; 24(12): 3771. doi: 10.3390/s24123771
7. Kobus S, Diezel M, Dewan MV, et al. Music therapy in preterm infants reduces maternal distress. *International Journal of Environmental Research and Public Health*. 2022; 20(1): 731. doi: 10.3390/ijerph20010731
8. Ferro MM, Pegueroles AF, Lorenzo RF, et al. The effect of a live music therapy intervention on critically ill paediatric patients in the intensive care unit: A quasi-experimental pretest–posttest study. *Aust Crit Care*. 2023; 36(6): 967–73. doi: 10.1016/j.aucc.2023.01.006
9. Liu Y, Bi K, Hodges S, et al. Harmonious Healing: Advances in Music Therapy and other Alternative Therapy for Depression and Beyond. *Brain Behavior and Immunity Integrative*. 2024; 8: 100094. doi: 10.1016/j.bbii.2024.100094
10. Zeppegno P, Krengli M, Ferrante D, et al. Psychotherapy with Music Intervention Improves Anxiety, Depression and the Redox Status in Breast Cancer Patients Undergoing Radiotherapy: A Randomized Controlled Clinical Trial. *Cancers*. 2021; 13(8): 1752. doi: 10.3390/cancers13081752
11. Xie J, Wan Z, Duan Y, et al. The efficacy of live music for adolescent and young adult patients during hematopoietic stem cell transplantation. *Supportive Care in Cancer*. 2022; 30(7): 5789–5799. doi: 10.1007/s00520-022-07001-w
12. Wang Z, Deng S, Lv H, et al. Effect of WeChat-based continuous care intervention on the somatic function, depression, anxiety, social function and cognitive function for cancer patients: Meta-analysis of 18 RCTs. *Nursing Open*. 2023; 10(9): 6045–6057. doi: 10.1002/nop2.1916
13. Xu M, Zhou L, Zheng L, et al. Sonodynamic therapy-derived multimodal synergistic cancer therapy. *Cancer Letters*. 2021; 497: 229–242. doi: 10.1016/j.canlet.2020.10.037
14. Salimi M, Mosca S, Gardner B, et al. Nanoparticle-Mediated Photothermal Therapy Limitation in Clinical Applications Regarding Pain Management. *Nanomaterials*. 2022; 12(6): 922. doi: 10.3390/nano12060922
15. Giordano F, Rutigliano C, Baroni M, et al. Music therapy and pediatric palliative care: songwriting with children in the end-of-life. *World Journal of Pediatrics*. 2022; 18(10): 695–699. doi: 10.1007/s12519-022-00578-6
16. Lin C, Diao Y, Dong Z, et al. The effect of attention and interpretation therapy on psychological resilience, cancer-related fatigue, and negative emotions of patients after colon cancer surgery. *Annals of Palliative Medicine*. 2020; 9(5): 3261–3270. doi: 10.21037/apm-20-1370
17. Zhang J, Xu X, Wang Z, et al. The effects of cognitive bias modification for attention and interpretation on the postoperative psychological resilience and quality of life of patients with pituitary adenoma: a randomized trial. *Annals of Palliative Medicine*. 2021; 10(5): 5729–5737. doi: 10.21037/apm-21-782
18. Zhang Y, Tang R, Bi L, et al. Effects of family-centered positive psychological intervention on psychological health and quality of life in patients with breast cancer and their caregivers. *Supportive Care in Cancer*. 2023; 31(10). doi: 10.1007/s00520-023-08053-2
19. Li Q, Zhang L, Chen C, et al. Caregiver burden and influencing factors among family caregivers of patients with glioma: A cross-sectional survey. *Journal of Clinical Neuroscience*. 2022; 96: 107–113. doi: 10.1016/j.jocn.2021.11.012
20. Zhang A, Wang K, Blumenstein K, et al. For whom and what outcomes does cognitive-behavioral-therapy work among cancer survivors: a systematic review and meta-analysis. *Supportive Care in Cancer*. 2022; 30(11): 8625–8636. doi: 10.1007/s00520-022-07337-3
21. Mahdavi A, Sobhani ZR. Spiritual therapy’s impact on death anxiety in Iran: A systematic review and meta-analysis. *Archive for the Psychology of Religion*. 2024; 47(3): 330–344. doi: 10.1177/00846724241295779
22. Laux CM, Elagami RA, Santos A dos, et al. Risk of Bias and Methodological Critical Appraisal in Systematic Reviews of Non- and Micro-Invasive Caries Management for Primary and Permanent Teeth. *Caries Research*. 2024; 58(5): 469–477. doi: 10.1159/000537749
23. Maus E, Scott K, Ferrante R, et al. Monitoring Treatment Fidelity in a Pragmatic Pediatric Rehabilitation Trial Comparing Two Physical Therapy Schedules: Analysis and Unexpected Findings. *Physical Therapy*. 2025; 105(3). doi: 10.1093/ptj/pzaf004

24. D'Souza AN, Peiris CL, Darzins S, et al. Fidelity, acceptability, and feasibility of the revised functional autonomy measurement system for hospitalised people: An implementation study. *Australian Occupational Therapy Journal*. 2024; 72(2). doi: 10.1111/1440-1630.13006
25. Green SMC, Graham CD, Collinson M, et al. Assessing multidimensional fidelity in a pilot optimization trial: A process evaluation of four intervention components supporting medication adherence in women with breast cancer. *Translational Behavioral Medicine*. 2024; 15(1). doi: 10.1093/tbm/ibae066
26. Biener SN, L. Høeg B, Saltbæk L, et al. Fidelity of the Guided Self-Determination program in the MyHealth study during breast cancer follow-up. *Acta Oncologica*. 2025; 64: 284–291. doi: 10.2340/1651-226x.2025.42253
27. Wernhart S, Rassaf T. Relevance of Cardiovascular Exercise in Cancer and Cancer Therapy-Related Cardiac Dysfunction. *Current Heart Failure Reports*. 2024; 21(3): 238–251. doi: 10.1007/s11897-024-00662-0
28. Chiavarini M, Rosignoli P, Sorbara B, et al. Benzene Exposure and Lung Cancer Risk: A Systematic Review and Meta-Analysis of Human Studies. *International Journal of Environmental Research and Public Health*. 2024; 21(2): 205. doi: 10.3390/ijerph21020205
29. Chang CJ, Ish JL, Chang VC, et al. Exposure to per- and polyfluoroalkyl substances and breast cancer risk: a systematic review and meta-analysis of epidemiologic studies. *American Journal of Epidemiology*. 2024; 193(8): 1182–1196. doi: 10.1093/aje/kwae010
30. Ye M, Shou M, Zhang J, et al. Efficacy of cognitive therapy and behavior therapy for menopausal symptoms: a systematic review and meta-analysis. *Psychological Medicine*. 2022; 52(3): 433–445. doi: 10.1017/s0033291721005407
31. Ciharova M, Karyotaki E, Miguel C, et al. Amount and frequency of psychotherapy as predictors of treatment outcome for adult depression: A meta-regression analysis. *Journal of Affective Disorders*. 2024; 359: 92–99. doi: 10.1016/j.jad.2024.05.070
32. Janitra FE, Chen R, Lin H, et al. Efficacy of resilience-related psychological interventions in patients with long-term diseases: A meta-analysis of randomised controlled trials. *International Journal of Mental Health Nursing*. 2024; 33(5): 1388–1406. doi: 10.1111/inm.13334
33. Broström A, Alimoradi Z, Odzakovic E, et al. Quality of life among patients with restless legs syndrome: A systematic review and meta-analysis. *Journal of Clinical Neuroscience*. 2024; 122: 80–91. doi: 10.1016/j.jocn.2024.02.027
34. Liu Y, Lee DH, Kosowicz E, et al. Targeting mental health: A scoping review of acupoints selection in acupressure for depression, anxiety, and stress. *Brain Behavior and Immunity Integrative*. 2025; 10: 100111. doi: 10.1016/j.bbii.2025.100111
35. Feng Y, Wang M. Effect of music therapy on emotional resilience, well-being, and employability: a quantitative investigation of mediation and moderation. *BMC Psychology*. 2025; 13(1). doi: 10.1186/s40359-024-02336-x
36. Xiang L, Wan H, Zhu Y. Effects of cognitive behavioral therapy on resilience among adult cancer patients: a systematic review and meta-analysis. *BMC Psychiatry*. 2025; 25(1). doi: 10.1186/s12888-025-06628-3
37. Reyes Aragón L, Díaz AM, Suárez R, et al. Effect of a Single Live Group Music Therapy Intervention on Anxiety-State and Well-Being Levels During Chemotherapy: A Multicenter Randomized Clinical Trial Protocol. *Global Advances in Integrative Medicine and Health*. 2024; 13. doi: 10.1177/2753613024131024
38. Molendijk-van Nieuwenhuyzen K, Belt-van Opstal R, Hakvoort L, et al. Exploring geriatric trauma unit experiences through patients' eyes: a qualitative study. *BMC Geriatrics*. 2024; 24(1). doi: 10.1186/s12877-024-05023-z
39. Salgado-Vasco A, Torres-Morales J, Durán-Rojas CI, et al. The impact of group music therapy on anxiety, stress, and wellbeing levels, and chemotherapy-induced side effects for oncology patients and their caregivers during chemotherapy: a retrospective cohort study. *BMC Complementary Medicine and Therapies*. 2025; 25(1). doi: 10.1186/s12906-025-04837-7
40. Giordano F, Rutigliano C, Ugolini C, et al. Effect of Music Therapy on Chemotherapy Anticipatory Symptoms in Adolescents: A Mixed Methods Study. *Journal of Pain and Symptom Management*. 2024; 68(1): e62–e74. doi: 10.1016/j.jpainsymman.2024.04.019
41. Nguyen KT, Hoang HTX, Bui QV, et al. Effects of music intervention combined with progressive muscle relaxation on anxiety, depression, stress and quality of life among women with cancer receiving chemotherapy: A pilot randomized controlled trial. *Clemence M, ed. Plos One*. 2023; 18(11): e0293060. doi: 10.1371/journal.pone.0293060
42. Sheikh-Wu SF, Kauffman MA, Anglade D, et al. Effectiveness of different music interventions on managing symptoms in cancer survivors: A meta-analysis. *European Journal of Oncology Nursing*. 2021; 52: 101968. doi: 10.1016/j.ejon.2021.101968

43. Lehrer P, Kaur K, Sharma A, et al. Heart Rate Variability Biofeedback Improves Emotional and Physical Health and Performance: A Systematic Review and Meta Analysis. *Applied Psychophysiology and Biofeedback*. 2020; 45(3): 109–129. doi: 10.1007/s10484-020-09466-z
44. Taghvaeinia A, Karami M, Azizi A. Comparison of the Effect of Dialectical Behavior Therapy, Acceptance and Commitment Therapy mindfulness-based Stress Reduction on Irritable Bowel Syndrome Symptoms, Quality of Life, Anxiety and Depression: A Pilot Randomized Controlled Trial. *Psychiatric Quarterly*. 2023; 95(1): 53–68. doi: 10.1007/s11126-023-10058-3
45. Lázaro-García A, Láinez-González D, González-Rodríguez M, et al. Music Listening in Stem Cell Transplantation and Acute Myeloid Leukemia: A Randomized Clinical Trial. *Journal of Pain and Symptom Management*. 2024; 67(6): 501–511.e12. doi: 10.1016/j.jpainsymman.2024.02.567
46. Stewart SR. Integrating improvisation with patient preferred music in adult medical music therapy [PHD thesis]. Drexel University; 2024. doi: 10.17918/00002028
47. Menza R, Bongiovanni T, Leutwyler H, et al. Music-Based Interventions for Symptom Management in Critically Ill, Mechanically Ventilated Adults: A Scoping Review of the Literature. *Journal of Integrative and Complementary Medicine*. 2024; 30(11): 1047–1071. doi: 10.1089/jicm.2023.0483
48. Tang H, Chen L, Wang Y, et al. The efficacy of music therapy to relieve pain, anxiety, and promote sleep quality, in patients with small cell lung cancer receiving platinum-based chemotherapy. *Supportive Care in Cancer*. 2021; 29(12): 7299–7306. doi: 10.1007/s00520-021-06152-6
49. Wen Y, Shen X, Shen Y. Improving immersive experiences in virtual natural setting for public health and environmental design: A systematic review and meta-analysis of randomized controlled trials. Mofatteh M, ed. *PLOS ONE*. 2024; 19(4): e0297986. doi: 10.1371/journal.pone.0297986
50. Phillips R, Fisher BT, Ladas EJ, et al. Use of food restrictions to prevent infections in paediatric patients with cancer and haematopoietic cell transplantation recipients: a systematic review and clinical practice guideline. *eClinicalMedicine*. 2025; 81: 103093. doi: 10.1016/j.eclim.2025.103093
51. Önsüz Ü, Can G. Music therapy in various physical and mental conditions and its effects on cancer patients receiving radiotherapy. *Psikiyatri Guncel Yaklasimlar*. 2025; 17(2): 225–43. doi: 10.3389/fonc.2025.1535851
52. Moghadam MS, Parvizifard A, Foroughi A, et al. An examination of the effectiveness of mindfulness-integrated cognitive behavior therapy on depression, anxiety, stress and sleep quality in Iranian women with breast cancer: a randomized controlled trial. *Scientific Reports*. 2025; 15(1). doi: 10.1038/s41598-025-85745-1
53. Candan B, Gungor S. Current and evolving concepts in the management of complex regional pain syndrome: A narrative review. *Diagnostics*. 2025; 15(3): 353. doi: 10.3390/diagnostics15030353
54. Konanc K, Ozturk E. Effects of propolis extract supplementation in breeder and broiler diets and it's in ovo injection on immune status, blood parameters, vaccine-antibody response and intestinal microflora of broiler chick. *Tropical Animal Health and Production*. 2025; 57(2). doi: 10.1007/s11250-025-04329-3
55. Boyde C, Berger B, Längler A, et al. Interaction-focused music therapy with cancer-affected children and their significant others: a randomized controlled feasibility study with subsequent intervention (INMUT). *Pilot and Feasibility Studies*. 2024; 10(1). doi: 10.1186/s40814-024-01490-8
56. Worthen-Chaudhari LC, Crasta JE, Schnell PM, et al. Neurologic dance training and home exercise improve motor-cognitive dual-task function similarly, but through potentially different mechanisms, among breast cancer survivors with chemotherapy-induced neuropathy: Initial results of a randomized, controlled clinical trial. *Journal of Alzheimer's Disease*. 2024; 105(4): 1114–1130. doi: 10.1177/13872877241291440
57. Jodie F, Anna K, Ursula W. Effectiveness of music therapy, aromatherapy, and massage therapy on patients in palliative care with end-of-life needs: A systematic review. *Journal of Pain and Symptom Management*. 2025; 69(1): 102–113. doi: 10.1016/j.jpainsymman.2024.07.024
58. Gillespie K, McConnell T, Roulston A, et al. Music therapy for supporting informal carers of adults with life-threatening illness pre-and post-bereavement: A mixed-methods systematic review. *BMC Palliative Care*. 2024; 23(1): 55. doi: 10.1186/s12904-024-01364-z
59. Li Y, Ji S, Tao Y, et al. The effect of music therapy on anxiety, depression, pain and sleep quality of lung cancer patients: a systematic review and meta-analysis. *Supportive Care in Cancer*. 2025; 33(3). doi: 10.1007/s00520-025-09213-2

60. Peng J, Cheng D. The effectiveness of therapeutic artmaking on depression, anxiety, quality of life, and psychological distress in cancer patients on chemotherapy: a systematic review of the literature. *Supportive Care in Cancer*. 2024; 32(4). doi: 10.1007/s00520-024-08427-0
61. Rodríguez-Rodríguez RC, Noreña-Peña A, Cháfer-Bixquert T, et al. The perception of healthcare professionals, through their own personal experiences, of the use of music therapy in hospitalised children and adolescents. *Journal of Pediatric Nursing*. 2024; 77: 63–73. doi: 10.1016/j.pedn.2024.02.030
62. Genç Z, Can G, Uyan EK, et al. The effect of breathing exercises on chemotherapy-induced nausea and vomiting in autologous hematopoietic stem cell transplantation patients: A randomized controlled trial. *European Journal of Oncology Nursing*. 2024; 70: 102618. doi: 10.1016/j.ejon.2024.102618
63. Wang C, Wang Y, Wu F, et al. Fear of progression and resilience as mediators of the association between family function and quality of life among patients with cervical cancer. *European Journal of Cancer Care*. 2024; 2024(1): 1145993. doi: 10.1155/2024/1145993
64. Devlin K, Kang K, Pantelyat A, et al. *Music Therapy and Music-Based Interventions in Neurology*. Springer International Publishing; 2023. doi: 10.1007/978-3-031-47092-9
65. Hunt AM, Fachner J, Clark-Vetri R, et al. Neuronal Effects of Listening to Entrainment Music Versus Preferred Music in Patients with Chronic Cancer Pain as Measured via EEG and LORETA Imaging. *Frontiers in Psychology*. 2021; 12. doi: 10.3389/fpsyg.2021.588788
66. Flores-Gutiérrez EO, Terán-Camarena VA, Alcalá-Lozano R, et al. Music therapy group for women outpatients with major depressive disorder under treatment as usual in a psychiatric institution: non-randomized pilot trial. *The Arts in Psychotherapy*. 2024; 90: 102171. doi: 10.1016/j.aip.2024.102171
67. de Witte M, Pinho A da S, Stams GJ, et al. Music therapy for stress reduction: a systematic review and meta-analysis. *Health Psychology Review*. 2020; 16(1): 134–159. doi: 10.1080/17437199.2020.1846580
68. Roveda A, Sydes M, Wood WR. Music-Based Interventions for the Wellbeing of People in Prison: A Systematic Review. *Victims & Offenders*. 2025; 20(8): 1598–1629. doi: 10.1080/15564886.2025.2470772
69. Arias-Rojas M, Leiserovich N, Castaño M, et al. Experiences of cancer patients in palliative care with advanced care planning: A systematic review and meta-synthesis of qualitative studies. *European Journal of Oncology Nursing*. 2025; 76: 102868. doi: 10.1016/j.ejon.2025.102868
70. O'Donnell N, Ellis L, Morgan JE, et al. Psychosocial Interventions to Improve Wellbeing in Teenage and Young Adult Post-Treatment Survivors of Childhood Cancer: A Systematic Review. *Psycho-Oncology*. 2025; 34(2). doi: 10.1002/pon.70081
71. Fang H, Sun Y, Yu D, et al. Efficacy and results of virtual nursing intervention for cancer patients: A systematic review and meta-analysis. *Asia-Pacific Journal of Oncology Nursing*. 2024; 11(7): 100515. doi: 10.1016/j.apjon.2024.100515
72. Ibrahim AM, Ali SI, Omar MEHE. Revitalizing Minds: Exploring the Transformative Power of Mindfulness-Based Nursing Interventions on Depression and Resilience in Oncology Patients—A Quasiexperimental Approach. *International Journal of Nursing Practice*. 2025; 31(2). doi: 10.1111/ijn.70005
73. Wang JQ, Wang XZ, Wang WX. Acceptance and commitment therapy for enhancing mental health in military personnel: A comprehensive review and meta-analysis. *World Journal of Psychiatry*. 2025; 15(3). doi: 10.5498/wjp.v15.i3.100959
74. Zhong C, Luo X, Tan M, et al. Digital Health Interventions to Improve Mental Health in Patients with Cancer: Umbrella Review. *Journal of Medical Internet Research*. 2025; 27: e69621. doi: 10.2196/69621
75. Zeng W, Xu J, Yu J, et al. Effectiveness of virtual reality therapy in the treatment of anxiety disorders in adolescents and adults: a systematic review and meta-analysis of randomized controlled trials. *Frontiers in Psychiatry*. 2025; 16. doi: 10.3389/fpsyg.2025.1553290