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Effectiveness of music therapy and Tai Chi exercise on anxiety, depression and quality of life for patients with cancer: a protocol for systematic reviews and meta-analysis

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ABSTRACT

Introduction Patients with cancer frequently suffer from psychological distress, including anxiety and depression, which negatively impacts their quality of life. Music therapy (MT)and Tai Chi exercise are emerging as promising complementary interventions in cancer care. However, their comparative effectiveness remains uncertain. This systematic review aims to evaluate and compare the effects of MT and Tai Chi exercise on anxiety, depression and quality of life among patients with cancer .

Methods and analysis Following the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) guidelines, a comprehensive search will be conducted in databases including PubMed, Web of Science, Scopus and CNKI for randomised controlled trials (RCTs) published up to March 2025. Studies assessing the effects of either intervention on cancer patients will be included. The primary outcomes are anxiety and depression, while quality of life is considered a secondary outcome. All outcomes will be measured using validated instruments. Two reviewers will independently screen, extract data and assess study quality using the Cochrane Risk of Bias tool. Meta-analyses will be performed using RevMan where appropriate, along with analyses of heterogeneity, publication bias and sensitivity.

Ethics and dissemination Ethical approval is not required as the study involves secondary data analysis. Results will be disseminated through peer-reviewed journals and conferences. This review will offer evidence-based insights to guide cancer rehabilitation strategies involving mind-body and music-based therapies.

PROSPERO registration number CRD42024550787.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Only randomised controlled trials are included in this study, and it adheres to Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines, which enhances the reliability of the evidence synthesis.
⇒ It adopts a multidisciplinary approach, offering novel insights into mental healthcare for individuals with cancer.
⇒ The study aims to emphasise the importance of addressing both mental and social well-being in cancer care.
⇒ Only English-language publications were included in the literature search, which may limit the comprehensiveness of the findings.

INTRODUCTION

Cancer is a disease in which some of the body's cells grow uncontrollably and spread to other parts of the body.[1] It has emerged as a significant concern in the 21st century, impacting society, public health and the economy. According to the International Agency for Research on Cancer, there were 20 million cancer cases globally in 2022, including non-melanoma skin cancers (NMSC). The number of deaths reached 9.7 million, also including NMSC. It was estimated that around one in five individuals developed cancer, with approximately one in nine men and one in twelve women succumbing to the disease.[2] Despite advancements in medical science, the cure rate for cancer remains lower than that of many other diseases. With the rising number of cancer diagnoses, patients in various stages of treatment face physical and psychological challenges that impact their survival, quality of life and response to medical interventions. Anxiety and depression are among the most common psychological problems in patients with cancer, leading to reduced well-being and increased healthcare burden.[3] They are also key indicators for evaluating the effectiveness of psychosocial interventions in cancer care. As a result, both the medical community and society are increasingly endorsing non-drug therapies for cancer patients,[4 5] including music therapy (MT), Tai Chi, exercise therapy, art

therapy, yoga, hypnosis and others. This article specifically examines the effectiveness of MT and Tai Chi in cancer treatment.

MT is a structured therapeutic practice that uses the emotional and psychological impact of music to support mental health and enhance overall well-being. According to the American Music Therapy Association (AMTA) and the World Federation of Music Therapy (WFMT), MT involves the intentional use of music-based activities within a therapeutic relationship, facilitated by a qualified music therapist, to address specific individual goals.[6 7] MT typically incorporates elements such as personalised music selection, sensitivity to the patient's physical and emotional cues, trust-building through sustained interaction and structured musical engagement that encourages positive behavioural patterns.[8] These features collectively create a therapeutic space where music acts as both a medium and a catalyst for healing. Recent research supports the effectiveness of MT as a non-pharmacological approach for managing symptoms such as anxiety, pain and fatigue, especially among individuals undergoing cancer treatment.[9] MT is often employed to promote calmness, reduce emotional distress and alleviate physical symptoms linked to both the illness and its treatment. On a neurological level, listening to music has been shown to activate the brain's reward circuitry, promoting the release of neurochemicals like dopamine and endorphins. These neurobiological responses may contribute to feelings of pleasure, emotional relief or reflective sadness, depending on how the music is perceived, and the emotional context in which it is experienced.[10 11]

As a classical oriental traditional health exercise, Tai Chi has become an increasingly popular complementary medicine approach all around the world.[12] Lots of studies have revealed that Tai Chi has positive effects on depressive symptoms, anxiety, mental health quality of life for patients.[13–16]

Numerous randomised controlled trials (RCTs) have demonstrated that both MT and Tai Chi therapy are effective in alleviating pain, reducing anxiety and depression, and enhancing the quality of life for cancer patients.[17–19] Nevertheless, there is a lack of academic and clinical research on the combined use of MT and Tai Chi therapy. Therefore, this study aimed to compare the effects of the two treatments on pain, anxiety, depression and quality of life in patients with cancer . The findings offer valuable insights for enhancing the clinical management of cancer.

METHODS AND ANALYSIS

Protocol Register and Ethics

This study has been registered on the PROSPERO platform, with the Registration Number: CRD42024550787. As the study is based on data retrieved from previously published RCTs, ethical approval was not required.

Patient and Public Involvement

Patients and members of the public were not involved in the design, conduct, reporting or dissemination of this protocol. As this is a systematic review and meta-analysis protocol based solely on previously published RCTs, no new data will be collected from patients or the public.

Planned start and end dates for the study

The study is scheduled to begin in March 2025 and is expected to conclude in December 2025.

Eligibility Criteria

1. The study involved either MT or Tai Chi exercise for patients with cancer to deal with fatigue, pain, anxiety, depression and to improve quality of life.
2. Subjects included in the study met authoritative or recognised cancer diagnostic criteria. Patients with hearing impairment and motor impairment were excluded. The study included patients regardless of their nationality, race, gender or age. The stages of patients with cancer were not specified as early, intermediate or late.
3. Participants in the intervention group received standard medical care in conjunction with either MT or Tai Chi exercise, whereas those in the control group were provided only with routine medical care, without exposure to the additional interventions. The control group did not participate in any of the experimental activities.[20]
4. The primary outcomes assessed were levels of anxiety, depression and overall quality of life. Secondary outcomes included various health-related metrics, such as standardised scores for anxiety and depression, as well as any reported adverse events. Inclusion criteria for studies required the reporting of at least one of these key outcome indicators.[20]
5. Studies were published in English and appeared in peer-reviewed journals.
6. Only RCTs were included.

Exclusion Criteria

Studies were excluded if they involved manipulated research data without authorisation, lacked sufficient data or important materials, or if authors were unable to provide comprehensive information for data analysis. Additionally, literature reviews, editorials, commentaries, conference abstracts and other non-original research articles will be excluded. Besides, studies regarding music medicine will not be included in this study.

Rationale for Primary and Secondary Outcomes

Anxiety and depression are selected as primary outcomes due to their high prevalence among patients with cancer and their direct relevance to the therapeutic goals of MT and Tai Chi. These outcomes reflect core psychological symptoms targeted by the interventions.

Quality of life is designated as a secondary outcome because it is a broader measure influenced by multiple

factors, including emotional well-being. While important, it reflects an indirect effect of the interventions.

All outcomes will be assessed using validated instruments as reported in the included studies.

Definition of Randomised Controlled Trial (RCT)

RCTs are defined as studies in which participants are randomly assigned to an intervention or control group using a clearly described randomisation process. This includes both individual and cluster-randomised designs. Studies labelled as "randomised" but lacking a clear description of the randomisation method will be assessed carefully for eligibility.

Assessment of Randomisation, Blinding and Allocation Concealment

We will evaluate the risk of bias in each included study using the Cochrane Risk of Bias 2.0 Tool (RoB 2.0), which includes specific domains for the following:

Randomisation process (eg, method of sequence generation and allocation concealment), deviations from intended interventions (including blinding of participants and personnel), missing outcome data, measurement of the outcome and

selection of the reported result. Any domains judged as unclear or at high risk of bias will be documented and addressed in the sensitivity analysis.

Handling of Multiarm Trials

For studies with more than two intervention arms (eg, MT, Tai Chi and control), we will include all relevant arms but avoid double-counting participants. If necessary, we will split the shared control group appropriately or select the most relevant comparisons based on our inclusion criteria.

Dealing with Missing Data

If essential data (eg, means and SD) are missing from a study, we will first attempt to contact the corresponding authors to request the missing information. If data remain unavailable, we will consider appropriate imputation methods or exclude the study from meta-analysis but still include it in the qualitative synthesis. The potential impact of missing data will be evaluated in a sensitivity analysis.

Database and Retrieval Strategies

The literature search primarily using databases such as Web of Science, PubMed, Scopus, as well as China National Knowledge Infrastructure (CNKI). No publication date restrictions will be applied during the database search, in order to include all relevant RCTs on MT and Tai Chi interventions for cancer patients, regardless of the year of publication. Only RCTs that met the criteria of the published systematic review will be included. The specific search terms can be referred to in table 1 and online supplemental appendix 1: Full Search Strategy, which covers all databases. Two researchers will be conducting a thorough review process by initially screening titles and abstracts, followed by a detailed examination of the full text. Data extraction will be carried out by two individuals who entered and cross-checked the information. Any disagreements will be resolved through discussion among the researchers, with a third person brought in for retrieval and verification. The data extraction process encompassed various content, including title, author, cancer diagnosis criteria, cancer stage, number of patients, average age, gender, research type, intervention measures, course of treatment, outcomes, follow-up, statistical results and adverse events. The specific procedure was shown in figure 1, the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) flow chart.

Table 1 Database retrieval strategy

Number	Search terms
1	"Music Therapy" or "music in therapy" or "music as therapy" or "music" or "singing" or "Music Intervention"
2	"Tai Chi" or "Taichi" or "Tai Ji" or "Taiji" or Taijiquan
3	"Cancer" or "Oncology" or "Neoplasms" or "Leukaemia" or "Lymphoma"
4	"Anxiety" or "Anxiety Disorders" or "Depression" or "Depressive Disorder" or "Quality of Life"
5	1 & 3 & 4
6	2 & 3 & 4
7	1 & 2 & 3 & 4

Literature Quality Assessment

The methodological quality of the included RCTs will be assessed independently by two reviewers using the Cochrane Risk of Bias 2.0 Tool, in accordance with the Cochrane Handbook for Systematic Reviews of Interventions (Version 6.4).[21] The following five domains will be evaluated for each included study:

1. Bias arising from the randomisation process. Was the allocation sequence adequately generated? Was the allocation sequence concealed until participants were enrolled and assigned to interventions?
2. Bias due to deviations from intended interventions. Were participants and study personnel blinded to the intervention assignment? Were deviations from the intended intervention balanced across groups?
3. Bias due to missing outcome data. Were outcome data complete? Were the missing data appropriately accounted for?
4. Bias in the measurement of the outcome. Were outcome assessors blinded? Were methods of outcome measurement appropriate and consistent across groups?
5. Bias in the selection of the reported result. Were all prespecified outcomes reported? Was the analysis conducted according to a prespecified plan?

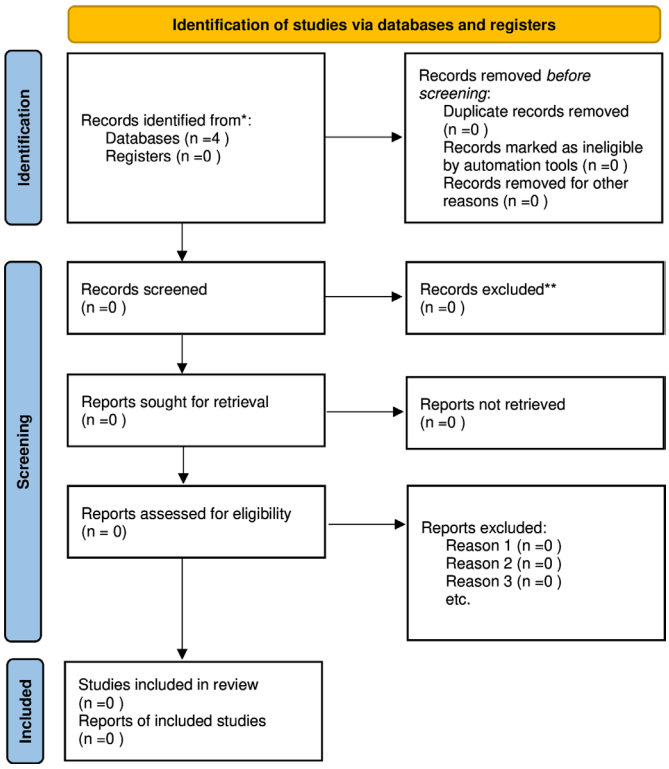

Figure 1 , the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols flow chart.

Each domain will be rated as 'low risk of bias,' 'some concerns,' or 'high risk of bias' based on signalling questions provided in the Cochrane Risk of Bias 2.0 Tool. The overall risk of bias judgement for each study will be determined by aggregating domain-level assessments. Discrepancies between reviewers will be resolved through discussion or third-party adjudication. A summary table of the risk of bias assessments will be presented in the results section.

The bias assessment tools

The risk of bias in the included studies will be evaluated using the Cochrane Collaboration's Risk of Bias tool, which is widely recognised for assessing the internal validity of RCTs.[22] It includes six domains of bias: selection bias, performance bias, detection bias, attrition bias, reporting bias and other bias.[22] The details include: 1. avoiding the use of overall quality scales; 2. prioritising internal validity; 3. evaluating the risk of bias in trial results; 4. recognising that assessments require subjective judgement; 5. selecting bias domains based on their relevance to specific outcomes and contexts; 6. focusing on the risk of bias in the data presented in the review; 7. conducting outcome-specific assessments.[22 23]

Identification of Studies with Manipulated Data

To ensure the integrity of the included evidence, we will take the following steps to identify studies with potentially manipulated data: 1. cross-check data consistency across reported outcomes, sample sizes and statistical values to detect anomalies such as identical baseline characteristics, implausible SD or duplicated tables. 2. Consult the Retraction Watch database and journal websites to identify studies that have been retracted or flagged for scientific misconduct. 3. Assess the risk of bias using the Cochrane Risk of Bias tool, with particular focus on reporting bias and selective outcome reporting, and verify trial registration information through clinical trial registries such as ClinicalTrials.gov and ChiCTR to ensure consistency with published results. Studies with clear evidence of data manipulation or ethical violations will be excluded, with reasons documented transparently.

Instruments

A range of validated instruments used in the included studies to measure anxiety, depression and quality of life will be extracted and documented. Differences in measurement tools will be considered during data synthesis.

Statistical Analysis

Categorical and continuous outcome variables will be analysed using relative risk (RR) and mean difference (MD), respectively, with corresponding 95% confidence intervals to estimate effect sizes. In studies with three treatment arms, data will be restructured into two-arm comparisons. Heterogeneity across studies will be assessed using Stata/SE 15.0. An I^2 value of 50% or below suggests low statistical heterogeneity, making it appropriate to proceed with a meta-analysis for pooling effect sizes. Conversely, an I^2 value exceeding 50% indicates considerable heterogeneity, prompting further investigation through meta-regression, subgroup analysis and sensitivity testing.[24] The network plot function in Stata will be employed to visualise the evidence structure of various treatment interventions. In this diagram, a connecting line between any two nodes signifies that direct comparative data exist between those interventions; absence of a line implies a lack of direct evidence. Following this, tests for heterogeneity and inconsistency will be conducted. When a closed loop is present within the network, the degree of agreement between direct and indirect comparisons will be assessed using the inconsistency factor (IF). If the 95% CI of the IF includes zero, it indicates no significant inconsistency between the direct and indirect evidence.[20 25] Following this, the network module in Stata will be applied to conduct a network meta-analysis. The interventions will be ranked based on their relative efficacy, and the Surface Under the Cumulative Ranking curve (SUCRA) will be computed for each. SUCRA provides a numerical indicator of the likelihood that an intervention is among the most effective, with values ranging from 0% (least effective) to 100% (most effective).[20 26] Higher SUCRA scores suggest superior therapeutic benefits.[27] To assess potential bias related to small sample sizes, comparison-adjusted funnel plots[28] will be generated at the final stage of the analysis.

MT and Tai Chi exercise have been widely recommended as complementary and complementary medicine

approaches for patients with cancer to address psychosocial problems and improve quality of life. This study will incorporate existing literature on the use of MT and Tai Chi exercise in the treatment of patients with cancer. The results of our review will provide a comprehensive overview of the reporting and methodological quality of existing studies, as well as the effects of MT or Tai Chi exercise in cancer care.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

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