Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Effects of Tibetan Singing Bowls on Quality of Life, Anxiety and Depression in Patients with Non-Small Cell Lung Cancer Receiving Palliative Care: A Randomized Controlled Trial

Dongxu Zheng
Tangdu Hospital Air Force Medical University
Liang Cao
Tangdu Hospital Air Force Medical University
jialin su
Tangdu Hospital Air Force Medical University
Lan Hui Zhang
[illegible]
Yuanyuan Dang
[illegible]
Lijun Han
Tangdu Hospital Air Force Medical University
Shanshan Jia
Tangdu Hospital Air Force Medical University
jin zhang
Tangdu Hospital Air Force Medical University
jin zheng
zjddln@163.com

Tangdu Hospital Air Force Medical University

Research Article

Keywords: Non-small cell lung cancer, Tibetan singing bowls, Quality of life, Anxiety, Depression, Psychological distress, Randomized controlled trial

Posted Date: August 10th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9891546/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Effects of Tibetan Singing Bowls on Quality of Life, Anxiety and Depression in Patients with Non-Small Cell Lung Cancer Receiving Palliative Care: A Randomized Controlled Trial

Dongxu Zheng[a,1], Liang Cao[a], Jialin Su[a], Lan Hui Zhang[b], Yuanyuan Dang[b], Lijun Han[a] Shanshan Jia[a], Jin Zhang[a,*], Jin Zheng[a,*]

a Department of Traditional Chinese Medicine, Tangdu Hospital, Air Force Medical University, Xi'an, China

b Department of Traditional Chinese Medicine, Xi'an Third Hospital, Xi'an, China

*Corresponding author. Tangdu Hospital, Air Force Medical University, No. 1 Xinsi Road, Baqiao District, Xi'an City, China 710038

E-mail addresses:bihaiyinsha0419@163.com(Jin Zhang), zjddln@163.com(Jin Zheng)

1 Dongxu Zheng is first authors.

Abstract

Background and Objectives Patients with non-small cell lung cancer (NSCLC) receiving palliative care (PC)often present with anxiety、depression and psychological distress, which exert a negative impact on their quality of life (QOL). Tibetan singing bowls (TSB), known for their rapid relaxing effects, are widely used as an adjuvant therapy for relieving anxiety and depression as well as improving quality of life in patients with severe physical illnesses. This study aimed to investigate the effects of a four-week continuous TSB intervention on QOL, anxiety, depression and psychological distress among NSCLC patients under PC.

Methods At two study centers, recruited adult participants with NSCLC receiving PC were randomly assigned to the experimental group (EG) and the control group (CG). Ultimately, data from 183 participants were included in the analysis, with 92 cases in the EG and 91 cases in the CG. The EG received TSB intervention, while the CG received standard care. The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30), Hospital Anxiety and Depression Scale (HADS) and Distress Thermometer (DT) were used as outcome measures. HADS and DT were assessed at baseline (Week 0) and at the end of the first to fourth weeks (Week 1–Week 4), while EORTC QLQ-C30 was evaluated at Week 0 and Week 4 only.

Results At Week 0, the baseline characteristics were comparable between the two groups. At Week 4, the EG showed statistically significantly greater changes than the CG in the increased score of the global quality of life factors of the EORTC QLQ-C30 (16.60 vs. 8.30, $p<0.001$), role function (16.70 vs. 16.70, $p<0.001$), emotional function (8.40 vs. 0.00, $p<0.01$), and the reduced score of fatigue (22.20 vs. 11.10, $p<0.01$). The effect sizes were small, small, small and medium respectively. From Week 1 to Week 4, the HADS-A factor of the EG was significantly lower than that of the CG. There was a main effect of time ($F=131.120$, $p<0.001$), a main effect of intervention ($F=7.631$, $p<0.01$), and a time*intervention interaction effect ($F=13.040$, $p<0.001$), corresponding to large, small and medium effect sizes respectively. From Week 1 to Week 4, the HADS-D factor score of the EG was significantly lower than that of the CG. There was a main effect of time ($F=64.943$, $p < 0.001$), a main effect of intervention ($F=9.541$, $p < 0.01$), and an interaction effect of time*intervention ($F=14.076$, $p < 0.001$), corresponding to large, small and medium effect sizes respectively. From week 0 to week 4, the DT scores of the EG decreased significantly. The time effect of the EG was statistically significant ($\chi^2=121.575$, $P<0.001$) with a

small effect size. At week 2 (P>0.05), there was no significant difference in DT scores between the two groups. At week 1, week 3 and week 4 (P<0.05), the DT scores of the EG were significantly lower than those of the CG. EG reported no severe or persistent adverse events.
Conclusion TSB may serve as an effective adjuvant approach to improve partial QOL, anxiety, depression and psychological distress in adult NSCLC patients receiving PC.

Keywords Non-small cell lung cancer; Tibetan singing bowls; Quality of life; Anxiety; Depression; Psychological distress; Randomized controlled trial

Introduction

Lung cancer is one of the malignant tumors with persistently high morbidity and mortality worldwide. NSCLC accounts for the vast majority of lung cancer pathological types, and most patients are diagnosed at the middle and advanced stages, losing the opportunity for radical surgery [1-2].Patients with advanced NSCLC are affected by multiple factors such as disease progression, adverse treatment reactions, prognostic uncertainty, and changes in social roles, and are highly prone to negative emotional disorders including anxiety, depression, and psychological distress [3-4]. Studies have shown that the incidence rates of anxiety and depression in NSCLC patients receiving PC are as high as 50% and 60% respectively, and the incidence rate of psychological distress exceeds 70% [5-7]. These negative emotions not only reduce treatment compliance and aggravate physical discomforts such as insomnia, fatigue and pain, but also significantly impair patients' QOL, forming a vicious cycle between physical and mental health. PC is widely adopted as the main clinical intervention model, aiming to relieve physical symptoms, maintain physical and mental status, prolong survival time and improve overall well-being in the terminal stage [8-9]. The World Health Organization (WHO) clearly states that the core of PC is to focus on the overall physical and mental health of cancer patients, rather than merely controlling physical symptoms [10]. Currently, most PC focuses on the management of physical symptoms, while standardized intervention approaches targeting patients' emotions remain relatively scarce. In addition, conventional psychological counseling is constrained by manpower, venues and individual acceptance, making it difficult to be widely popularized among patients receiving oncological palliative care. There is an urgent need for safe, non-invasive and easy-to-implement non-pharmacological adjuvant intervention programs to supplement the existing palliative care system.

As a traditional music therapy, TSB can rapidly regulate autonomic nervous tone and relieve mental and physical tension through its unique low-frequency resonance and soothing sounds [11-12]. Current studies have confirmed that TSB intervention can regulate electroencephalogram activity and heart rate variability in the brain, reduce cortisol levels, thereby effectively alleviating anxiety and depression in healthy people and patients with chronic diseases, relieving psychological stress, and improving well-being and subjective feelings [13-15]. In recent years, the physical and psychological conditioning effects of TSB have been initially explored in populations with chronic diseases, severe illnesses and tumors [16-18]. However, for the specific population of NSCLC patients receiving PC, high-quality randomized controlled trials are still lacking to verify the effects of TSB on QOL, negative emotions and psychological distress. Meanwhile, the relevant clinical application specifications remain unclear.

Based on the above, this study conducted a randomized controlled trial to explore the intervention effects of a 4-week TSB intervention on QOL, anxiety, depression and psychological distress in adult NSCLC patients receiving PC. The time*intervention interaction effect was analyzed. It is expected to explore a safe, feasible and popularizable non-pharmacological physical and psychological adjuvant intervention for NSCLC patients receiving PC, and provide clinical empirical evidence for optimizing the integrated physical and psychological intervention strategies in oncological PC.

Materials and Methods

Design

This study followed the guidelines of the 2010 CONSORT Statement, including its extensions for complementary medicine and music interventions. This is a multicenter, randomized, two-arm, single-blind randomized controlled clinical trial conducted from October 2023 to December 2025 at the Department of Traditional Chinese Medicine of Tangdu Hospital, Air Force Military Medical University and Xi'an No.3 Hospital in Xi'an City, China. In this trial design, outcome assessors and data analysts were blinded to group assignments. However, due to the distinct characteristics of the TSB sound, complete blinding of participants was not achieved.

Ethical Approval

The study protocol was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrollment. The study obtained ethical approval from the Ethics Committee of The Second Affiliated Hospital of Air Force Medical University, and the corresponding approval number is K202512-36. It was also registered on the International Traditional Medicine Clinical Trial Registration Platform with the registration number ITMCTR2026000315 on January 15, 2026 (https://itmctr.ccebtcm.org.cn/).

Sample size and randomization

Sample size was calculated using G*Power software (version 3.1.9.7). The primary outcome was measured using the EORTC QLQ-C30 questionnaire. A two-sided test was performed with $\alpha=0.05$, a power of $1-\beta=0.8$, and an effect size of Cohen's $d=0.3$. The calculation indicated a requirement of 88 participants per group. Considering a 20% dropout rate, a final sample size of 106 participants per group was determined, resulting in a total of 212 participants in both groups. Participants were randomly assigned to either EG or CG at a 1:1 ratio using a computer-generated random sequence.

Participants and Setting

Participants were recruited through referrals from attending physicians and research poster recruitment. Interested participants contacted the research coordinator, who arranged face-to-face eligibility interviews for enrollment. Eligibility criteria include：（a）Meets the diagnostic criteria for NSCLC according to the ICD-11, with tumor staging at II–IV；(b) is receiving PC for tumors；(c) Age ≥ 18 years old, gender is not limited, and hearing is normal；(d) Expected survival time ≥ 6 months；(e) Karnofsky Performance Status (KPS) score ≥ 50；(f) Have no previous experience with music therapy ；(g) Proficient in using social media platforms for online communication, so as to support post-discharge follow-up procedures. Exclusion criteria include (a) Current

diagnosis or history of suicidal tendencies, post-traumatic stress disorder, schizophrenia, and/or psychotic disorders; (b) Central nervous system metastatic tumors accompanied by cognitive impairment; (c) Severe cardiopulmonary function abnormalities; (d) Patients experiencing pain or breakthrough pain; (e) Severe hearing impairment that makes it impossible to perceive TSB sounds; (f) Inability to understand the assessment scale or instructions for experimental interventions. Withdrawal Criteria：（a）Voluntary withdrawal from the study during the intervention period；（b）Disease progression leading to non-compliance with inclusion criteria;(c)Loss to follow-up or failure to complete the required interventions/assessments. The study design and participant flow have been summarized in the CONSORT flow diagram (Figure 1).

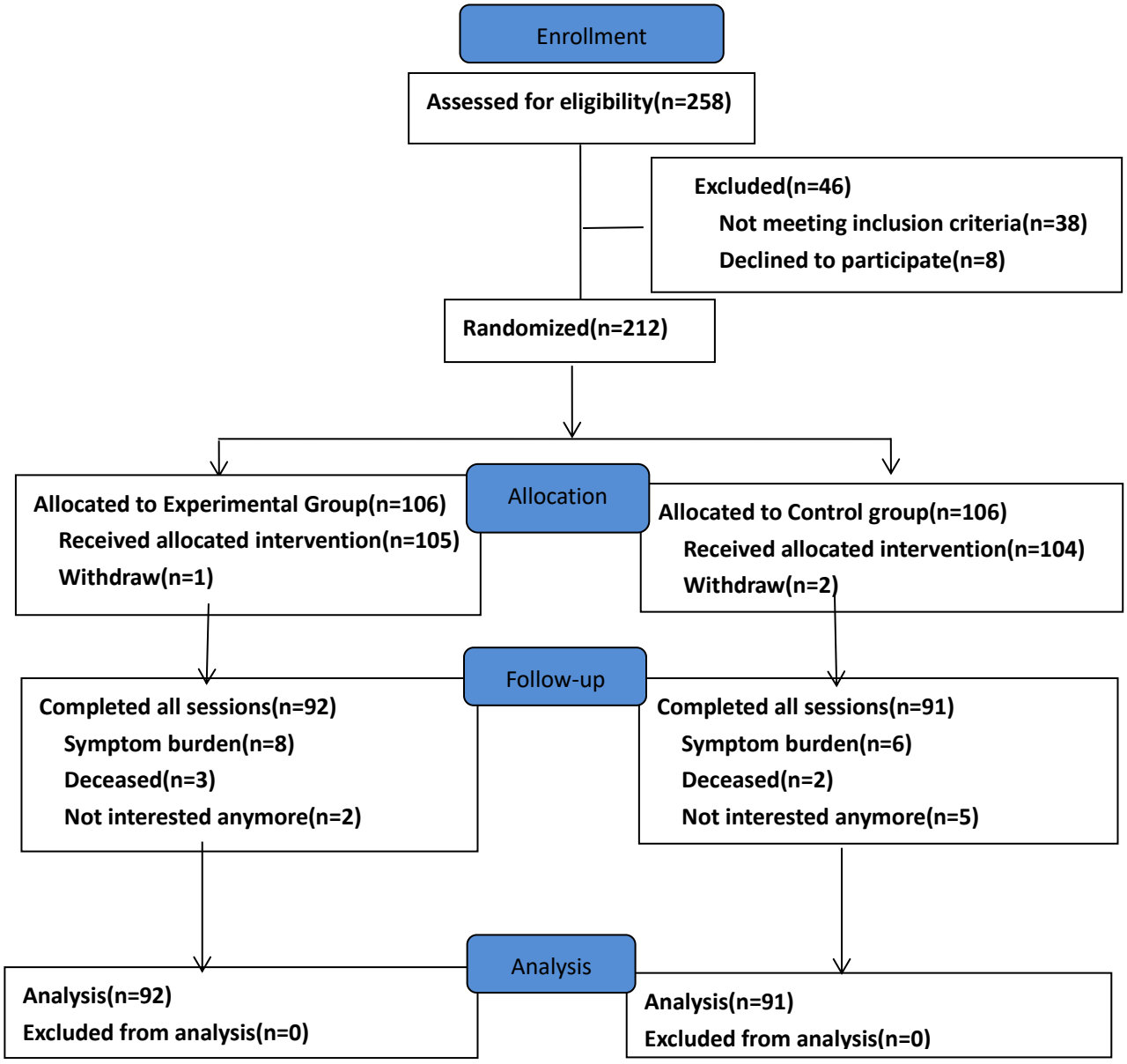


Figure 1. CONSORT flow diagram

Intervention Protocol

TSB for EG were administered at 4:30 p.m. on weekdays during participants' hospitalization, with each session lasting 40 minutes and a total of 3 to 5 sessions conducted. The PI invited 3 to 5 participants from EG into the treatment room as a group to complete baseline assessments. TSB was delivered by standardized trained music therapists in accordance with a standardized protocol，the therapist generated TSB by striking or rubbing quartz singing bowls, while participants listened in a relaxed semi-recumbent position on a sofa(Figure 2). The treatment session was recorded, and the audio file was sent to participants after the first intervention. All participants received short-term interventions during hospitalization and transitioned to long-term interventions after discharge, listening to the singing bowl recordings independently at 9:00 p.m. daily. To improve intervention adherence, a dedicated WeChat work group was established for EG, and the PI sent reminders to listen to the TSB recordings at 8:40 p.m. daily. Interventions for CG were conducted at 2:30 p.m. on weekdays during participants' hospitalization. The PI invited participants to the same treatment room to complete baseline assessments and invited them to join a CG WeChat work group. PC physicians and nurses provided health education on oncological PC to participants, with each session lasting 40 minutes. The educational content was recorded simultaneously and sent to participants, who were encouraged to listen to the recordings regularly.



Figure 2: Scene diagram of the TSB process

Self-report Outcomes

At baseline, the participants' sociodemographic characteristics, medical history, treatment history, as well as EORTC QLQ-C30, HADS, and DT were assessed; at the end of the 1st, 2nd, and 3rd weeks after intervention, only HADS and DT were assessed; at the end of the 4th week, EORTC QLQ-C30, HADS, and DT were assessed again.

Primary Outcome

This study mainly focuses on the participants' quality of life, evaluated using the EORTC

QLQ-C30[19]. This scale consists of 30 items, with the specific composition as follows: 1 global quality of life dimension (QL), which serves as a comprehensive evaluation of the patients' overall quality of life and is one of the core assessment indicators in this study; 5 functional dimensions, used to reflect the patients' functional status in daily physical, social, and psychological aspects, specifically including physical functioning (PF), role functioning (RF), cognitive functioning (CF), emotional functioning (EF), and social functioning (SF); 3 multi-item symptom dimensions, including fatigue (FA), nausea and vomiting (NV), and pain (PA); 6 single-item symptoms, including dyspnea (DY), insomnia (SL), loss of appetite (AP), constipation (CO), diarrhea (DI), and financial difficulties (FI). All items are scored on a 4-point scale ranging from 1 to 4. The scoring strictly follows the principle of converting raw scores to standard scores, and the final scores of all dimensions are uniformly converted to a 0-100 scale. Moreover, the interpretation logic of functional dimensions and symptom dimensions is opposite. Among them, higher scores in the global quality of life dimension and functional dimensions indicate that the patients have a higher corresponding overall quality of life and better functional status; higher scores in all symptom dimensions indicate that the severity of the patients' corresponding symptoms is higher and their physical discomfort is stronger. This scale has good reliability (reliability coefficient 0.70-0.90) and validity (validity coefficient 0.50-0.90), and is suitable for evaluating the quality of life in this study.

Secondary Outcome

We used HADS [20] to assess the participants' anxiety and depression symptoms. This scale consists of 14 items, divided into two parts: the Anxiety Subscale (HADS-A) and the Depression Subscale (HADS-D), with each subscale containing 7 items. All items are scored on a 4-point scale ranging from 0 to 3. The total score range for both subscales is 0 to 21, with higher scores indicating more severe anxiety or depression symptoms in the subjects. This scale has good reliability (reliability coefficient 0.80-0.90) and validity (validity coefficient 0.60-0.80), and can be effectively used to assess anxiety and depression symptoms in this study.

We used DT[21] to assess the participants' level of psychological distress. This tool is a standardized scale specifically designed for the rapid assessment of psychological distress in cancer patients. The scale adopts a single-item visual analog scoring format, with an 11-level scoring system ranging from 0 to 10, to evaluate the overall psychological distress of patients over the past week. A score of 0 indicates no distress, 10 indicates extreme distress, and a score of $\geqslant 4$ suggests that the patient has clinically significant psychological distress. Additionally, the scale is accompanied by a Problem List, which can further identify the specific sources of the patient's psychological distress from multiple dimensions such as emotional, physical, family, social, spiritual beliefs, and practical issues. The scale has good reliability (reliability coefficient 0.70 - 0.90) and validity (validity coefficient 0.65 - 0.85), which can effectively meet the needs of assessing psychological distress in this study.

Statistical Analysis

SPSS 23.0 software was used for statistical analysis and graph plotting[22]. Firstly, normality test and homogeneity of variance test were performed on all research variables. Measurement data were described as mean standard deviation ($\overline{X} \pm SD$) or median (interquartile range, IQR) according to their distribution characteristics; enumeration data were expressed as case number (percentage, %). The chi-square test was adopted for enumeration data that met the applicable conditions of the test, while Fisher's exact probability method was used for those that did not. For

measurement data conforming to normal distribution, independent-samples t-test was used for intergroup comparison; for measurement data not conforming to normal distribution, Mann-Whitney U test was employed. Repeated-measures analysis of variance (RMANOVA) was applied for normally distributed repeated observation data. If Mauchly's test of sphericity is significant, the Greenhouse-Geisser method shall be used to correct the degrees of freedom, and the Bonferroni method shall be adopted for post-hoc multiple comparisons. For repeated measurement data that do not conform to the normal distribution, the Friedman nonparametric test is applied, Kendall's W is used to calculate the effect size, and the Nemenyi test is performed for post-hoc analysis. All tests in this study are two-tailed, and a P value less than 0.05 is considered statistically significant.

Results

Participant characteristics

A total of 258 participants were screened for eligibility, of whom 46 were excluded. Among the excluded participants, 38 did not meet the inclusion criteria and 8 declined to participate in the study. Finally, 212 participants were enrolled and randomly assigned to EG and CG, with 106 in each group. A total of 29 patients withdrew during the study, with a dropout rate of 13.68%. Specifically, 14 patients withdrew from EG, representing a dropout rate of 13.20%. Among them, 1 patient failed to understand the assessment content, 8 withdrew due to disease progression, 3 died, and 2 lost interest in the study. Meanwhile, 15 patients withdrew from CG, with a dropout rate of 14.15%. In this group, 2 patients could not comprehend the assessment content, 6 withdrew because of disease progression, 2 passed away, and 5 lost interest in the research. A total of 183 participants completed all interventions and assessments and were included in the final analysis, with 92 in EG and 91 in CG (Figure 1).

The average age of the participants was 62.61 years (SD = 8.16), among whom 73.2% were male, 96.2% were Han ethnicity, 88.0% had an education level of junior high school or above, and 89.6% were married. The main pathological type of the participants was adenocarcinoma, accounting for 50.8%, and squamous cell carcinoma accounted for 41.0%. The distribution of tumor stages was as follows: stage Ⅱ accounted for 19.1%, stage Ⅲ for 57.4%, and stage Ⅳ for 23.5%. Most participants (73.2%) received immunotherapy in their palliative care regimen, and the average duration of palliative care received by the participants was 2.44 years (SD = 1.19). There were no statistically significant differences between the two groups in demographic characteristics, pathological types, tumor stages, treatment history, or duration of palliative care (P > 0.05), indicating that the two groups had good comparability (Table 1).

Table1 **Baseline sample characteristics.**

Characteristics	Total(n=183)	EG (n=92)	CG (n=91)	t/χ^2	*P*
Age(M,SD,years)	62.61(8.16)	62.92(7.93)	62.29(8.42)	0.528	0.598
Sex(n and %)					

Male	134(73.2%)	65(70.7%)	69(75.8%)	0.624	0.430
Female	49(26.8%)	27(29.3%)	22(24.2%)		
Ethnic(n and %)					
Han ethnic	176（96.2%）	88（95.7%）	88（96.7%）	0.137	0.711
Other（Hui、Mongolian、Tibetan）	7（3.8%）	4（4.3%）	3（3.3%）		
Education(n and %)					
Primary school and below	22(12.0%）	10（10.9%）	12（13.2%）	0.686	0.953
Junior high school	60（32.8%）	32（34.8%）	28（30.8%）		
Senior high school	55（30.1%）	28（30.4%）	27（29.7%）		
University	41（22.4%）	20（21.7%）	21（23.1%）		
Postgraduate	5（2.7%）	2（2.2%）	3（3.3%）		
Marital status (n and %)					
Married	164(89.6%)	83(90.2%)	81(89.0%)	2.562	0.464
Widowed	7(3.8%)	3(3.3%)	4(4.4%)		
Divorced	10(5.5%)	4(4.3%)	6(6.6%)		
Single	2(1.1%)	2(2.2%)	0(0%)		
Pathology of NSCLC (n and %)					
Squamous cell carcinoma	75(41.0%)	36（39.1%）	39（43.3%）	1.161	0.884
Adenocarcinoma	93(50.8%)	49（53.3%）	44（48.9%）		
Large cell carcinoma	9(4.9%)	5（5.4%）	4（4.4%）		
Mixed	3（1.6%）	1（1.1%）	2(2.2%)		

Other	3(1.6%）	1（1.1%）	2（2.2%）		
Tumor staging（n and %)				0.284	0.867
II	35(19.1%)	19(20.7%)	16(17.6%)		
III	105(57.4%)	52(56.5%)	53(58.2%）		
IV	43(23.5%)	21(22.8%)	22(24.2%)		
Undergoing anticancer treatment（n and %)					
Immunotherapy	134（73.2%）	69(75.0%)	65(71.4%)	1.457	0.692
Targeted therapy	28（15.3%）	15(16.3%)	13(14.3%)		
Chemotherapy	16（8.7%）	6(6.5%)	10(11.0%)		
Radiotherapy	5(2.7%)	2(2.2%)	3(3.3%）		
Years in palliative care(M,SD,years)	2.44(1.19)	2.47(1.24)	2.41(1.15)	0.994	0.730

EORTC QLQ-C30

At week0, there were no significant differences between EG and CG in the factor scores of QL, RF, EF, and FA of the EORTC QLQ-C30. At week4, the scores of QL ($p<0.01$), RF ($p<0.01$), and EF ($p<0.05$) in EG were significantly higher than those in CG, with effect sizes of 0.39, 0.19, and 0.16 respectively, representing medium, small, and small effects respectively. Moreover, the increases in QL ($p<0.01$), RF ($p<0.01$), and EF ($p<0.01$) in EG were significantly higher than those in CG, with effect sizes of 0.25, 0.24, and 0.22 respectively, all indicating small effects. At week0, there was no significant difference in FA factor scores between the two groups. At week4, the FA score ($p<0.01$) in EG decreased significantly, with an effect size of 0.23, small effect， and the reduction in FA ($p<0.01$) was significantly greater than that in CG, with an effect size of 0.29，medium effect (Table 2). There were no significant differences between the two groups at week0 in the remaining 11 factors of the EORTC QLQ-C30, nor were there significant differences in the values at week4. Comparison of the week0-4 differences in EORTC QLQ-C30 factors between the two groups (Figure 3).

Table 2 Comparison of QL, RF, EF, and FA Factor Scores of EORTC QLQ-C30 [($\bar{X}$±SD)or Median(IQR)]

	Total(n=183)	EG(n=92)	CG(n=91)	t/Z	*p*	Effect siz
QL						
Week0	46.31±18.7	46.29±19.3	46.34±18.2	0.016	0.987	
week4	53.78±19.1	57.43±18.4	50.09±19.2	2.634	0.009	0.39
Week4-0	8.30(16.7)	16.60(16.7)	8.30(16.7)	3.323	0.001	0.25
RF						
Week0	50.00(33.4)	50.00(33.4)	50.00(33.4)	0.763	0.806	
Week4	66.70（33.3）	66.70(16.7)	66.70(25.0)	2.607	0.009	0.19
Week4-0	16.70（33.3）	16.70(33.3)	16.70(33.3)	3.301	0.001	0.24
EF						
Week0	58.70±21.0	58.34±20.7	59.07±21.5	0.350	0.815	
Week4	66.70(25.0)	66.70(16.7)	58.30(25.0)	2.203	0.028	0.16
Week4-0	8.30(24.9)	8.40（16.7）	0.00（16.8）	2.982	0.003	0.22
FA						
Week0	44.40(33.4)	44.40(44.5)	44.40(33.4)	0.018	0.985	
Week4	44.40(33.4)	33.30(22.2)	44.40(22.3)	3.063	0.002	0.23
Week4-0	11.10(22.2)	22.20(30.5)	11.10(11.2)	3.899	<0.001	0.29

Abbreviations: QL, global quality of life dimension; RF, role functioning ; EF, emotional functioning; FA, fatigue

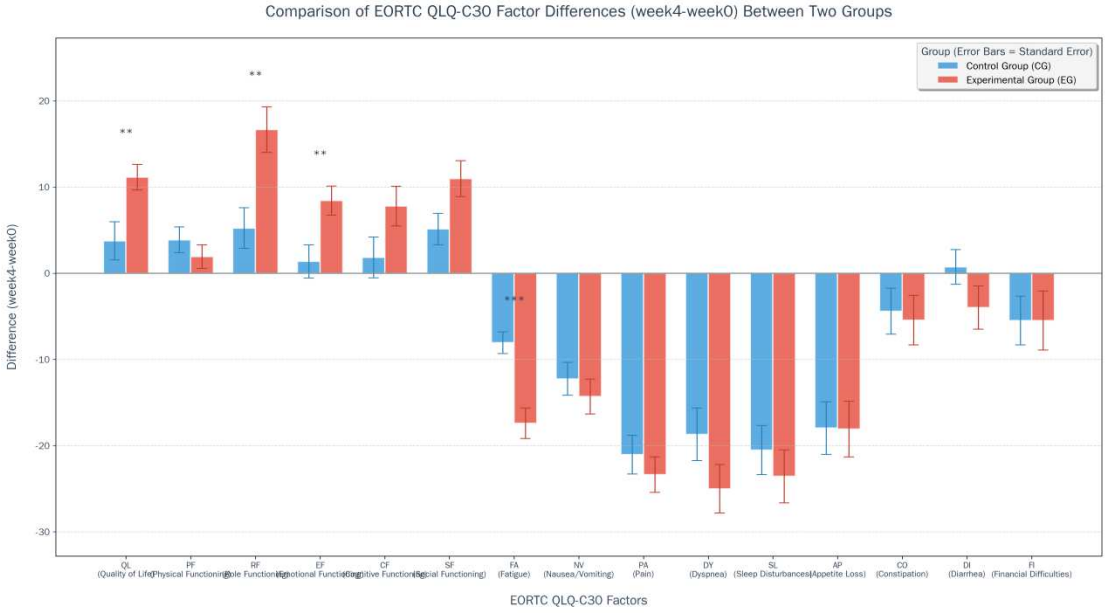


Figure 3 Comparison of week4-week0 differences in EORTC QLQ-C30 factors between the two groups

HADS-A

RMANOVA revealed significant statistical differences in the main time effect of anxiety scores (F=131.120, P<0.001，η^2=0.420), main intervention effect (F=7.631, P=0.006，η^2=0.040), and time*intervention interaction effect (F=13.040, P<0.001，η^2=0.067)，respectively for large, small and medium effects. Further simple effect analysis revealed the following results. Taking time as the independent variable, a significant main effect of time was found on anxiety scores in the EG (F = 81.987, P < 0.001). Bonferroni post-hoc tests showed that anxiety scores from week 1 to week 4 were significantly lower than those at week 0 (P < 0.001). The CG also exhibited a significant main effect of time (F = 52.196, P < 0.001), and Bonferroni post-hoc tests indicated that anxiety scores from week 1 to week 4 were significantly lower than those at week 0 (P < 0.001).In terms of intervention effect with group as the independent variable, there was no significant difference between the two groups at week 0 (P>0.05), while significant differences were observed at week 1 to week 4 (P<0.05or P<0.01). The changes in anxiety scores of the two groups are shown in Figure 4.

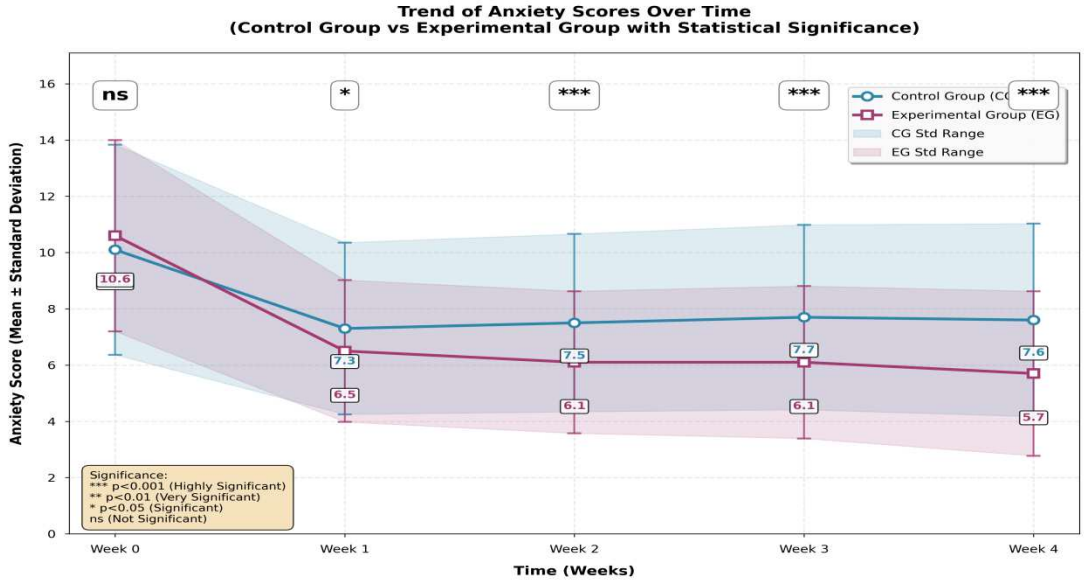


Figure 4. Changes in anxiety during the intervention process assessed by the HADS scale. Dots represent mean values, and error bars indicate 95% confidence intervals

HADS-D

RMANOVA revealed that the main time effect (F=64.943，P<0.001，η^2=0.264), main intervention effect (F=9.541，P<0.01，η^2=0.050), and time*intervention interaction effect (F=14.076，P<0.001，η^2=0.072) of depression scores were all statistically significant，respectively for large, small and medium effects. Further simple effect analysis showed that the time effect with time as the independent variable indicated a significant main effect of time on depression scores in the EG (F=91.613，P<0.001). Bonferroni post-hoc tests revealed that depression scores from week 1 to week 4 were significantly lower than those at week 0 (P < 0.001). The CG also showed a significant main effect of time (F=10.711，P<0.001), and Bonferroni post-hoc tests confirmed that depression scores from week 1 to week 4 were significantly lower than those at week 0 (P < 0.01 or P < 0.001). The intervention

effect analysis with group as the independent variable showed that there was no significant difference between the two groups at week 0 (P>0.05). From week 1 to week 4, the depression scores of the EG group were lower than those of the CG group, with statistically significant differences (P<0.05, P<0.01 or P<0.001). The changes in depression scores of the two groups are presented in Figure5.

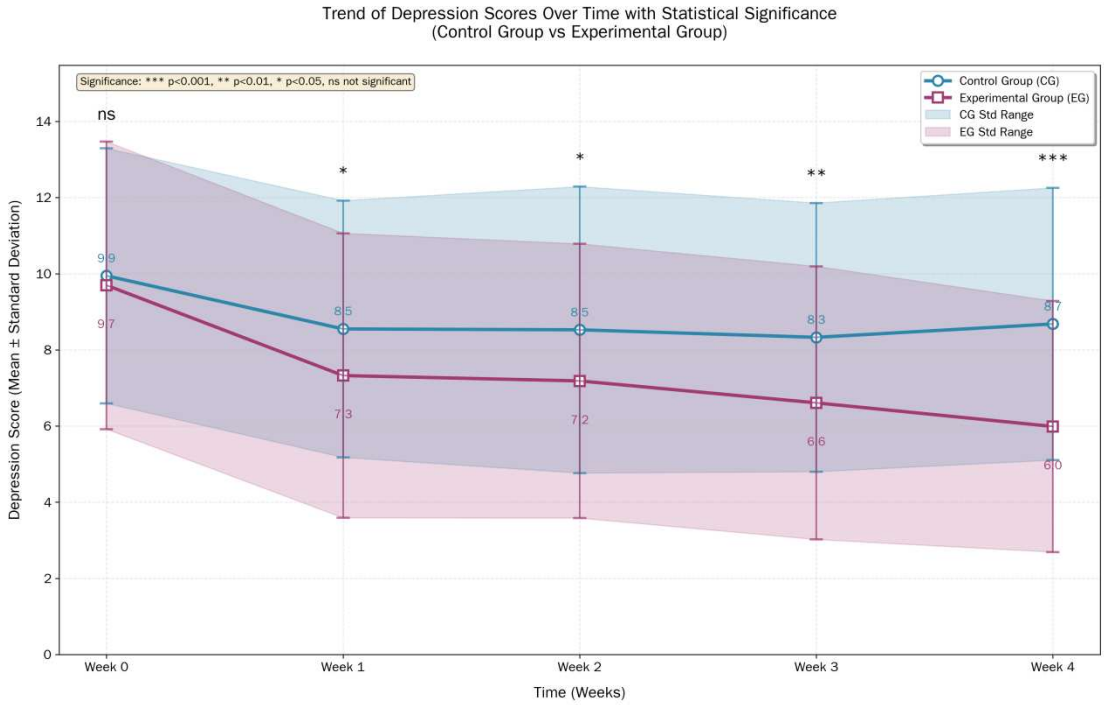


Figure 5. Changes in depression during the intervention process of the HADS scale. Dots represent mean values, and error bars indicate 95% confidence intervals

DT

Repeated-measures Friedman nonparametric test on DT scores revealed a significant time effect in the EG (χ^2=121.575, P<0.001, Kendall's W=0.22) with a small effect size. The Nemenyi post-hoc test showed that the DT scores from week 1 to week 4 were significantly lower than those at week 0 (P<0.05 or P<0.001). A significant time effect was also observed in the CG (χ^2=62.272, P<0.001, Kendall's W=0.21), accompanied by a small effect size. The Nemenyi post-hoc test indicated that the DT scores from week 1 to week 4 were significantly lower than those at week 0 (P<0.05 or P<0.001). Further Mann-Whitney U tests were performed on the DT scores of the two groups from week 0 to week 4. No significant differences were found at week 0 and week 2 (P>0.05). The DT scores of the EG were significantly lower than those of the CG at week 1, week 3 and week 4 (P<0.05). Boxplots illustrating changes in DT scores between the two groups from week 0 to week 4 are presented in Figure 6.

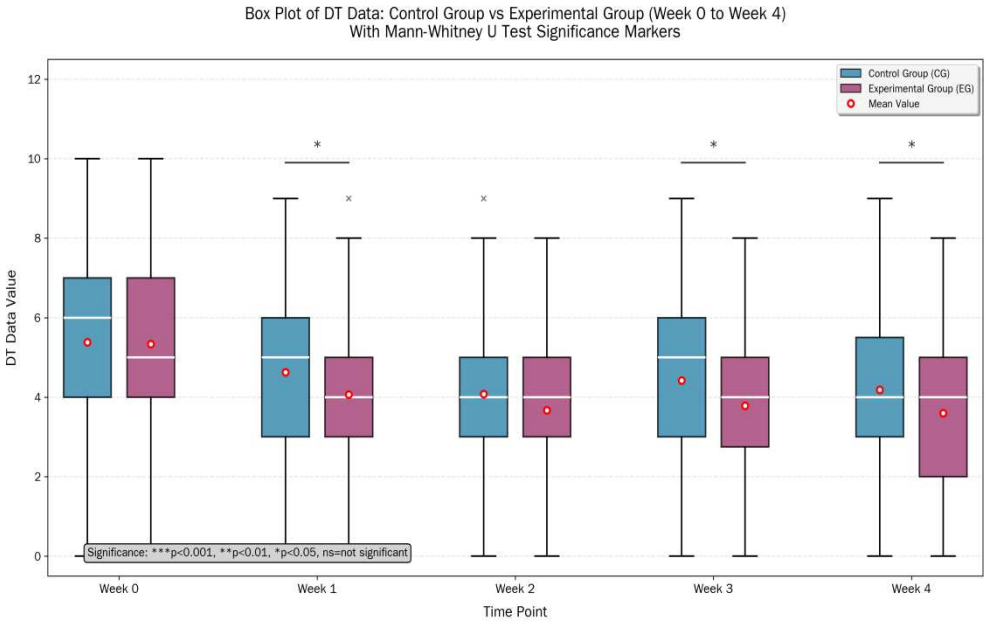


Figure 6. Changes in psychological distress during intervention assessed by the DT scale. The horizontal line in the box represents the median, and the dot represents the mean value.

Safety

During the study, after the initial TSB intervention, 2 participants in the EG reported tinnitus, 1 reported dizziness and 1 experienced increased sleepiness. These symptoms all emerged right after the first intervention and resolved spontaneously within 24 hours. No adverse events were reported in subsequent interventions. Participants in the CG reported no intervention-related adverse events.

Discussion

Patients with NSCLC receiving PC experience a severe symptom burden, among which negative emotions are prominent and severely impair their QOL. TSB has been repeatedly proven to alleviate negative emotions and improve QOL in healthy young and middle-aged individuals, patients waiting for surgery, and those with chronic diseases including tumors, spondylitis and post-traumatic stress disorder [12,13]. Featuring non-invasiveness, easy operation, wide accessibility and low cost, TSB is suitable for debilitated NSCLC patients receiving PC. This multicenter, randomized, single-blind controlled trial explored the effects of four consecutive weeks of TSB intervention on QOL and negative emotions of patients with metastatic NSCLC receiving PC. The results showed that at the end of the trial, the EG had significantly higher increases in the GL, RF and EF scores, as well as a notably greater reduction in FA scores of the EORTC QLQ-C30 compared with the CG. Four weeks of continuous TSB intervention markedly lowered the scores of HADS-A, HADS-D and DT in the EG. The findings of this study support TSB as a complementary strategy to enhance QOL and mental health of metastatic NSCLC

patients receiving PC.

The EORTC QLQ-C30 is one of the classic instruments for evaluating QOL in cancer. Compared with the CG, the results revealed that 4 weeks of TSB exerted significant positive effects on the increased values of QL, RF, EF and the decreased value of FA in the EG ($p < 0.01$ or $p < 0.001$). The effect sizes were 0.25, 0.24, 0.22 and 0.29 respectively, all indicating small effect sizes. This suggests that TSB can effectively improve patients' overall QOL, role functioning, emotional functioning and relieve fatigue symptoms, though the magnitude of improvement is limited. No significant improvements were observed in other functional and symptomatic dimensions. TSB yielded stronger effects on functional domains than symptomatic domains.

QL reflects patients' overall subjective perception of their own QOL and is closely correlated with functional and symptomatic factors. The RF dimension assesses patients' ability to engage in daily activities, work and fulfill social roles. TSB is not only an alternative medical approach but also an activity. It adds fun to participants' monotonous PC phase. Meanwhile, the guiding words of TSB include expressions that focus on present feelings, accept the current situation and do what one should do, which may facilitate participants' cognitive transformation towards the PC state and help improve QL and RF.

Findings from existing studies support the conclusions of this research. A randomized controlled trial on refugees reported significant improvements in vitality and mental health as measured by the 36-Item Short Form Health Survey (SF-36) [24]. Another randomized controlled trial targeting patients with stage I–III breast cancer found notable increases in the mental health and mental well-being subscales of the SF-36 [25]. Nevertheless, a randomized controlled trial on patients with chronic non-specific spinal pain showed no significant improvement in SF-36-assessed QOL, yet a favorable trend was observed in the pain subscale [26]. Additionally, a pre-post comparative study involving 12 patients with metastatic cancer detected no improvement in QOL, and the small sample size was considered a major source of bias [27].

Fatigue is a prevalent symptom among non-small NSCLC patients receiving PC and severely impairs their QOL. During TSB, participants achieved physical and mental relaxation and recovered physical strength. Current relevant studies have yielded the same results. A self-controlled trial involving healthy participants demonstrated a significant reduction in fatigue scores [28]. However, another study on fatigue among patients with stage I-III breast cancer reported no notable improvement [25]. There are numerous factors contributing to fatigue in breast cancer patients, among which treatment modalities stand as a major cause. Endocrine therapy and chemotherapy for breast cancer can lead to persistent fatigue [29]. In this study, 73.2% of the participants received immunotherapy, which causes mild fatigue that is easy to relieve [30].

Furthermore, TSB is categorized as a type of music therapy. Current evidence has confirmed its beneficial effects on fatigue in cancer patients across different disease stages and under various treatment modalities [31,32]. In summary, TSB produces positive yet small-sized effects on overall QOL, role functioning, emotional functioning and fatigue in NSCLC patients receiving PC.

Anxiety is one of the most common negative emotions among patients with NSCLC during PC, which is mainly manifested as excessive worry about the future. Patients tend to suffer from prominent anxiety due to disease progression, uncertain treatment outcomes, fear of death and other related factors.

This study adopted HADS-A to evaluate the effect of TSB on participants' anxiety.

RMANOVA revealed statistically significant main effects of time, intervention, as well as the time*interaction effect on anxiety scores (all $P < 0.001$). The corresponding effect sizes were 0.420, 0.040 and 0.067, representing large, small and medium effect sizes respectively. The findings indicated that the intervention, time factor and their interaction all exerted significant impacts on participants' anxiety.

With group as the independent variable, there was no significant between-group difference in anxiety scores at Week 0 ($P > 0.05$). From Week 1 to Week 4, the HADS-A scores of the EG were significantly lower than those of the CG ($P < 0.05$ or $P < 0.01$). This demonstrated that TSB could effectively relieve participants' anxiety starting from the first week, and the therapeutic effect persisted until the end of the intervention. Given the medium effect size of the time*intervention interaction, TSB exerted a moderate effect on alleviating anxiety at the end of the study.

TSB can reduce the overall electroencephalogram power, regulate the balance between the sympathetic and parasympathetic nerves, thereby improving heart rate variability and lowering anxiety scores [33]. Previous studies on TSB involving both healthy individuals and patients have verified that its anxiolytic effect exists across different populations [16]. A randomized controlled trial among young healthy adults found that TSB significantly reduced anxiety scores [34]. Consistent results were also reported in randomized controlled trials targeting college students and middle-aged healthy populations [14、28、35]. Furthermore, TSB was proven to markedly decrease anxiety levels in patients awaiting surgery or angiography [36,37]. One study also noted a significant reduction in anxiety among patients with metastatic tumors after TSB intervention [27].

The results of the present study are in line with previous evidence, further confirming that TSB can alleviate anxiety in NSCLC patients receiving palliative care with a moderate therapeutic effect.

Depression is another prevalent negative emotion among patients with NSCLC receiving PC, which often coexists with anxiety. Its core manifestations include persistent low mood, feelings of hopelessness and helplessness, and may even lead to suicidal ideation in severe cases.

The analytical results of HADS-D in this study shared certain similarities with anxiety scores, while presenting distinct characteristics. RMANOVA showed significant main effects of time, intervention, as well as the time*intervention interaction on depression scores (all $P < 0.01$). The corresponding effect sizes were 0.264, 0.050 and 0.072, categorized as large, small and medium effect sizes respectively. Notably, the effect size of the main intervention effect was slightly higher than that for anxiety, indicating that TSB exerted a marginally stronger effect on relieving depression than anxiety.

Taking group allocation as the independent variable, no significant difference in depression scores was observed between the two groups at Week 0 ($P > 0.05$). From Week 1 to Week 4, the HADS-D scores of the EG were significantly lower than those of the CG ($P < 0.05$, $P < 0.01$ or $P < 0.001$). Moreover, the statistical significance of intergroup differences gradually increased over time. These findings demonstrated that TSB could alleviate depression starting from the first week of intervention, with sustained efficacy that became more prominent as the intervention progressed. The time*intervention interaction yielded a medium effect size, suggesting that TSB produced a moderate improvement in depression by the end of the study.

The physiological mechanism underlying TSB's antidepressant effect is identical to its anxiolytic mechanism, which involves reducing participants' overall electroencephalogram power.

Randomized controlled trials on healthy individuals revealed that a single TSB session could reduce depression scores in young and middle-aged adults, accompanied by improvements in heart rate variability and brain wave activity [28,37,38]. Another randomized controlled trial on TSB sound meditation reported a marked reduction in negative emotions among healthy participants [39]. Consistent outcomes were also observed in patient cohorts: significant declines in depression scores were documented in patients with chronic non-specific spinal pain, patients with stage I–III breast cancer, and patients with metastatic tumors [25,26,27].

The results of the present study are consistent with prior research, further verifying that TSB exerts a significant and sustained therapeutic effect on alleviating depression in NSCLC patients under palliative care.

Psychological distress is a comprehensive reflection of the physical and mental status of cancer patients. It covers multiple dimensions including emotion, cognition and social interaction, and serves as a key indicator for evaluating patients' psychological conditions [40].

In this study, the Friedman nonparametric test was used to analyze changes in DT scores between the two groups. The results showed a significant time effect on DT scores in the EG（χ^2=121.575，P＜0.001）with Kendall's W = 0.22, indicating a small effect size. A significant time effect was also found in the CG（χ^2=62.272，P＜0.001）with Kendall's W = 0.21, also representing a small effect size. The Nemenyi post-hoc test revealed significant differences in pairwise comparisons between Week 0 and all other time points in both groups ($P < 0.05$ or $P < 0.001$). This indicated that both TSB and standard care yielded significant improvements in DT scores starting from the first week, which was consistent with the improvement trends of anxiety and depression.

Further Mann-Whitney U test demonstrated no significant intergroup differences in DT scores at Week 0 and Week 2 ($P > 0.05$). However, the EG presented remarkably lower DT scores than the CG at Week 1, Week 3 and Week 4 ($P < 0.05$), suggesting that TSB was superior to standard care at these time points. Unlike its effects on anxiety and depression, TSB exerted a time-lagged impact on psychological distress, with more stable efficacy observed in the middle and late stages of intervention.

It is speculated that this may be attributed to the multifaceted nature of psychological distress [41]. Its relief is a gradual process, and the beneficial effects of the intervention on emotion, role functioning and overall QOL require time to accumulate. Although initial efficacy was observed, a transient fluctuation occurred at Week 2, followed by steady and sustained improvement.

A multi-session TSB intervention study on patients with metastatic cancer confirmed a significant reduction in DT scores [27], and a music therapy trial targeting patients with NSCLC drew the same conclusion [42]. Accordingly, music therapy represented by TSB can effectively alleviate psychological distress among cancer patients.

This study adopted a four-week continuous TSB protocol, which differs from previous studies reviewed in the literature that applied single-session TSB intervention [13]. While a single session can produce therapeutic effects, the four-week continuous intervention allowed for observation of participants' adherence.

A total of 92 participants in the EG completed all interventions and assessments, with a dropout rate of 13.2%, which falls within the reasonable range for similar clinical studies. The main reasons for dropout included disease progression, loss of interest in the study and death. These findings indicate that the four-week TSB intervention design possesses good feasibility and

participant adherence.

Male patients accounted for 73.2% of all participants. This high proportion may be attributed to the higher incidence of NSCLC among males [43].

In addition, safety is one of the core indicators for evaluating TSB. NSCLC patients receiving PC generally have poor physical function and low tolerance to invasive interventions, making the safety of interventions particularly important. The results showed that only a few adverse events occurred among EG participants during the intervention, including mild dizziness, tinnitus and increased sleepiness. All these symptoms relieved and subsided in subsequent sessions, proving that TSB intervention has favorable safety and tolerability without causing obvious additional adverse reactions.

This outcome is highly consistent with the design philosophy of TSB. As a non-invasive and gentle intervention, TSB avoids potential adverse reactions associated with pharmacotherapy and invasive procedures, making it more suitable for physically frail NSCLC patients receiving PC. Its satisfactory safety not only helps improve participants' adherence, but also lays a solid foundation for its clinical promotion. It is confirmed that TSB can be safely applied to cancer patients receiving PC, serving as a safe, feasible and effective approach for clinical intervention targeting QOL and negative emotions.

Other demographic and clinical characteristics of the participants were basically consistent with those of mainstream NSCLC patients receiving routine PC in clinical practice. This demonstrates that the study sample is well representative, and the research findings can be generalized to similar NSCLC patients receiving PC.

Limitations

Although this study has yielded promising results among NSCLC patients receiving PC, several limitations remain and need to be addressed in future research. First, the follow-up period was only four weeks, so the long-term sustainability of the intervention effects remains unclear. Longer follow-up durations are required to explore the persistent impacts of the intervention on patients' QOL, negative emotions and psychological distress.

Second, participants were recruited mainly from two medical institutions, most of whom resided in northwest China. The sample was predominantly Han ethnicity and married individuals, resulting in insufficient sample diversity. This may introduce bias and compromise the generalizability of the findings. Further studies should expand the sample size and enroll participants of diverse ethnicities and marital statuses to improve the extrapolation value of the results.

Third, all TSB sessions in this study were performed by professional therapists. Given that TSB is well known for its simple operation, subsequent research could investigate the efficacy of self-administered TSB among NSCLC patients receiving PC.

Research Prospects

First, existing literature has reported that TSB exerts positive effects on subjective sleep perception, hypertension and anxiety during stress [45-46]. This provides new directions for future studies on anxiety in newly diagnosed NSCLC, as well as insomnia, hypertension and other physical symptoms among NSCLC receiving PC.

Second, this study did not conduct an in-depth exploration of the specific mechanisms

underlying TSB efficacy. We only speculated that the effects were associated with psychological support and emotional relief. Further mechanistic research is therefore needed to clarify the core pathways through which this intervention improves participants' QOL and relieves negative emotions, so as to generate more precise evidence for the optimization of intervention protocols.

Third, data on potential confounding factors including treatment adherence, economic status and social support were not collected in this study. These factors may exert certain impacts on the research outcomes. Follow-up studies should incorporate relevant confounding factors and conduct multivariate analysis to further enhance the reliability of the results.

Looking ahead, future research may target other types of cancer patients receiving PC, so as to accumulate solid evidence for the widespread application of TSB among this patient population. To facilitate the clinical translation of TSB in PC for cancer patients, the TSB intervention protocol can be further optimized based on the findings of this study and in consideration of individual differences among patients.

Meanwhile, TSB can be combined with routine palliative care to establish a physical and mental integrated PC model. This will deliver more comprehensive and high-quality care for cancer patients under PC, improve their QOL, and alleviate negative emotions and psychological distress.

Conclusion

This randomized controlled trial verified that TSB can effectively improve the overall quality of life, role functioning and emotional functioning of patients receiving palliative care, as well as alleviate their fatigue, anxiety, depression and psychological distress. Meanwhile, the intervention presents favorable safety and tolerability.

The experimental group and the control group had well-matched baseline characteristics. The intervention exerted significant and sustained therapeutic effects, which provides an effective intervention strategy and theoretical evidence for improving the physical and mental status of patients in clinical palliative care.

Future studies shall optimize the research design in view of the limitations of the present study, expand the research scope, and conduct in-depth exploration on the intervention mechanisms, so as to promote the clinical promotion and application of this intervention.

Authorship Contribution Statemen

Authorship: **Dongxu Zheng** contributed to the study design, experimental intervention, data collection, data analysis, data interpretation, and manuscript drafting. **Jin Zheng** participated in the study design, data analysis, data interpretation, manuscript revision. **Lanhui Zhang** was involved in experimental intervention, data collection. **Yuanyuan Dang** took part in experimental intervention, data collection. **Lijun Han** contributed to experimental intervention, data collection. **Shanshan Jia** participated in the study design. **Jialin Su** was involved in experimental intervention, data collection. **Liang Cao** took part in the study design, experimental intervention, data collection. **Jin Zhang** contributed to experimental intervention, data collection, data analysis, data interpretation and manuscript drafting. All authors approved the final version to be published, have made substantial contributions to this work, and take public responsibility for the content.

Author statement

We have read and approved the final version of this manuscript. All persons who meet authorship criteria are listed as authors, and no one meeting these criteria has been omitted. The order of authors listed in this manuscript has been approved by all authors.

Funding

This work was supported by the Scientific Research and Innovation Team Program of Traditional Chinese Medicine of Shaanxi Province, and the grant number is 2025-CXTD-09.

Competing interests

The authors declare that they have no competing interests.

Disclosures and Acknowledgements

Acknowledgements: The authors would like to thank Shi HJ for promoting specialized PC for patients with advanced tumors in the Department of Traditional Chinese Medicine, the Second Affiliated Hospital of Air Force Medical University. We are also grateful to the specialized palliative care team of this center for their contributions to the experimental intervention and data collection of this study.

Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

References

1. Bray F, Laversanne M, Sung H, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2024;74(3):229-263. doi:10.3322/caac.21834

2. Smolarz B, Łukasiewicz H, Samulak D, Piekarska E, Kołaciński R, Romanowicz H. Lung Cancer-Epidemiology, Pathogenesis, Treatment and Molecular Aspect (Review of Literature). Int J Mol Sci. 2025;26(5):2049. Published 2025 Feb 26. doi:10.3390/ijms26052049

3. Karlsson K, Olsson C, Erlandsson A, Ahlberg KM, Larsson M. Exploring Symptom Clusters and Their Measurements in Patients With Lung Cancer: A Scoping Review for Practice and Research. Oncol Nurs Forum. 2023;50(6):783-815. doi:10.1188/23.ONF.783-815

4. Wang M, Sun Y, Zhang M, Yu R, Fu J. Effects of high-quality nursing care on quality of life, survival, and recurrence in patients with advanced nonsmall cell lung cancer. Medicine (Baltimore). 2022 Sep 16;101(37):e30569. doi: 10.1097/MD.0000000000030569. PMID: 36123938; PMCID: PMC9478279.

5. Zhu YX, Zhang YY, Jiang XJ. Impact of Baseline Nutritional Status, Psychological Health, Fatigue, and Insomnia on Outcomes of Immune Checkpoint Inhibitors in Advanced Non-Small Cell Lung Cancer: A Retrospective Cohort Study. Kaohsiung J Med Sci. 2026;42(2):e70097. doi:10.1002/kjm2.70097

6. Gu W, Xu YM, Zhong BL. Health-related quality of life in Chinese inpatients with lung cancer treatedin large general hospitals: across-sectional study. BMJ Open. 2018;8(4):e019873. Published 2018 Apr 24. doi:10.1136/bmjopen-2017-019873

7. Boulanger MC, Lo SB, Centracchio JA, et al. Pilot Feasibility Trial of a Supportive Care Digital Application for Patients with Advanced Nonsmall Cell Lung Cancer. J Palliat Med. 2025;28(9):1210-1219. doi:10.1089/jpm.2025.0066

8. Aragon KN. Palliative Care in Lung Cancer. Clin Chest Med. 2020;41(2):281-293. doi:10.1016/j.ccm.2020.02.005

9. Temel JS, Petrillo LA, Greer JA. Patient-Centered Palliative Care for Patients With Advanced Lung Cancer. J Clin Oncol. 2022;40(6):626-634. doi:10.1200/JCO.21.01710

10. World Health Organization. Palliative care: A guide for health care professionals[M]. Geneva: WHO Press, 2020.

11. Seetharaman R, Avhad S, Rane J. Exploring the healing power of singing bowls: An overview of key findings and potential benefits. Explore (NY). 2024;20(1):39-43. doi:10.1016/j.explore.2023.07.007

12. Stanhope J, Weinstein P. The human health effects of singing bowls: A systematic review. Complement Ther Med. 2020;51:102412. doi:10.1016/j.ctim.2020.102412

13. Lin FW, Yang YH, Wang JY. Effects of Tibetan Singing Bowl Intervention on Psychological and Physiological Health in Adults: A Systematic Review. Healthcare (Basel). 2025;13(16):2002. Published 2025 Aug 14. doi:10.3390/healthcare13162002

14. Kim SC, Choi MJ. Does the Sound of a Singing Bowl Synchronize Meditational Brainwaves in the Listeners?. Int J Environ Res Public Health. 2023;20(12):6180. Published 2023 Jun 19. doi:10.3390/ijerph20126180

15. Nasrat SA, Alskafi FA, Ahmad DY, et al. The Effect of Tibetan Singing Bowls on Stress Reduction: A Heart Rate Variability Study. Annu Int Conf IEEE Eng Med Biol Soc. 2025;2025:1-4. doi:10.1109/EMBC58623.2025.11253160

16. Cai Y, Yang G, Liu Y, et al. Therapeutic effects of singing bowls: A systematic review of clinical studies. Integr Med Res. 2025;14(2):101144. doi:10.1016/j.imr.2025.101144

17. Imbriani C. Le Tibetan Singing Bowls e l'intervento musicoterapeutico [Le Tibetan Singing Bowls e l'intervento musicoterapeutico.]. G Ital Med Lav Ergon. 2017;39(4):273-277.

18. Sobo EJ. Sound Baths, Trauma Talk, and the Wellness Paradox in the USA. Med Anthropol. 2024;43(5):367-382. doi:10.1080/01459740.2024.2377289

19. Cocks K, King MT, Velikova G, Martyn St-James M, Fayers PM, Brown JM. Evidence-based guidelines for determination of sample size and interpretation of the European Organisation for the Research and Treatment of Cancer Quality of Life Questionnaire Core 30. J Clin Oncol. 2011;29(1):89-96. doi:10.1200/JCO.2010.28.0107

20. Annunziata MA, Muzzatti B, Bidoli E, et al. Hospital Anxiety and Depression Scale (HADS) accuracy in cancer patients. Support Care Cancer. 2020;28(8):3921-3926. doi:10.1007/s00520-019-05244-8

21. Ownby KK. Use of the Distress Thermometer in Clinical Practice. J Adv Pract Oncol. 2019;10(2):175-179.

22. SPSS, IBM, Version 23.0; IBM SPSS Statistics for Windows; IBM: Armonk, NY, USA, 2015.

23. Cotoia A, Dibello F, Moscatelli F, et al. Effects of Tibetan Music on Neuroendocrine and Autonomic Functions in Patients Waiting for Surgery: A Randomized, Controlled Study. Anesthesiol Res Pract. 2018;2018:9683780. Published 2018 Mar 5. doi:10.1155/2018/9683780

24. Pozmogova, N.; Bohdanovska, N.; Boichenko, C.; Mashir, V.; Rudenko, A. The influence of the complex program of psychophysiological audio-vibrovisualization with Tibetan bowls on the level of psychological well-being of Ukrainian refugees. Phytother. J. 2023, 4, 27–32.

25. Milbury K, Chaoul A, Biegler K, et al. Tibetan sound meditation for cognitive dysfunction: results of a randomized controlled pilot trial. Psychooncology. 2013;22(10):2354-2363. doi:10.1002/pon.3296

26. Wepner, F.; Hahne, J.; Teichmann, A.; Berka-Schmid, G.; Hördinger, A.; Friedrich,M. Quarzklangschalentherapie bei Wirbelsäulenbeschwerden und chronobiologische Vorgänge–eine randomisierte kontrollierte Studie. Forsch. Komplementärmedizin/Res.Complement. Med. 2008, 15, 130–137.

27. Livia Bidin, Luca Pigaiani, Manlio Casini, Pietro Seghini, Luigi Cavanna, Feasibility of a trial with Tibetan Singing Bowls, and suggested benefits in metastatic cancer patients. A pilot study in an Italian Oncology Unit, European Journal of Integrative Medicine, 2016;8 (5), Pages 747-755,https://doi.org/10.1016/j.eujim.2016.06.003.

28. Goldsby TL, Goldsby ME, McWalters M, Mills PJ. Effects of Singing Bowl Sound Meditation on Mood, Tension, and Well-being: An Observational Study. J Evid Based Complementary Altern Med. 2017;22(3):401-406. doi:10.1177/2156587216668109

29. Franzoi MA, Agostinetto E, Perachino M, et al. Evidence-based approaches for the management of side-effects of adjuvant endocrine therapy in patients with breast cancer. Lancet Oncol. 2021;22(7):e303-e313. doi:10.1016/S1470-2045(20)30666-5

30. Yang X, Bai J, Liu R, Wang X, Zhang G, Zhu X. Symptom clusters and symptom network analysis during immunotherapy in lung cancer patients. Support Care Cancer. 2024;32(11):717. Published 2024 Oct 9. doi:10.1007/s00520-024-08918-0

31. Trigueros-Murillo A, Martinez-Calderon J, Casuso-Holgado MJ, González-García P, Heredia-Rizo AM. Effects of music-based interventions on cancer-related pain, fatigue, and distress: an overview of systematic reviews. Support Care Cancer. 2023;31(8):488. Published 2023 Jul 24. doi:10.1007/s00520-023-07938-6

32. Qi Y, Lin L, Dong B, et al. Music interventions can alleviate cancer-related fatigue: a metaanalysis. Support Care Cancer. 2021;29(7):3461-3470. doi:10.1007/s00520-021-05986-4

33. Walter N, Hinterberger T. Neurophysiological Effects of a Singing Bowl Massage. Medicina (Kaunas). 2022;58(5):594. Published 2022 Apr 26. doi:10.3390/medicina58050594

34. Rio-Alamos C, Montefusco-Siegmund R, Cañete T, Sotomayor J, Fernandez-Teruel A. Acute Relaxation Response Induced by Tibetan Singing Bowl Sounds: A Randomized Controlled Trial. Eur J Investig Health Psychol Educ. 2023;13(2):317-330. Published 2023 Jan 29. doi:10.3390/ejihpe13020024

35. Oguy,V.O.; Svirshch, E.N.; Tarasenko, A.A. Study of vibroacoustic tibetan massage effectiveness to reduce anxiety level. Mod.Eur. Res. 2018, 2, 63–74.

36. Cotoia A, Dibello F, Moscatelli F, et al. Effects of Tibetan Music on Neuroendocrine and Autonomic Functions in Patients Waiting for Surgery: A Randomized, Controlled Study. Anesthesiol Res Pract. 2018;2018:9683780. Published 2018 Mar 5. doi:10.1155/2018/9683780

37. Hasani Z, Mohammadi S, Karimi H. Investigating the Effect of Singing Bowl Sound on the Level of State-trait Anxiety and Physiological Variables of Patients Awaiting Angiography. J Perianesth Nurs. 2025;40(2):305-309. doi:10.1016/j.jopan.2024.04.012

38. Oguy,V.O.; Bykov, E.; Litvichenko, E. Single vibroacoustic impact effect of singing bowls over the psycho-emotional state and cardiovascular system work. J. Intellect. Disabil. Diagn. Treat 2021, 9, 483–494. https://doi.org/10.6000/2292-2598.2021.09.05.7

39. Landry JM. Physiological and psychological effects of a Himalayan singing bowl in meditation practice: a quantitative analysis. Am J Health Promot. 2014;28(5):306-309. doi:10.4278/ajhp.121031-ARB-528

40. Zhang L, Liu X, Tong F, et al. Lung cancer distress: screening thermometer meta-analysis. BMJ Support Palliat Care. 2024;13(e3):e1084-e1092. Published 2024 Jan 8. doi:10.1136/bmjspcare-2021-003290

41. Agarwal P, Patel PM, Powell C, Kesireddy M. Optimizing NCCN distress thermometer use in real-world settings: a systematic review and thematic synthesis of the literature. J Cancer Surviv. Published online April 16, 2025. doi:10.1007/s11764-025-01807-3

42. Duan X, Jia Y, Chai J, et al. Music therapy, quality of life and efficacy of immunotherapy for NSCLC. BMJ Support Palliat Care. 2025;16(1):140-149. Published 2025 Dec 23. doi:10.1136/spcare-2023-004325

43. Chinese Anti-Cancer Association, Lung Cancer Study Group of Committee of Oncopathology; Multicenter Big Data Research Project Specialists of Chinese Lung Cancer Pathology. Zhonghua Bing Li Xue Za Zhi. 2021;50(8):882-890. doi:10.3760/cma.j.cn112151-20210427-00328

44. Bergmann M, Riedinger S, Stefani A, et al. Effects of singing bowl exposure on Karolinska sleepiness scale and pupillographic sleepiness test: A randomised crossover study. PLoS One. 2020;15(6):e0233982. Published 2020 Jun 1. doi:10.1371/journal.pone.0233982

45. Jain S, McKusick E, Ciccone L, Sprengel M, Ritenbaugh C. Sound healing reduces generalized anxiety during the pandemic: A feasibility study. Complement Ther Med. 2023;74:102947. doi:10.1016/j.ctim.2023.102947

46. Mir IA, Chowdhury M, Islam RM, et al. Relaxing music reduces blood pressure and heart rate among pre-hypertensive young adults: A randomized control trial. J Clin Hypertens (Greenwich). 2021;23(2):317-322. doi:10.1111/jch.14126