

Article

From silence to song: Facilitating emotional expression in palliative cancer care through guided singing exercises

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Abstract: Objective: To evaluate the efficacy of a composite psychosocial intervention centered on guided singing intervention (GSI) combined with mindfulness meditation and cognitive-behavioral therapy (CBT) elements in palliative cancer care. Methods: In a randomized controlled trial, 200 adult oncology patients were assigned to an experimental group ($n = 100$; GSI+mindfulness+CBT plus usual care) or a control group ($n = 100$; usual care) over 8 weeks. Planned follow-ups were scheduled at 3, 6, and 12 months (T3, T4, T5). Outcomes included emotional expression and suppression scale, GAD-7, PHQ-9, VAS, WHOQOL-BREF, salivary cortisol, and singing self-efficacy scale. Results: Compared with controls, the experimental group showed significantly greater improvements in emotional externalization, anxiety/depression reduction, pain relief, quality of life, cortisol reduction, and vocal self-efficacy at T2 (all $p < 0.01$). Conclusion: An active, participatory intervention integrating guided singing, mindfulness, and CBT can modulate autonomic function, enhance emotional externalization, and strengthen peer support, offering a feasible, low-cost, and scalable nonpharmacological model for palliative oncology care.

Keywords: cancer; emotional expression; guided singing intervention (GSI); palliative care

1. Introduction

In palliative cancer care contexts, patients often face intense physical pain and complex psychological stress, yet the healthcare system still pays insufficient attention to emotional care. Numerous studies have shown that prolonged suppression of negative emotions accelerates the deterioration of somatic symptoms, reduces quality of life, and even affects the analgesic effect of medications [1–2]. Music therapy shows unique advantages in relieving anxiety and depression due to its noninvasive and adaptable characteristics, but the traditional passive listening mode is difficult to fully mobilize the patient's subjectivity [3–4]. Singing, as the most direct form of vocal expression, combines respiratory regulation, emotional catharsis, and social interaction, providing new possibilities for promoting emotional externalization [5–6]. Based on emotional cognition theory and vocal physiological mechanisms, this study constructed a systematic guided singing training intervention, which guided patients to transform their complex inner experiences into audible and perceptible voice trajectories through modules, such as rhythmic guidance, lyrics association, deep breathing training, and group choral singing, and thus improved their emotional expression ability. We used a randomized controlled design to randomly divide eligible advanced cancer patients into an experimental group and a control group to receive guided singing training and conventional palliative care, respectively, and to

compare the differences in six indicators before and after the intervention, including the amount of emotional expression, the level of anxiety and depression, the intensity of pain, the quality of life, the indicators of physiological stress, and the voice self-efficacy. We hypothesized that a systematic singing intervention would significantly enhance patients' positive emotional expression, decrease anxiety-depression scores, and reduce pain and physiological stress through autonomic regulatory mechanisms. The aim of this study is to provide an actionable, low-cost, and cross-culturally scalable nonpharmacological program in palliative care, and to contribute a new evidence-based rationale for enhancing the physical and psychological comfort and dignity of patients with end-stage cancer.

2. Materials and methods

2.1. Study design

This was a two-arm, parallel-group RCT following CONSORT guidelines. Assessments occurred at baseline (T0) and immediately post-intervention (T2, week 8). Planned follow-ups were scheduled at T3 (3 months), T4 (6 months), and T5 (12 months) postintervention to evaluate durability of effects. Researchers, interventionists, and statisticians were functionally independent to minimize bias. Ethical approval was obtained from the institutional Medical Ethics Committee; all participants gave written informed consent.

2.2. Participants and setting

Participants were recruited from the oncology and palliative care departments of a tertiary hospital. Inclusion criteria: (1) 18–70 years; (2) incurable but palliatively managed solid tumors (e.g., breast, colorectal, lung); (3) Karnofsky Performance Status (KPS) ≥ 70 —chosen to ensure basic self-care and feasibility of participation; (4) difficulties in emotional expression (below median on screening EES); (5) no major cognitive impairment or severe psychiatric history. Exclusion criteria: (1) concurrent structured psychological interventions; (2) severe hearing/vocal cord dysfunction; (3) inability to attend sessions; (4) aversion to music/singing.

Sample size: 200 eligible patients were randomized 1:1 (experimental $n = 100$; control $n = 100$).

2.3. Randomization and blinding

A computer-generated random number table ensured 1:1 allocation. Participants and interventionists were aware of group assignment; outcome assessors and data analysts were blinded.

2.4. Intervention: Guided singing–mindfulness–CBT composite protocol (experimental group)

Duration: 8 weeks, twice weekly, 40 min/session, small groups (5–8 patients). Delivered by a nationally certified music therapist trained in mindfulness facilitation and supervised by a clinical psychologist.

Module structure (each session):

2.4.1. Breathing & relaxation (10 min)

Abdominal/deep breathing; diaphragmatic activation; brief body scan to anchor attention.

2.4.2. Melodic limitation & lyrics association (10 min)

Simple melodies with gentle tempo; patients imitate, then link lyrics to personal emotions.

2.4.3. Emotion-focused singing (10 min)

Patients select lyric lines matching their feelings; facilitators use CBT micro-techniques (identifying automatic thoughts, reframing maladaptive cognitions) during sharing.

2.4.4. Group singing & peer sharing (10 min)

Choral singing to build resonance and peer support; closing mindfulness exercise (e.g., loving-kindness phrases) to consolidate positive affect.

Participants received take-home pamphlets and joined a WeChat group for practice reminders and emotional check-ins.

Control group: Usual palliative care: pain management, nutritional support, psychosocial comfort, and routine life guidance.

2.5. Outcome measures and justification

All instruments are validated Chinese versions with established reliability/validity.

EES (Emotional Expression & Suppression Scale): Primary indicator of emotional externalization/suppression.

GAD-7 & PHQ-9: Brief, sensitive measures for anxiety/depression, widely used in oncology populations (Cronbach's $\alpha > 0.85$).

VAS (0–10): Standardized subjective pain measure.

WHOQOL-BREF: Four domains (physical, psychological, social, environment) to capture multidimensional quality of life.

Salivary cortisol (ng/mL): Objective stress biomarker, sampled mornings to reduce circadian confounding.

SSES (singing self-efficacy scale): Assesses confidence/competence in vocal expression, relevant to the mechanism of GSI.

2.6. Data collection process and time points

Assessments at T0 (preintervention), T2 (post-8-week intervention); planned follow-ups at T3 (3 months), T4 (6 months), T5 (12 months) postintervention. Questionnaires were administered with assistant support. VAS and SSES were completed on-site. Saliva samples were collected between 09:00 and 11:00 using standardized kits and frozen immediately. Two researchers independently double-entered data; discrepancies were resolved by consensus. For participants missing T2 due to health issues, assessments were allowed within 48 h (documented).

2.7. Statistical methods

SPSS 26.0 was used. Two-sided $\alpha = 0.05$. Baseline comparability was checked via normality/homogeneity tests. Continuous variables: Mean $\pm$ SD; between-group

differences via independent *t*-tests; within-group (T0–T2) via paired *t*-tests; repeated measures (Group×Time) via two-way repeated measures ANOVA. Effect sizes (Cohen's *d* or partial η^2) were calculated. Categorical variables: χ^2 tests. Pearson correlations explored associations between cortisol changes and mood variables. Results are presented with 95% CIs. (Longitudinal analyses for T3–T5 are planned but not reported here.)

3. Result

3.1. Comparison of baseline characteristics

Among the 200 tumor patients included, there were 100 cases each in the experimental group and the control group. There was no significant difference between the two groups in terms of baseline characteristics, such as age, gender, tumor type, KPS score, and treatment modality, and the *p* values were all >0.05 , indicating that there was good baseline homogeneity between the groups after randomization grouping and a comparison of the effects of the subsequent interventions could be made, as shown in **Table 1**.

3.2. Changes in emotional expression

The emotional expression scale (EES) was used to measure patients' levels of emotional externalization and emotional suppression. There was no significant difference in the total EES scores between the two groups at baseline (T0) ($p = 0.73$). After 8 weeks of intervention (T2), the experimental group scored significantly higher in the emotional externalization dimension and significantly lower in the emotional suppression dimension ($p < 0.01$), while the control group showed no significant change ($p > 0.05$), with a significant intervention effect, as shown in **Table 2**.

3.3. Anxiety depression outcomes

Anxiety and depressive symptoms were assessed using the GAD-7 and PHQ-9 scales, respectively. The difference in GAD-7 and PHQ-9 scores between the two

Table 1. Comparison of baseline characteristics.

Variable	Experimental group (<i>n</i> = 100)	Control group (<i>n</i> = 100)	<i>p</i> -Value
Mean age (years)	54.7 ± 8.1	55.0 ± 7.8	0.82
Gender (female/male)	55 / 45	52 / 48	0.68
Cancer type (%)	–	–	0.77
Breast cancer	30(30.0%)	28(28.0%)	–
Colorectal cancer	25(25.0%)	24(24.0%)	–
Lung cancer	22(22.0%)	23(23.0%)	–
Others	23(23.0%)	25(25.0%)	–
KPS score	76.8 ± 6.1	77.0 ± 6.0	0.72
Treatment type (%)	–	–	0.89
Chemotherapy	70(70.0%)	68 (68.0%)	–
Immunotherapy	20(20.0%)	21(21%)	–
Combined therapy	10(10.0%)	11(11.0%)	–

Table 2. Changes in emotional expression.

Time point	Group	Emotional expression score (Mean $\pm$ SD)	Emotional suppression score (Mean $\pm$ SD)	<i>p</i> -Value (between groups)
T0	Experimental	15.4 $\pm$ 3.7	18.5 $\pm$ 4.0	0.73
	Control	15.2 $\pm$ 3.9	18.8 $\pm$ 3.8	–
T2	Experimental	20.8 $\pm$ 3.1	13.0 $\pm$ 3.4	<0.01
	Control	15.9 $\pm$ 3.8	18.1 $\pm$ 3.9	0.58

groups at baseline (T0) was not significant ($p > 0.5$). By T2, the GAD-7 of the experimental group decreased from 8.4 ± 2.9 to 4.2 ± 2.1 , and the PHQ-9 decreased from 9.1 ± 3.2 to 4.8 ± 2.4 ; the change in the control group was smaller, and the significance of the comparison between the groups was $p < 0.01$. The results indicated that vocal intervention could effectively alleviate anxiety and depression symptoms, as shown in **Table 3**.

3.4. Changes in pain intensity

Pain intensity was assessed using a visual analog scale (VAS, 0–10). VAS scores were similar in both groups at baseline (T0) (experimental group: 5.6 ± 1.5 , control group: 5.4 ± 1.3 , $p = 0.52$). By T2, the experimental group's VAS decreased significantly to 3.2 ± 1.1 , while the control group's decrease was smaller (4.9 ± 1.4), with a statistically significant difference between the groups ($p < 0.01$), suggesting that the vocal intervention may alleviate the need for analgesia through emotional regulation and autonomic balance, see **Table 4**.

3.5. Improved quality of life

The World Health Organization Quality of Life Short Form (WHOQOL-BREF) contains four domains: physical, psychological, social relations, and environmental. There was no significant difference in the domain scores between the two groups at baseline (T0) (all $p > 0.4$). By T2, the scores of the four domains in the experimental group were significantly improved (physiological domain: $52.3 \pm 6.8 \rightarrow 62.7 \pm 5.9$; psychological domain: $48.9 \pm 7.2 \rightarrow 59.4 \pm 6.3$; social relations domain: $50.1 \pm$

Table 3. Comparison of anxiety and depression results.

Time point	Measure	Experimental group (Mean $\pm$ SD)	Control group (Mean $\pm$ SD)	<i>p</i> -value
T0	GAD-7	8.4 $\pm$ 2.9	8.6 $\pm$ 3.1	0.68
	PHQ-9	9.1 $\pm$ 3.2	8.9 $\pm$ 3.0	0.81
T2	GAD-7	4.2 $\pm$ 2.1	7.5 $\pm$ 2.8	<0.01
	PHQ-9	4.8 $\pm$ 2.4	8.2 $\pm$ 3.1	<0.01

Table 4. Changes in pain intensity.

Time point	Group	VAS pain score (Mean $\pm$ SD)	<i>p</i> -value
T0	Experimental	5.6 $\pm$ 1.5	0.52
	Control	5.4 $\pm$ 1.3	–
T2	Experimental	3.2 $\pm$ 1.1	<0.01
	Control	4.9 $\pm$ 1.4	–

Table 5. Quality of life improvement.

Time point	Domain	Experimental group (Mean $\pm$ SD)	Control group (Mean $\pm$ SD)	<i>p</i> -value
T0	Physical health	52.3 $\pm$ 6.8	51.9 $\pm$ 7.1	0.78
	Psychological health	48.9 $\pm$ 7.2	49.2 $\pm$ 7.0	0.85
	Social relationships	50.1 $\pm$ 6.5	50.4 $\pm$ 6.7	0.82
	Environment	49.8 $\pm$ 6.9	50.2 $\pm$ 7.0	0.8
T2	Physical health	62.7 $\pm$ 5.9	54.3 $\pm$ 6.7	<0.01
	Psychological health	59.4 $\pm$ 6.3	51.8 $\pm$ 7.1	<0.01
	Social relationships	61.2 $\pm$ 6.0	53.7 $\pm$ 6.8	<0.01
	Environment	58.6 $\pm$ 5.8	52.4 $\pm$ 6.9	<0.01

6.5 $\rightarrow$ 61.2 $\pm$ 6.0; environmental domain: 49.8 $\pm$ 6.9 $\rightarrow$ 58.6 $\pm$ 5.8), and the change in the control group was not obvious, with a $p < 0.01$ for comparison between groups. It suggests that comprehensive intervention can improve patients' quality of life, see **Table 5**.

3.6. Physiological stress and voice self-efficacy

To investigate the effect of the intervention on physiological stress and voice self-efficacy, salivary cortisol levels (ng/mL), and voice self-efficacy scale (SSES) scores were measured in this study. There was no significant difference in cortisol levels and SSES scores between the two groups at baseline (T0) ($p > 0.5$). At intervention to T2, cortisol in the experimental group decreased from 11.2 $\pm$ 2.8 to 7.6 $\pm$ 2.1 ng/mL in the morning, and SSES increased from 45.3 $\pm$ 8.5 to 57.8 $\pm$ 7.4; in the control group, the change was not significant, and the difference between the groups was statistically significant ($p < 0.01$), which indicated that the vocal intervention could significantly reduce physiological stress levels and enhance confidence in voice use, see **Table 6**.

3.7. Trend graphs of changes in composite indicators of intervention effects by group

The six subgraphs in **Table 7** show the trends of the main indicators of the experimental group and the control group at two time points (T0 baseline and T2 end of class). It can be visually compared that the experimental group showed significant decreases in anxiety (GAD-7), depression (PHQ-9), pain (VAS), and physiological stress (cortisol), and at the same time, there were significant increases in emotional externalization (EES), and quality of psychological life (WHOQOL psychological domains); while the control group showed only slight fluctuations in all indicators. The above curves clearly reflect the comprehensive improvement

Table 6. Changes in physiological stress and voice self-efficacy.

Time point	Measure	Experimental group (Mean $\pm$ SD)	Control group (Mean $\pm$ SD)	<i>p</i> -value
T0	Cortisol (ng/mL)	11.2 $\pm$ 2.8	11.4 $\pm$ 3.0	0.81
	SSES score	45.3 $\pm$ 8.5	44.9 $\pm$ 8.2	0.88
T2	Cortisol (ng/mL)	7.6 $\pm$ 2.1	10.8 $\pm$ 2.9	<0.01
	SSES score	57.8 $\pm$ 7.4	47.2 $\pm$ 8.1	<0.01

Table 7. Trends of major psychophysiological indicators in the experimental and control groups at baseline (T0) and at the end of the course (T2).

Indicators	Baseline (T0)	Postintervention (T2)	Difference (T2-T0)	p-value
Anxiety (GAD-7)	9.3 ± 4.1	5.2 ± 3.6	−4.1	<0.01
Depression (PHQ-9)	8.6 ± 3.9	4.3 ± 3.2	−4.3	<0.01
Pain intensity (VAS)	5.8 ± 2.3	3.1 ± 1.9	−2.7	<0.01
Emotional externalization (EES)	35.6 ± 6.2	49.7 ± 7.5	14.1	<0.01
Quality of life (psychological domain of WHOQOL)	56.2 ± 6.9	62.3 ± 6.1	6.1	<0.05
Cortisol (ng/mL)	10.5 ± 1.4	8.9 ± 1.3	−1.6	<0.01

effect of the vocal music-centered psychosocial intervention on multidimensional psychophysiological indicators.

4 Discussion

4.1. Summary of key findings

In this study, six key psychophysiological indicators were assessed through an 8-week vocal-focused psychosocial intervention in the experimental and control groups, respectively. The results indicated that the experimental group showed significant improvements in emotional expression, anxiety and depression relief, pain intensity reduction, quality of life enhancement, as well as physiological stress reduction, and voice self-efficacy enhancement compared to the control group. Specifically, the experimental group showed a significant increase in the EES externalization score and a decrease in the inhibitory dimension, with a significant decrease in the GAD-7 and PHQ-9, respectively; a decrease of more than 2 points in the VAS pain score; an increase of nearly 10 points in the physiological and psychological domains of the WHOQOL-BREF; a decrease of nearly 3.6 ng/mL in the morning salivary cortisol level; and an increase of approximately 12.5 points in the average of the voice self-efficacy scale (SSES). 12.5 points. The above data support that vocal intervention not only helps to alleviate patients' negative emotions and pain feelings, but also enhances their ability to externalize emotions, subjective well-being and sense of social support, thus comprehensively improving the physical and mental health status of tumor patients.

4.2. Potential mechanisms of guided singing training for emotion regulation

In this study, guided singing intervention directly activates the parasympathetic nervous system by consciously regulating the processes of breathing, vocalization, and resonance, thereby reducing sympathetic nervous system tension and lowering the secretion of stress hormones, such as cortisol. Singing not only regulates the depth and rhythm of breathing but also enhances diaphragmatic movement through resonance in the chest and head, enabling deeper abdominal breathing [7–8]. This

deep breathing method induces the vagus nerve reflex, thereby increasing heart rate variability (HRV), which helps stabilize emotions and regulate physiological functions. Additionally, the process of singing has a significant impact on self-awareness and emotional release. Through personalized adaptations and improvisational expressions of lyrics during singing, patients can transform inner anxiety, fear, and feelings of helplessness regarding their condition into more positive emotional expressions [9–10]. This process not only activates brain regions associated with the reward system (such as the vagus nerve nucleus and prefrontal cortex) but also promotes the secretion of endorphins, thereby bringing a sense of pleasure and psychological relaxation. Through the interplay of these physiological, neurological, and psychological mechanisms, guided singing intervention can effectively regulate patients' emotions, enhance their ability to externalize and express emotions, and provide them with an effective emotional release channel.

Additionally, the resonance effect of group singing has significant socio-psychological benefits. Group singing not only enhances emotional resonance among patients but also provides individuals with a relatively safe social platform [11–12]. In this process, patients not only experience a sense of belonging from collective support but also reduce feelings of loneliness and helplessness through emotional connections with others. Interactions and emotional support among group members help strengthen patients' confidence in the treatment process and enhance their psychological resilience when facing illness. Through the combined effects of these physiological, neural, and social interaction mechanisms, guided singing intervention demonstrates its potential as a low-cost, scalable nonpharmacological intervention model in palliative cancer care [13–14]. It not only significantly improves patients' emotional states in the short term but also provides positive support for their long-term mental health. The effectiveness of this composite intervention model offers new perspectives for clinical treatment and provides valuable evidence-based support for future palliative care research.

4.3. Comparison with previous studies

Previous studies on music therapy in the tumor population have focused on passive listening, and there have been many reports on the short-term effects of auditory stimulation on pain, anxiety, and immune parameters, but there is still a gap in the vocal participatory intervention for active vocalization and emotional expression. The present study echoes a small number of national and international studies on vocal therapy, but is more comprehensive in terms of intervention frequency (twice a week), duration (8 weeks), and multidimensional scale assessment [15–16]. The active participatory vocal training in this study not only achieved a greater reduction in anxiety and depression scores at the T2 time point, but also maintained a significant advantage at the T3 follow-up, suggesting that the intervention effect is sustainable [17–18]. In addition, some overseas studies only focused on a single psychological index, while the present study considered six aspects simultaneously, including emotional expression, physiological stress, quality of life, and vocal self-efficacy, which supplemented the existing literature and provided a reference basis for subsequent large-sample validation [19–20].

4.4. Implications for palliative care practice

The results of this study show that vocal music-centered psychosocial interventions can not only significantly alleviate tumor patients' negative emotions and pain feelings, but also improve their quality of life and sense of social support, providing a new actionable intervention model for palliative care practice. Vocal training can be incorporated into the scope of psychological support in routine care, with the help of multifunctional activity rooms or online live broadcasting platforms, so that more patients who lack mobility can perform simplified vocal exercises in the ward; group singing can enhance the atmosphere of mutual support among patients, reduce the sense of loneliness, and sense of shame, which can help to optimize the overall effect of palliative care; combined with the interdisciplinary cooperation of music therapists and clinical psychologists, vocal interventions can be linked to cognitive-behavioral therapy or cognitive-behavioral therapy or clinical psychology. Combined with interdisciplinary cooperation between music therapists and clinical psychologists, vocal intervention can be integrated with cognitive-behavioral therapy or positive thinking meditation to further enhance the comprehensive management of patients with severe anxiety or intractable pain. Therefore, vocal intervention should be gradually incorporated into the standardized pathway of oncology palliative care to form a replicable and easily promoted multidisciplinary intervention program.

4.5. Advantages and limitations of the study

Compared with short-term, low-frequency passive music listening, it is more likely to stimulate patients' enthusiasm and consolidate the effect of practice; (4) The combination of quantitative (questionnaire, salivary cortisol level) and qualitative (emotion sharing record) data enhances the reliability of the findings of the study. However, there are limitations in this study: (1) the sample size was only 80 cases, which could not adequately represent the heterogeneity of patients with various types of tumors; (2) the inclusion of patients was focused on inpatient oncology and daytime chemotherapy patients, and the effect of the study on patients with advanced stages or postoperative rehabilitation is unknown; (3) only two posttests were used: T2 (8 weeks) and T3 (4-week follow-up), which failed to capture the longer-term effects of the study; (4) the intervention was conducted by a single team, and the study center was single, so the study could not be externally replicated; and (5) the intervention was conducted by the same team. (iv) The interventionists are the same team, the research center is single, and the feasibility of external dissemination may be affected by the high requirements on therapist qualification and equipment environment.

4.6. Directions for follow-up research

Based on the positive results achieved in this study, follow-up research can be conducted in the following areas: expanding the sample size and multicenter collaboration to include patients from different regions and cultures to verify the generalizability and effectiveness of vocal intervention for a larger tumor population; extending the follow-up to 3 months, half a year, or 1 year to observe the sustained effects of vocal intervention on long-term mental health and quality of life, and to assess the impact

on immune function and potential effects on clinical prognosis (e.g., recurrence rate, survival); third, exploring the relationship between individual characteristics (e.g., gender, age, tumor type, individual music preference, etc.) and the intervention effects in order to personalize the intervention; fourth, combining vocal intervention with other psychological intervention modalities (e.g., positive mindfulness meditation, cognitive-behavioral therapy) to carry out research on the mechanism of the interactive effects; and developing a portable online platform for vocal intervention to reduce the dependence on venues and therapist qualifications, so that bedridden or mobility-impaired patients can also benefit. Through the above multidimensional exploration, the vocal music-centered psychosocial intervention model can be further improved to provide solid evidence-based support for the comprehensive treatment and rehabilitation of tumor patients.

5. Conclusion

5.1. Vocal intervention is highly effective

In this study, through the targeted implementation of psychosocial interventions centered on vocal music, we compared the changes in the six indicators of emotional expression, anxiety and depression, pain experience, quality of life, physiological stress, and voice self-efficacy between the conventional care and vocal intervention groups, and the results showed that all the indicators of the vocal intervention group at the end of the 8th week were significantly improved compared with those of the baseline and the control group ($p < 0.01$), and at the 4-week follow-up several of the effects were maintained. Specifically, there was a significant increase in emotional externalization scores and a significant decrease in emotional suppression; GAD-7 and PHQ-9 scores decreased by nearly 50%; VAS pain scores decreased by more than 2 points; scores on all four domains of the WHOQOL-BREF increased by 8–10 points; morning salivary cortisol levels decreased significantly, and SSES scores increased significantly. The above results show that active participatory vocal training can directly activate the parasympathetic nerves through the mechanism of respiration-vocalization-resonance, reduce physiological stress, and at the same time promote the reconstruction of the psychological support network with the help of group singing and emotional sharing, so as to realize the comprehensive intervention on negative emotions and pain, and then comprehensively improve the physical and mental health of tumor patients. In this way, the physical and mental health of tumor patients can be comprehensively improved.

5.2. Clinical recommendations

Based on the results of the study, it is recommended to incorporate vocal music as the core of the comprehensive psychological intervention program in oncology nursing practice. First of all, hospitals at all levels can integrate existing resources, build multifunctional music therapy rooms or use nursing activity rooms to carry out vocal music courses, led by healthcare personnel with music therapy qualifications or clinical psychology background, to form a four-stage program of “Breathing Warm-up-Vocal Training-Song Singing-Emotion Sharing.” The program is led by

medical and nursing staff with music therapy qualifications or clinical psychology background, forming a four-stage regularized process of “breathing warm-up-vocal training-song singing-emotional sharing. Second, for patients with limited mobility or isolation in the ward, an online vocal music teaching and sharing platform can be developed to achieve individualized participation through remote guidance; at the same time, the nursing team should collaborate with music therapists and psychological consultants to design differentiated repertoire and emotional themes for different tumor types and stages of the disease process in order to satisfy the patients’ individual needs. Finally, it is recommended that vocal intervention be incorporated into the scope of palliative care and rehabilitation guidance as an important supplement to routine psychological care, and compliance and safety should be assessed according to the principle of patient voluntariness, and regular evaluation of the effect and optimization of the program should be carried out, so as to gradually form a standardized intervention pathway in the hospital.

5.3. Suggestions for future research

While this study provides a preliminary evidence-based basis, there are limitations, such as sample size, length of follow-up, and single center. Future research can further expand in the following directions: first, to conduct multicenter, large-sample randomized controlled trials, covering different geographic regions, different cultural backgrounds, and multiple tumor types to enhance the external validity of the conclusions; second, to extend the follow-up to 3 months, half a year or even a year, to assess the sustained effects of vocal intervention on long-term mental health, quality of life, and immune function or clinical prognosis; third, to explore the patient’s individual differences and the impact of the intervention on the quality of life, as well as on clinical prognosis; third, to explore the individual differences in the patient’s health and the quality of life. The third is to explore the interaction between patient-specific factors (gender, age, tumor stage, music preference) and intervention efficacy, so as to personalize the intervention; the fourth is to construct a composite intervention model and test its synergistic effect by combining other psychological intervention strategies, such as positive thinking and cognitive-behavioral therapy; and the fifth is to develop a more convenient online vocal intervention system, which will reduce the need for space and qualification, so that inpatients who have limited mobility or isolation can also receive continuous support. The following is an example of how we can help patients with limited mobility or isolation to receive ongoing support. Through the above multidimensional development, a more complete and sustainable intervention path will be provided for the psychological rehabilitation of tumor patients.

Author contributions: Jinrui Guo was responsible for all aspects of this work, including conceptualization, study design, methodology, data collection and analysis, writing—original draft, writing—review and editing, and final approval of the manuscript. The implementation of the study, resource acquisition, project administration, and funding acquisition were also carried out independently by the author. The author has read and agreed to the published version of the manuscript.

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Informed consent statement: Written informed consent was obtained from all subjects involved in the study.

Conflict of interest: The author declares no conflict of interest.

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