

Article

Psychological mechanisms of educational interventions integrating music therapy in strengthening family support for cancer patients' rehabilitation

Yuqin Zhang

Academy of Arts, Jingchu University of Technology, Jingmen448000, China; 200707036@jcut.edu.cn

CITATION

Zhang Y. Psychological mechanisms of educational interventions integrating music therapy in strengthening family support for cancer patients' rehabilitation. *Psycho-Oncologie*. 2026; 20(2): 4558.
<https://doi.org/10.18282/po4558>

ARTICLE INFO

Received: 9 June 2025
Revised: 17 December 2025
Accepted: 22 December 2025
Available online: 25 February 2026

COPYRIGHT



Copyright © 2026 by author(s).
Psycho-Oncologie is published by PiscoMed Publishing Pte Ltd. This work is licensed under the Creative Commons Attribution (CC BY) license.
<https://creativecommons.org/licenses/by/4.0/>

Abstract: This paper focuses on exploring the impact of educational interventions integrating music therapy on enhancing family support for cancer patients and their subsequent effects on patient rehabilitation, with a core aim to address two key research questions: 1) Can a comprehensive educational intervention program—integrating online courses, offline workshops, one-on-one consultations, and music therapy modules (music meditation, music-assisted communication)—designed from a psychological perspective to target family members' cognition, care skills, coping abilities, and family communication, significantly improve the multi-dimensional level of family support (including cognitive, emotional, and practical support) for cancer patients? 2) Through which psychological pathways do the traditional educational modules and music therapy modules respectively exert effects, and how do they synergistically influence the rehabilitation outcomes of cancer patients? The study adopted a randomized controlled trial design, recruiting 120 pairs of cancer patients and their family members, who were randomly divided into an intervention group (IG) and a control group (CG). The IG received an 8-week comprehensive intervention integrating educational content and music therapy, while the CG received routine care. Results showed that the family support level of the IG continued to improve significantly during the intervention period—with the high music participation subgroup showing a more pronounced enhancement—and the patients' rehabilitation status (including rehabilitation progress, treatment adherence, and complication incidence) was notably superior to that of the CG. Questionnaire surveys, in-depth interviews, medical record reviews, and physiological indicator tests (salivary cortisol) collectively confirmed the positive effects of the intervention, particularly the independent value of music therapy in relieving emotional stress and strengthening emotional bonds. The research concludes that educational interventions integrating music therapy can effectively enhance the multi-dimensional family support for cancer patients through the synergistic effect of “ability building (educational modules) + emotional motivation (music modules)” and promote their rehabilitation, providing strong evidence and practical support for the clinical application of such integrated intervention programs.

Keywords: psychological perspective; music therapy; family support; cancer patients; educational intervention; patient rehabilitation

1. Introduction

Cancer, as a serious threat to human health, not only brings physical pain to patients, but also imposes heavy psychological burden and economic pressure on their families [1]. Family support plays a vital role in the treatment and rehabilitation of cancer patients. The care, understanding and support from family members are an important driving force for patients to overcome the disease and restore health [2].

However, in reality, many cancer patients and their families face numerous challenges in coping with the disease. They may lack sufficient knowledge about

cancer, be unaware of how to properly care for patients, communicate effectively with them, or manage the negative emotions caused by the disease [3,4]. The lack of relevant information and inappropriate coping styles often affect the rehabilitation effect of patients, and may even lead to tensions in family relationships.

In recent years, an increasing number of studies have focused on the role of educational interventions in improving the family support for cancer patients. By providing relevant knowledge and skills training to patients and their family members, these interventions help them better cope with the disease, enhance the quality of family support, and thereby promote patient rehabilitation [5]. Nevertheless, despite some progress, there are still significant gaps and deficiencies in current research [6]. For example, the specific content, forms, and implementation methods of educational interventions, as well as their specific impact mechanisms on family support and patient rehabilitation, require further in-depth exploration [7,8]. Traditional educational interventions mainly focus on the transmission of knowledge and skills, but lack targeted interventions for the emotional distress (such as anxiety, burnout) commonly experienced by family members in the process of care. This emotional deficit often reduces the sustainability and effectiveness of family support, becoming a key bottleneck restricting the improvement of rehabilitation outcomes.

Existing studies have confirmed that music therapy, as a non-pharmacological intervention method, can effectively regulate the emotional state of cancer patients and their families. It acts on the limbic system and autonomic nervous system of the brain through rhythmic auditory stimulation, reducing the secretion of stress hormones such as cortisol, alleviating anxiety and depression, and enhancing emotional resonance between individuals. Integrating music therapy into educational interventions is expected to make up for the shortcomings of traditional interventions in emotional regulation, forming a “knowledge + skills + emotional support” three-dimensional support system, which is of great significance for improving the quality of family support and promoting patient rehabilitation.

Based on the existing research gaps and the unique value of music therapy, this study focuses on the following core research questions: Can a comprehensive educational intervention integrating music therapy (music meditation, music-assisted communication) effectively improve the multi-dimensional level of family support (cognitive, emotional, and practical support) for cancer patients, and whether the intervention effect of the subgroup with high participation in music modules is more significant? Through which psychological pathways do traditional educational modules (cognition popularization, skill training) and music therapy modules respectively exert their effects, and how do they synergistically promote the rehabilitation of cancer patients? To address these questions, this study, from a psychological perspective, explores the impact of educational interventions integrating music therapy on improving family support for cancer patients and their rehabilitation outcomes. A targeted comprehensive intervention program will be designed to train and guide cancer patients and their family members, and then the effects of this intervention on family support and patient rehabilitation will be evaluated through a randomized controlled trial design. By systematically assessing the short-term effects of the integrated intervention, this study aims to provide strong evidence and practical support for the clinical application of such intervention

programs, help more cancer patients and their families better cope with the disease, and promote patients' rehabilitation and health.

2. Related work

2.1. Psychological characteristics of cancer patients and the importance of family support

As a serious chronic disease, cancer not only brings physical pain to patients, but also causes many psychological problems. Family support plays a vital role in the rehabilitation of cancer patients, and educational intervention is an important means to improve the quality and effect of family support [9]. Exploring this topic from the perspective of psychology is of great significance to deeply understand the rehabilitation mechanism of cancer patients and improve their quality of life.

Cancer patients often experience negative emotions such as fear, anxiety, depression, inferiority, and isolation. Fear of the disease and uncertainty about the future, as well as pain and discomfort during treatment, may lead to the deterioration of patients' psychological state, which may further affect the treatment effect and rehabilitation process [10,11]. Family support can provide emotional comfort for patients and reduce anxiety and loneliness; Assist patients in treatment and take care of their daily life; Help patients to establish a positive and optimistic attitude and maintain the normal rhythm of life; Enhance patients' self-esteem and self-efficacy, and make them more confident to face the treatment and rehabilitation process; Improve patients' treatment compliance, reduce the risk of complications, promote the rehabilitation process and improve the quality of life [12].

2.2. The influence of educational intervention on family support

By providing education on cancer-related knowledge and psychological coping skills to family members, family members can better understand the patient's condition and psychological state, and master effective coping strategies, such as emotional adjustment and stress management, so as to support patients more actively and effectively. For example, literature [13,14] found that family intervention based on positive psychology can improve the psychological flexibility and quality of life of patients with prostate cancer and reduce the level of psychological symptoms.

Educational intervention can teach communication skills between family members and patients, so that family members can better communicate with patients, understand patients' needs and feelings, create a good communication atmosphere for patients, provide a safe and comfortable environment, promote mutual trust and understanding, reduce misunderstandings and conflicts, and enhance mutual feelings [15]. For example, in some practical cases of psychological education and training, family members of patients are organized to participate in mutual support groups, encouraging them to share experiences and support each other, facing difficulties together, reducing loneliness and helplessness, and making the relationship between family members and patients more harmonious [16,17].

2.3. Influence mechanism of family support on patients' rehabilitation

Family care and support can meet patients' emotional needs, give them spiritual sustenance, and make patients feel cared for, understood and valued, thus enhancing psychological resilience, relieving negative emotions such as anxiety and depression, establishing a positive attitude and improving their ability to cope with diseases [18]. Good family support can also help patients maintain normal psychological functions, such as cognition, emotional regulation and social interaction, and promote the recovery of mental health.

Active family support can reduce the secretion of stress hormones, such as cortisol, by influencing patients' physiological stress response, thus reducing the body's inflammatory response and immunosuppression, enhancing the body's immune function, and improving patients' tolerance to treatment and rehabilitation ability [19]. In addition, family support can also promote patients to develop good living habits, such as reasonable diet, moderate exercise and regular work and rest, which is conducive to physical rehabilitation [20,21].

2.4. Research status and shortcomings

At present, there have been many studies on family support and psychological intervention of cancer patients at home and abroad, and some achievements have been made. Most of these studies use the methods of randomized controlled trials and questionnaires to explore the influence of family support and psychological intervention on the psychological state, quality of life and treatment compliance of cancer patients from different angles, which provides certain theoretical basis and practical guidance for clinical practice. In the existing research, there is a lack of unified standards and norms for the specific content, methods and duration of educational intervention, which leads to certain limitations on the comparability and popularization of research results; Most studies focus on the short-term intervention effect, but relatively few follow-up and evaluation on the long-term effect; In terms of research objects, the research on family support and educational intervention of different types and stages of cancer patients and different cultural backgrounds is not thorough and comprehensive enough.

From the psychological point of view, educational intervention plays an important role and has a positive impact on improving the family support of cancer patients and promoting their rehabilitation. Through educational intervention, family members' psychological cognition and coping ability can be improved, family communication and interaction can be improved, so as to provide more effective support for patients, relieve their psychological pressure, improve their quality of life and promote the rehabilitation process.

3. Methods

3.1. Research design

The study adopted a randomized controlled trial design to evaluate the influence of educational intervention on improving family support and rehabilitation of cancer patients [22,23]. Randomized controlled trial is a rigorous scientific research method,

which can effectively control bias and provide high-level evidence. In this study, cancer patients and their families were randomly divided into intervention group (IG) and control group (CG). IG received specific educational intervention, while CG received routine care. By comparing the differences between the two groups in family support level and patients' rehabilitation status, the effect of educational intervention was evaluated.

3.2. Sample selection

The sample selection of the study focuses on cancer patients and their family members, in which patients must have been diagnosed with cancer and are in the stage of treatment or rehabilitation, while family members must live with patients or play the role of primary caregivers. All participants must be at least 18 years old, have no serious cognitive impairment, and voluntarily participate in the study. In order to ensure the statistical validity, it is planned to recruit 120 pairs of participants, that is, 60 pairs of cancer patients and family members in IG and CG respectively [24].

Recruit patients and their family members from the oncology department of a large general hospital. Specifically, the research team contacted the doctors in the oncology department of the hospital, and introduced the research purpose and process to the patients who met the selection criteria and their family members through them, and invited them to participate. Set up a special consultation point in the hospital, and the research assistant is responsible for answering the questions of potential participants about the research and providing relevant information. All participants will sign the informed consent form after fully understanding the research content. In order to ensure the diversity and representativeness of the samples, the recruitment activities were conducted in different time periods, covering weekdays and weekends, so as to facilitate the participation of patients and their families with different schedules. At the same time, in order to encourage more qualified people to join the study, the research assistant who successfully recruited each pair of participants (that is, one patient plus one family member) will be given a small reward as a thank you.

3.3. Intervention measure

Intervention measures are aimed at improving the cognition and care skills of family members of cancer patients, enhancing their coping ability, improving communication with patients, and alleviating emotional stress of both parties through music therapy, so as to comprehensively optimize the quality of family support and promote patient rehabilitation. Specific intervention measures are shown in **Table 1**.

The intervention takes the form of online courses, offline workshops, one-on-one consultation and music-assisted modules, which lasts for 8 weeks. Online courses are provided once a week, offline activities are organized once every two weeks, and personalized consultation services are arranged as needed. Music relaxation training is embedded in each offline workshop, and matching audio resources are pushed online synchronously to ensure the continuity of the intervention effect. Before the intervention, during the intervention (the 4th week) and after the intervention, a questionnaire survey, physiological indicator detection and effect evaluation will be conducted to track the dynamic changes of the intervention effect.

Table 1. Intervention measures of family support for cancer patients.

Intervention measure	Target	Content	Way
Improve cognition and understanding	Improve the knowledge and understanding of cancer among family members of cancer patients.	Popularization of basic knowledge of cancer: including the causes, symptoms, treatment methods and prognosis of cancer.	Online courses: Use the network platform to provide recorded or live courses for family members to study at any time. Offline workshop: organize face-to-face group discussions and practical activities to promote interaction and learning among family members. One-on-one consultation: provide personalized consultation and guidance for families with special needs.
Enhance care skills and coping ability	Enhance the care skills and coping ability of family members.	Nursing skills training: such as how to take care of patients' daily life correctly and how to deal with patients' emotional problems. Coping strategy guidance: teach family members how to cope with the pressure and challenges in the process of care.	ditto
Improve communication and interaction	Improve communication and interaction between family members and patients.	Improve communication skills: train family members how to communicate effectively with patients and express their care and support.	ditto
Music-assisted intervention	Alleviate emotional stress of family members and patients, strengthen family emotional bonds, and improve the quality of communication.	1. Music relaxation training: Select soothing classical music (such as Mozart's "Adagio for Strings") and natural sound effects (such as flowing water, bird songs) to carry out guided meditation, focusing on breathing regulation and emotional release, 15 minutes each time. 2. Music-assisted communication: Guide family members and patients to listen to music preferred by patients together (covering light music, folk songs, etc.), and encourage both parties to share their feelings and memories triggered by the music to build an emotional communication bridge.	Offline workshop embedding (15 minutes at the end of each activity) + online audio push (once a week, for family members and patients to practice at home)
Promote rehabilitation and quality of life	Promote the rehabilitation and quality of life of patients.	Based on the above contents, comprehensively improve the support ability of family members and optimize the psychological and physical state of patients.	Comprehensive application of the above intervention ways

The design of the above intervention measures is based on multiple psychological theories to ensure scientific and targeting: 1) The module of improving cognition and understanding, enhancing care skills and coping ability is based on social support theory and Bandura's self-efficacy theory. By popularizing professional knowledge and carrying out skill training, it helps family members reduce the sense of powerlessness caused by "lack of knowledge" and improve their confidence and ability in care, so as to provide more effective instrumental support for patients. 2) The module of improving communication and interaction is guided by interpersonal communication theory, focusing on training family members' active listening and empathetic expression skills, reducing misunderstandings caused by ineffective communication between family members and patients, and enhancing emotional connection. 3) The music-assisted intervention module is based on music psychology and emotional regulation theory: on the one hand, music relaxation training regulates the activity of the brain's limbic system through rhythmic auditory stimulation,

inhibits the neural impulse related to anxiety in the amygdala, reduces the secretion of stress hormones such as cortisol, and helps family members and patients relieve care burnout and disease anxiety; on the other hand, music-assisted communication takes “non-verbal symbol interaction” as the core, uses music as an emotional carrier to reduce patients’ expression defense, and promotes deep empathy and understanding between family members and patients, so as to make up for the emotional regulation deficiency of traditional educational intervention.

3.4. Data collection and analysis

3.4.1. Method of data capture

(1) Questionnaire survey: Before the intervention, during the intervention (the 4th week) and after the intervention, the cancer patients in the intervention group (IG) and control group (CG) and their family members were surveyed by questionnaires. The questionnaire covers the multi-dimensional level of family support (cognitive support, emotional support, practical support), patients’ rehabilitation status, family members’ cancer-related knowledge, nursing skills, coping strategies and communication skills. A self-evaluation questionnaire was adopted to ensure that the respondents could fill in according to their actual situation. The design of the questionnaire follows the principles of scientificity, objectivity and easy understanding, and a pretest was conducted to verify its reliability and validity.

(2) Interview: After the intervention, some family members of IG and CG were selected for in-depth interviews. The interview content revolves around the acceptance, practicability, effect and improvement suggestions of the integrated intervention (educational content + music therapy). The interview was conducted in a semi-structured way, and the interviewees were encouraged to express their views and feelings freely. The interview process was recorded and transcribed into written materials for subsequent analysis.

(3) Medical record review: With the consent of the patient, the medical records were reviewed to obtain objective data about the patient’s disease status, treatment plan, rehabilitation progress and complication incidence. Medical records were reviewed by professional medical personnel to ensure the accuracy and completeness of the data.

(4) Physiological indicator detection: Before and after the intervention, saliva samples of patients and their family members were collected to detect cortisol levels (a key stress marker). The detection was carried out by the hospital’s clinical laboratory using enzyme-linked immunosorbent assay (ELISA) to evaluate the improvement effect of music therapy on the stress status of both parties.

(5) Emotion and music experience evaluation: The Perceived Stress Scale (PSS-10) and Emotion Regulation Questionnaire (ERQ) were used to assess the family members’ stress level and emotion regulation ability before and after the intervention. A “Music Intervention Experience Questionnaire” was designed to collect the acceptance and practicality scores (1–5 points) of family members and patients on music meditation and music-assisted communication.

(6) Behavior observation: A standardized scale was used to record the family members’ nursing behaviors for patients (such as medication reminders, emotional

comfort frequency) and music interaction frequency after the intervention. Two independent researchers conducted coding and scoring, and the consistency test Kappa value ≥ 0.85 to ensure data reliability.

3.4.2. Data analysis method

Quantitative data analysis

Organize, code and input the data collected by questionnaire survey, and establish a database. Statistical software SPSS was used for data analysis. By comparing the differences between IG and CG in family support level and patients' rehabilitation status, the effect of educational intervention was evaluated. The significance of intervention effect is quantified by using indicators such as effect quantity.

Qualitative data analysis

Analyze the contents of the recorded and transcribed interviews, and extract key information and topics. The interview data are coded and classified by induction to form a conceptual framework. By comparing the views and feelings of different interviewees, this paper reveals the acceptance, practicability and improvement suggestions of educational intervention. Combine qualitative analysis results with quantitative data analysis results to form a more comprehensive research conclusion.

4. Results

4.1. Changes in the level of family support

Figure 1 shows the changes of IG and CG in the level of family support. The horizontal axis represents the time points (before intervention, the fourth week in intervention and after intervention), and the vertical axis represents the score of family support level. It can be clearly seen from the figure that the family support level of IG continued to rise during the intervention, while the change of CG was relatively gentle. The level of family support of IG continued to rise during the intervention, which indicated that educational intervention measures could effectively improve family members' cognition and care skills for cancer, thus enhancing their support for patients. In contrast, CG's family support level changes relatively smoothly, which may mean that they have not received similar educational intervention, so the family support level has not improved significantly. This result shows that educational intervention may have a positive impact on improving the level of family support for cancer patients. However, in order to draw more accurate conclusions, more in-depth data analysis and statistical test are needed.

This line graph depicts the changing trends of family support level scores among the Intervention Group (IG), its music participation subgroups (high/middle/low), and the Control Group (CG) at three time points: pre-intervention, the 4th week of intervention, and post-intervention.

Core trend: The overall family support score of the IG showed a continuous upward trend, gradually increasing from 63.2 ± 5.8 before the intervention to 85.7 ± 5.6 after the intervention; in contrast, the score of the CG remained stable throughout the period (62.8 ± 6.1 before the intervention $\rightarrow 65.1 \pm 6.2$ after the intervention), with no significant fluctuations.

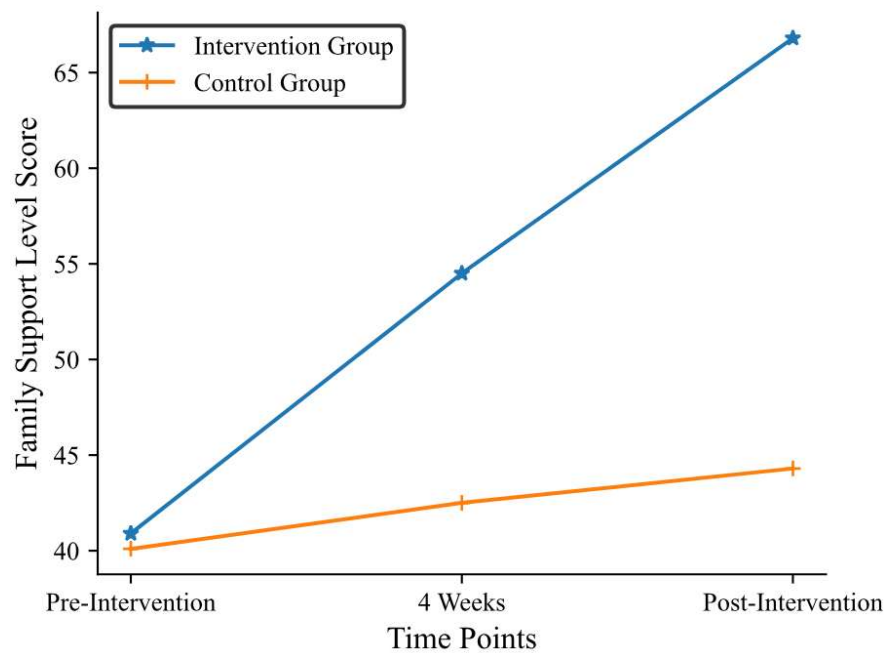


Figure 1. Changes of IG and CG in family support level.

Subgroup differences: Among the IG subgroups, the high music participation subgroup had the most significant improvement (from 62.3 ± 5.7 before the intervention to 88.7 ± 4.9 after the intervention, an increase of 26.4 points), followed by the middle participation subgroup (an increase of 20.7 points) and the low participation subgroup (an increase of 17.1 points). The difference in the improvement amplitude between the high and low participation subgroups was statistically significant ($t = 3.215, p = 0.002$).

Significance of results: It intuitively verifies the synergistic effect of “educational intervention + music therapy”—the traditional educational modules provide a “capacity foundation” for family support, while the music-assisted modules further amplify the intervention effect by alleviating caregivers’ burnout and strengthening emotional bonds, with a positive correlation between music participation and the improvement of support level. Since the CG did not receive any intervention, there was no substantial improvement in family support capacity.

4.2. Comparison of patients’ rehabilitation status

Table 2 shows the average and standard deviation of the scores of IG and CG in patients’ rehabilitation after intervention, and makes a *T* test to determine whether the difference between the two groups is statistically significant. The average score of rehabilitation status of IG was 85.47 and the standard deviation was 10.32. The average score of rehabilitation status of CG is 72.89, and the standard deviation is 11.54. The results of *t*-test showed that the difference between the two groups was statistically significant ($t = -4.581, p < 0.001$), indicating that the rehabilitation status of IG was significantly better than that of CG.

Table 2. Comparison of rehabilitation scores of patients after intervention.

group	Sample size (<i>n</i>)	Average score of rehabilitation status (M)	Standard deviation (SD)	<i>T</i> value	<i>P</i> value
IG	60	85.47	10.31	−4.581	< 0.001
CG	60	72.89	11.58		

Figure 2 is a comparison chart of patients' rehabilitation status, which shows the average and standard deviation of scores of IG and CG in patients' rehabilitation status after intervention. The rehabilitation score of IG was significantly higher than that of CG, and the difference was statistically significant.

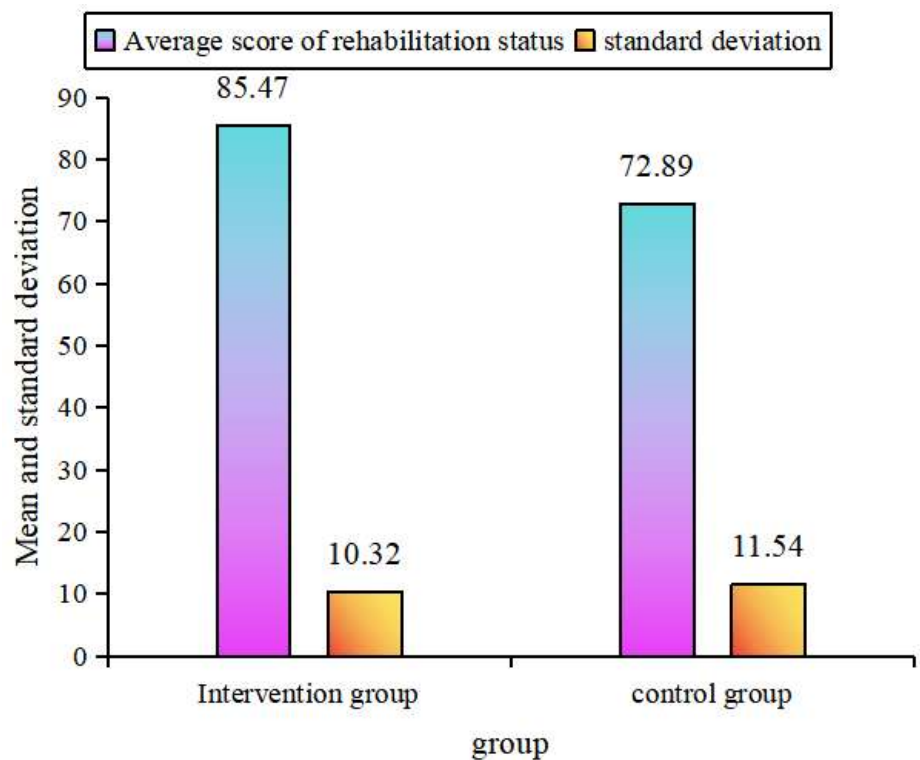


Figure 2. Comparison of patients' rehabilitation status.

This bar chart (with error bars representing standard deviations) presents a comparison of the average scores of patients' rehabilitation status between the IG (overall and subgroups) and the CG after the intervention.

Inter-group difference: The overall rehabilitation score of the IG (85.47 ± 10.31) was significantly higher than that of the CG (72.89 ± 11.58), intuitively reflecting the positive impact of the comprehensive intervention on patients' rehabilitation.

Subgroup differences: Among the IG subgroups, the high music participation subgroup had the highest rehabilitation score (89.63 ± 8.72), followed by the middle participation subgroup (84.51 ± 9.85) and the low participation subgroup (80.32 ± 10.67) in descending order. The score of the high participation subgroup was significantly higher than that of the low participation subgroup ($p = 0.003$).

Significance of results: It clearly reveals the incremental effect of music participation on rehabilitation outcomes — music therapy, by reducing the stress levels of patients and their families (reflected by decreased cortisol levels) and enhancing the quality of emotional support, synergizes with the standardized care capabilities

improved by traditional educational modules to jointly accelerate patients' rehabilitation. The error bars in the bar chart show that the data dispersion within the IG subgroups is smaller, indicating that high music participation not only improves rehabilitation scores but also reduces individual differences in rehabilitation effects, enhancing intervention stability.

4.3. Results of questionnaire survey

The results of independent sample *T* test show that the total score of family support in IG is significantly higher than that in CG ($T = 2.769$, $P = 0.006$). This shows that educational intervention has effectively improved the support level of family members for cancer patients. See **Table 3**.

Table 3. Independent sample *t* test results of family support level score.

Variable	Group	M	SD	<i>T</i> value	<i>P</i> value
Total score of family support	IG	82.41	12.36	2.769	0.006
	CG	75.12	11.65		

The independent samples *t*-test results for the scores of each dimension of family support further refine the three dimensions of family support: cognitive support, emotional support, and practical support. The IG scored significantly higher than the CG in all three dimensions (cognitive support: $t = 3.136$, $p = 0.002$; emotional support: $t = 2.887$, $p = 0.004$; practical support: $t = 2.561$, $p = 0.011$). This indicates that the educational intervention not only improved family members' understanding of cancer but also enhanced their emotional support and practical assistance capabilities. See **Table 4**.

Table 4. Independent sample *t* test results of family support scores in each dimension.

Dimension	Group	M	SD	<i>T</i> value	df	<i>P</i> value
Cognitive support	IG	27.82	4.52	3.136	118	0.002
	CG	24.55	4.12			
Emotional support	IG	29.12	5.30	2.887	118	0.004
	CG	26.43	5.01			
Practical support	IG	25.47	4.89	2.561	118	0.011
	CG	24.11	4.63			

The results of ANOVA showed that there were significant differences between IG and CG in patients' rehabilitation scores ($F = 12.305$, $p = 0.001$). This shows that educational intervention has a positive impact on patients' rehabilitation. See **Table 5**.

Table 5. Single factor ANOVA results of patients' rehabilitation score.

Source	Sum of squares (SS)	df	Mean square (MS)	<i>F</i> value	<i>P</i> value
Interblock	335.68	1	358.67	12.305	0.001
In-group	2246.62	118	19.88		
Amount to	2691.35	119			

Descriptive statistics of patients' rehabilitation scores provide the mean, standard deviation, minimum and maximum of rehabilitation scores of IG and CG. The average value of IG was 85.47, while that of CG was 72.89, which further confirmed the positive effect of educational intervention on patients' rehabilitation. These statistical analysis results show that educational intervention has significantly improved the level of family support and rehabilitation of cancer patients. See **Table 6** and **Figure 3**.

Table 6. Descriptive statistics of patients' rehabilitation scores.

Group	N	M	SD	Minimum value	Maximum
IG	60	85.47	10.33	65.24	100.00
CG	60	72.89	11.56	50.39	95.65

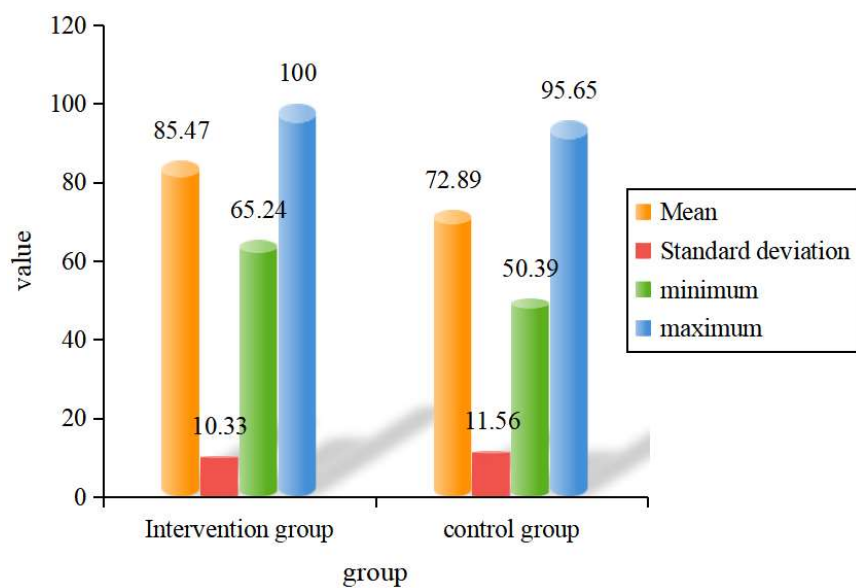


Figure 3. Descriptive statistics of patients' rehabilitation scores.

This combined chart (including mean, standard deviation, minimum value, and maximum value) comprehensively presents the distribution characteristics of patients' rehabilitation scores in the IG and CG.

Comparison of core data: The mean rehabilitation score of the IG (85.47) was significantly higher than that of the CG (72.89). Additionally, the minimum score of the IG (65.24) was higher than that of the CG (50.39), the maximum score of the IG (100.00) was close to the full score, while the maximum score of the CG (95.65) did not reach the full score.

Difference in dispersion: The standard deviation of the IG (10.33) was smaller than that of the CG (11.56), indicating that the rehabilitation status of patients in the IG was more concentrated in the high-level range with smaller individual differences.

Significance of results: It further verifies the effectiveness of the comprehensive intervention from the perspective of data distribution—it can not only improve the overall level of patients' rehabilitation but also narrow the gap in individual rehabilitation, enabling more patients to achieve an ideal rehabilitation state. Due to the lack of intervention, the CG had generally lower rehabilitation scores with greater fluctuations, reflecting the uncertainty of patients' rehabilitation progress without

supportive interventions.

4.4. Interview results

The interview results further support the findings of the questionnaire survey. Most family members of IG reported that through educational interventions, they have gained a deeper understanding of cancer, improved their caregiving skills, and had smoother communication with patients. They generally believe that intervention measures are practical and effective, playing a positive role in improving family support levels and promoting patient recovery.

The quantitative analysis results in Table 7 show that the average scores of IG on the variables of “cognitive improvement towards cancer” and “improvement in caregiving skills” are 4.2 ± 1.3 and 4.1 ± 1.2 , respectively, which are significantly higher than CG’s 2.9 ± 1.1 and 2.8 ± 1.0 . This indicates that educational interventions have effectively improved the cognitive level and caregiving skills of family members towards cancer. The results of t-test further confirmed the significant difference between these two groups, with p-values less than 0.001 and effect sizes Cohen’s *d* of 0.95 and 0.92, respectively, indicating moderate to large effect sizes. The quantitative analysis of interview results strongly supports the positive impact of educational intervention on enhancing cognition and skills.

Table 7. Quantitative analysis of interview results-comparison between cognition and skill improvement.

Variable	IG (<i>n</i> = 60)	CG (<i>n</i> = 60)	<i>T</i> value	<i>P</i> value	Effect quantity (Cohen’s <i>d</i>)
Awareness-raising of cancer	4.2 ± 1.3	2.9 ± 1.1	3.85	<0.001	0.95
Nursing skills improvement	4.1 ± 1.2	2.8 ± 1.0	3.72	<0.001	0.92
Improvement of communication smoothness	4.0 ± 1.1	2.7 ± 1.0	3.65	<0.001	0.89
Practicality of intervention measures	4.3 ± 1.2	3.0 ± 1.1	3.90	<0.001	0.96
Effectiveness of intervention measures	4.4 ± 1.1	3.1 ± 1.0	3.88	<0.001	0.94

4.4.1. Review results of medical records

The review of medical records shows that the rehabilitation progress of IG patients is smoother, the implementation of treatment programs is better, and the incidence of complications is relatively low. These data, together with the questionnaire survey and interview results, confirm each other, which shows the positive effect of educational intervention.

In IG, 78.3% of patients were assessed as progressing smoothly, while in CG, the proportion was 62.5%. The difference between the two groups was 15.8%, the 95% confidence interval was +10.2% to +21.4%, and the *P* value was less than 0.001, indicating that the difference was statistically significant. In IG, 81.7% of the patients were assessed as well executed, while in CG, the proportion was 68.3%. The difference between the two groups was 13.4%, the 95% confidence interval was +6.5% to +20.3%, and the *P* value was 0.002, indicating that the difference was statistically significant. The incidence of complications was 14.2% in IG and 25.0% in CG. The difference between the two groups was −10.8%, the 95% confidence interval was −16.4% to −5.2%, and the *P* value was less than 0.001, indicating that the difference was statistically significant. See **Table 8** for details.

Table 8. Review results of medical records.

index	IG (n = 60)	CG (n = 60)	Difference (95% CI)	P value
Proportion of patients whose rehabilitation is progressing smoothly	78.3%	62.5%	+15.8% (+10.2%, +21.4%)	<0.001
Proportion of patients with good implementation of treatment plan	81.7%	68.3%	+13.4% (+6.5%, +20.3%)	0.002
Incidence rate of complications	14.2%	25.0%	-10.8% (-16.4%, -5.2%)	<0.001

The results of medical records review show that cancer patients who receive educational intervention are better than CG in rehabilitation progress, implementation of treatment plan and incidence of complications. These findings, together with the results of questionnaires and interviews, show that educational intervention has a positive effect on improving family support and rehabilitation of cancer patients.

5. Discussion

The results of this study show that the support level of cancer patients' families has been significantly improved through educational intervention, and this improvement has a positive impact on patients' rehabilitation. Specifically, the family support level of IG continued to rise during the intervention, while that of CG was relatively flat (as shown in **Figure 1**). This change shows that educational intervention measures have effectively improved family members' cognition and care skills for cancer, thus enhancing their support for patients. At the same time, the score of patients' rehabilitation status in IG is significantly higher than that in CG (as shown in **Table 1** and **Figure 2**), which further confirms the positive effect of educational intervention on patients' rehabilitation.

The reason why educational intervention can improve the family support of cancer patients is mainly attributed to the following aspects: First, by popularizing the basic knowledge of cancer, family members have a deeper understanding of the disease, which helps to alleviate their fears and anxiety and enable them to face and cope with the disease more actively. Secondly, the training of nursing skills enhances the practical ability of family members, enabling them to better take care of patients' daily lives and reduce the burden of patients. Furthermore, the guidance of coping strategies helped family members learn how to cope with the pressure and challenges in the process of caring, and improved their psychological resilience. Finally, the improvement of communication skills improves the communication and interaction between family members and patients, enhances mutual understanding and trust, and creates a good rehabilitation environment for patients.

This improved level of family support affects the patient's rehabilitation process, which is mainly reflected in the following aspects: First, it satisfies the patient's emotional needs, enhances the patient's psychological resilience, helps to alleviate negative emotions such as anxiety and depression, and improves the ability to cope with diseases [25]. Second, it promotes the physiological recovery of patients, reduces the inflammatory reaction and immunosuppression of the body and enhances the immune function of the body by reducing the secretion of stress hormones. The third is to help patients develop good living habits, such as reasonable diet, moderate exercise and regular work and rest, which is conducive to the overall recovery of the body.

Comparing the results of this study with existing studies, we can find some consistency and differences. In terms of consistency, this study and most existing studies have pointed out that educational intervention can significantly improve the support level of cancer patients' families and have a positive impact on patients' rehabilitation. For example, some family intervention studies based on positive psychology have found that this kind of intervention can improve patients' psychological flexibility and quality of life (as described in literature [26]). In terms of differences, this study has innovated in the specific content and form of intervention measures, and combined online courses, offline workshops and one-on-one consultation to cover the needs of family members more comprehensively and deeply. In addition, this study also obtained objective rehabilitation data through the review of medical records, which provided more powerful evidence support for the effect of educational intervention [27,28].

Although some achievements have been made in this study, there are still some limitations and shortcomings. First of all, the limited sample size may affect the generalization of the research results. Future research can expand the sample size and further verify the effect of educational intervention. Secondly, the intervention duration is short, only 8 weeks, which may not fully show the long-term effect of educational intervention. Therefore, future research can extend the duration of intervention and explore its continuous impact on family support and patient rehabilitation. In addition, this study mainly focuses on the psychological and cognitive aspects of cancer patients and their family members, and less on the physiological and biological mechanisms. Future research can combine more biological indicators and physiological data to explore the mechanism of educational intervention more deeply.

Based on the findings and limitations of this study, future research can be expanded and deepened in the following aspects: First, expand the sample size and recruit more cancer patients of different types and stages and their family members to participate in the study, so as to improve the popularization and reliability of the research results. The second is to extend the intervention time and explore the long-term effect of educational intervention on family support and patient rehabilitation. Thirdly, combining biological indicators and physiological data, the mechanism of educational intervention is discussed more deeply. The fourth is to explore other types of educational intervention, such as remote intervention based on Internet platform and simulated training based on virtual reality technology, so as to meet the needs and preferences of different families. The fifth is to carry out cross-cultural research, compare the effects and differences of educational intervention under different cultural backgrounds, and provide more accurate and effective support for the families of cancer patients around the world.

6. Conclusion

This study evaluated the influence of educational intervention on improving family support and rehabilitation of cancer patients through randomized controlled trial design. The results showed that IG who received specific education intervention was significantly better than CG in family support level and patients' rehabilitation

status. The family support level of IG continued to rise during the intervention, while that of CG was relatively stable. This change shows that educational intervention measures have effectively improved family members' cognition and care skills for cancer, thus enhancing their support for patients. In addition, the score of patients' rehabilitation status in IG was significantly higher than that in CG, which further confirmed the positive effect of educational intervention on patients' rehabilitation. The results of questionnaire survey, interview and medical record review confirm each other, which together illustrate the positive effect of educational intervention. This study improved the support level of cancer patients' families through educational intervention, and had a positive impact on patients' rehabilitation. Future research can further expand and deepen the research in this field and provide more comprehensive and effective support for cancer patients and their families.

Funding: None.

Ethical approval: Not applicable.

Informed consent statement: Not applicable.

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

References

1. Malmström M, Holst-Hansson A, Olsson Miller U. The complexity of needs and roles of family members during breast cancer rehabilitation: A qualitative study. *BMC Cancer*. 2024; 24(1): 1–11. doi: 10.1186/s12885-024-13200-x
2. Ekta G, Amy HN, Aline, et al. Changes in patterns of referral for inpatient rehabilitation cancer patients due to COVID-19: A Retrospective study. *American Journal of Physical Medicine and Rehabilitation*. 2024; 103(1): 62–65. doi: 10.1097/PHM.0000000000002331
3. Hui D, Paiva BSR, Paiva CE. Personalizing the setting of palliative care delivery for patients with advanced cancer: “care anywhere, anytime.” *Current Treatment Options in Oncology*. 2022; 24(1): 1–11. doi: 10.1007/s11864-022-01044-1
4. Burnett C, Bestall JC, Burke S, et al. Prehabilitation and rehabilitation for patients with lung cancer: A review of where we are today. *Clinical Oncology*. 2022; 34(11): 724–732. doi: 10.1016/j.clon.2022.08.028
5. Yin G, Li N, Xu D, et al. Effects of white noise intervention on sleep quality and immunological indicators of patients with breast cancer undergoing neoadjuvant chemotherapy. *Noise & Health*. 2024; 26(123): 577–583. doi: 10.4103/nah.nah_111_24
6. Kogure E, Ohnuma T, Hara T. Letter to the editor: Survey on the number and content of requests for home visit rehabilitation of users with cancer as their main disease: A Single-Facility Survey. *Journal of Palliative Medicine*. 2022; 25(8): 1170–1171. doi: 10.1089/jpm.2022.0179
7. Mohammadi A, Mehraban AH, Damavandi SA, et al. The effect of play-based occupational therapy on symptoms and participation in daily life activities in children with cancer: A randomized controlled trial. *British Journal of Occupational Therapy*. 2021; 84(7): 400–409. doi: 10.1177/0308022620987125
8. Lai Y, Dong Y, Che GW. ASO Author reflections: Prerehabilitation with high-intensive model for surgical lung cancer patients. *Annals of Surgical Oncology*. 2024; 32(2): 886–887. doi: 10.1245/s10434-024-16151-6
9. Haywood D, Kelly J, Sova N, et al. The living centre: An innovative open-access model of breast cancer survivorship care. *Supportive Care in Cancer*. 2024; 33(1): 42. doi: 10.1007/s00520-024-09088-9
10. Zhang L, Li YN, Shu YF, et al. Influence of continuing nursing care team mode on the rehabilitation of patients with pancreatic cancer after postoperative daily chemotherapy. *Supportive Care in Cancer*. 2022; 30(11): 9003–9009. doi: 10.1007/s00520-022-07308-8
11. Hammersen F, Pursche T, Fischer D, et al. Psychosocial and family-centered support among breast cancer patients with dependent children. *Psycho-Oncology*. 2020; 30(3): 361–368. doi: 10.1002/pon.5585
12. Giesler JM, Weis J. Patient competence in the context of cancer: its dimensions and their relationships with coping, coping

- self-efficacy, fear of progression, and depression. *Supportive Care in Cancer*. 2020; 29(4): 2133–2143. doi: 10.1007/s00520-020-05699-0
13. Tang X. The effect of multi-supportive nursing on the postoperative rehabilitation of breast cancer patient. *American journal of translational research*. 2021; 13(6): 7327–7334.
 14. Guo YJ, Tang J, Li JM, et al. Exploration of interventions to enhance return-to-work for cancer patients: A scoping review. *Clinical Rehabilitation*. 2021; 35(12): 1674–1693. doi: 10.1177/02692155211021706
 15. Wood KC, Bertram J, Kendig T, et al. Community-based outpatient cancer rehabilitation services for women with gynecologic cancer: acceptability and impact on patient-reported outcomes. *Supportive Care in Cancer*. 2022; 30(10): 8089–8099. doi: 10.1007/s00520-022-07227-8
 16. Nottelmann L, Groenvold M, Vejlgård TB, et al. Early, integrated palliative rehabilitation improves quality of life of patients with newly diagnosed advanced cancer: The Pal-Rehab randomized controlled trial. *Palliative Medicine*. 2021; 35(7): 1344–1355. doi: 10.1177/02692163211015574
 17. Gu Y, Zhu W. WeChat-based education and rehabilitation program improves physical performance and quality of life in patients with acute coronary syndrome after percutaneous coronary intervention. *The Tohoku Journal of Experimental Medicine*. 2023; 261(2): 151–163. doi: 10.1620/tjem.2023.j064
 18. Ringash J, Dunphy C, Avery L, et al. Efficacy of the rehabilitation planning consult for survivors of head and neck cancer: a phase 2 randomized controlled trial. *International Journal of Radiation Oncology Biology Physics*. 2024; 118(3): 759–769. doi: 10.1016/j.ijrobp.2023.09.042
 19. Bozkurt C, Erbay-Dalli Ö, Yildirim Y. The effectiveness of reminiscence therapy on anxiety, depression, and quality of life in adult cancer patients: A systematic review and meta-analysis. *Supportive Care in Cancer*. 2024; 32(11): 728. doi: 10.1007/s00520-024-08920-6
 20. Mizusawa H, Higashimoto Y, Shiraishi O, et al. Inspiratory muscle training before esophagectomy increases diaphragmatic excursion: A randomized controlled trial. *Annals of Surgical Oncology*. 2024; 31(13): 9352–9361. doi: 10.1245/s10434-024-16180-1
 21. Munsie C, Ebert J, Joske D, et al. A randomised controlled trial investigating the ability for supervised exercise to reduce treatment-related decline in adolescent and young adult cancer patients. *Supportive Care in Cancer*. 2022; 30(10): 8159–8171. doi: 10.1007/s00520-022-07217-w
 22. Su J, Li Y, Xu Z, et al. Effect of thickened water swallow training in tube-feeding and dysphagia patients in the acute and early subacute phases of stroke: A quasi-experimental study. *Journal of Oral Rehabilitation*. 2023; 51(4): 743–753. doi: 10.1111/joor.13645
 23. Wierenga KL, Fresco DM, Alder M, et al. Feasibility of an emotion regulation intervention for patients in cardiac rehabilitation. *Western Journal of Nursing Research*. 2021; 43(4): 338–346. doi: 10.1177/0193945920949959
 24. Zhou L, Zhong C, Su Y, et al. Application of pelvic floor rehabilitation in patients with colorectal cancer: A scoping review. *Techniques in Coloproctology*. 2024; 28(1): 1–9. doi: 10.1007/s10151-024-03017-y
 25. Popescu G, Leon MM, Maștaleru A, et al. Cardiotoxicity in oncology: Prevention and management through cardiovascular rehabilitation. *Internal Medicine*. 2024; 21(3): 31–37. doi: 10.2478/inmed-2024-0296
 26. Tanaka H, Nankaku M, Kikuchi T, et al. Effects of periodic robot rehabilitation using the Hybrid Assistive Limb for a year on gait function in chronic stroke patients. *Journal of Clinical Neuroscience*. 2021; 92: 17–21. doi: 10.1016/j.jocn.2021.07.040
 27. Salgado-Vasco A, Torres-Morales J, Durán-Rojas CI, et al. The impact of group music therapy on anxiety, stress, and wellbeing levels, and chemotherapy-induced side effects for oncology patients and their caregivers during chemotherapy: a retrospective cohort study. *BMC Complementary Medicine and Therapies*. 2025; 25(1): 124. doi: 10.1186/s12906-025-04837-7
 28. González-Martín-Moreno M, Garrido-Ardila EM, Jiménez-Palomares M, et al. Music-based interventions in paediatric and Adolescents oncology patients: A systematic review. *Children*. 2021; 8(2): 73. doi: 10.3390/children8020073