

Effects of Music Therapy on Patients with Cancer Receiving Outpatient Treatment

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KEYWORDS

Outpatient Treatment For Cancer, Music Therapy, Anxiety, Satisfaction

ABSTRACT

Patients with cancer often experience anxiety when waiting for diagnostic test results, before receiving treatment, or when informed of a recurrence. Therefore, appropriate interventions are required at each of these stages. This study determines the effects of music therapy with preferred music on anxiety, blood pressure, pulse, and the satisfaction of patients with cancer when receiving outpatient intravenous therapy in a long-term care facility.

This quasi-experimental non-equivalent control-group and non-synchronized study was conducted in the outpatient injection room of a long-term care facility in South Korea. This study included 57 patients (divided into experimental and control groups) with female reproductive system/breast or digestive system cancer who received short-term intravenous vitamin C on an outpatient basis. The participants chose from a music selection table for each genre, which was based on the prior research, under the supervision of a professor experienced in music therapy. The participants selected 20 songs to listen to for 1 h while receiving intravenous therapy. The participants were surveyed for state anxiety and satisfaction to confirm the effects of music therapy, and their systolic and diastolic blood pressure and pulse were measured.

The state anxiety ($U=282$, $p=.046$) and satisfaction ($U=262$, $p=.016$) scores of the experimental and control groups revealed significant differences. There were no significant differences in systolic blood pressure ($U=311$, $p=.13$), diastolic blood pressure ($t=1.88$, $p=.065$), and pulse ($t=-0.5$, $p=.61$) between the experimental and control groups.

Music therapy is an effective intervention for reducing anxiety and improving satisfaction in patients with cancer when receiving short-term outpatient treatment. However, to generalize these results, a larger sample size of participants is needed with similar types of cancer.

1. Introduction

Cancer is a debilitating and lethal disease and remains the primary cause of mortality in South Korea, despite early diagnoses and advances in modern medicine [1]. Patients diagnosed with cancer experience a wide range of negative psychological symptoms, including embarrassment, sadness, fear, depression, and panic. A cancer diagnosis is frequently associated with thoughts of mortality and severe anxiety due to uncertain treatment outcomes and prognoses [2, 3]. Anxiety causes an imbalance in the hypothalamus-pituitary-adrenal axis, resulting in changes in the physiological coping system, including the neuroendocrine, immune, and autonomic nervous systems [4]. Moreover, anxiety triggers a stress response wherein the autonomic sympathetic nervous system is activated and epinephrine and norepinephrine are released from the adrenal medulla, thereby increasing blood pressure, pulse, and respiration rate [5] and negatively affecting the recuperation process of patients with cancer.

Various interventions are used to alleviate anxiety in patients with cancer. Among them, music therapy, a simple and accessible intervention, uses the physiological, psychological, and social responses to music to reduce anxiety, stress, and pain [6]; regulate the autonomic nervous system, relax the body, and induce emotional relaxation to relieve anxiety [7]. Music therapy is safe and cost-effective [8]; it also considers patient preferences and thus has a positive effect on patient satisfaction [7, 9, 10]. Further, playing patients' preferred music in accordance with their symptoms and moods enhances the therapeutic effect of the intervention by reducing anxiety, increasing comfort, and enhancing pain thresholds [11]. Since music therapy can relax the psychological state of patients with cancer, improves

communication, and relieves tension, it is considered an important nursing intervention that can improve patient satisfaction [12].

Previous studies have reported the effects of music therapy, including preferred music, on relieving anxiety in patients undergoing spinal anesthesia [9, 13–25], reducing fatigue and anxiety in patients undergoing hemodialysis [26], and reducing pain and anxiety in patients undergoing angioplasty [27]. Moreover, several studies on the impact of music therapy on patients with cancer have reported reduced anxiety and depression [28–30]. However, these studies have been conducted with inpatients rather than those receiving outpatient treatment. Moreover, the number of patients with cancer receiving outpatient treatment for chemotherapy, radiation therapy, and additional diagnostic tests has increased [31]. As such, there are fewer complementary interventions, such as music therapy, for patients who receive intravenous injections as outpatients. Therefore, this study examines the effects of music therapy on the anxiety and satisfaction levels of patients with cancer when listening to preferred music while receiving short-term outpatient treatment. It analyzes the results to validate the effectiveness of music therapy as a complementary therapeutic intervention.

2. Methodology

Study Design and Participants

This study employed a quasi-experimental non-equivalent control-group and non-synchronized design. The participants were patients with female reproductive system/breast or digestive system cancer who visited a long-term care facility in Changwon City to receive high-dose intravenous administration of vitamin C for three months, from June 13, 2019 to September 10, 2019. The inclusion criteria were patients who could communicate and express their opinions clearly, patients without disabilities, patients who were receiving high-dose intravenous administration of vitamin C (1–3 h), and patients who agreed to participate in the study.

The participants were informed of their rights to anonymity and confidentiality and could withdraw at any time without disadvantage; written informed consent was obtained from all participants. The Institutional Review Board (IRB) of Changshin University (CSIRB-R2019007) approved the study. This study was performed in accordance with the appropriate institutional review committee guidelines and the ethical standards set forth in the Declaration of Helsinki (1975).

Sample Size

The sample size was calculated using G*Power 3.1.0 [32]. There are few prior studies on the effects of music therapy on patients with cancer when receiving outpatient treatment; hence, the required sample size was 54 participants, with 27 in the experimental and control groups, respectively, based on the median effect size (d) of .5, t -test ($1-\beta$) of .95, and significance level (α) of .05. Factoring in a dropout rate of 10%, this study used 60 participants (30 in the experimental and control groups, respectively).

Group Allocation

To prevent confusion during the data collection process, the data were first collected from the control group (from June 13, 2019 to July 20, 2019) and were subsequently collected from the experimental group (from July 21, 2019 to September 10, 2019) after providing music therapy.

Intervention

This study partially modified the genre-based music selection listing used by Yun [33] to obtain a music selection table for each age group. It referred to the “100 Best Pop Songs Favored by Koreans” [34] as well as the preferred music rankings according to different age groups. The music selection table was prepared under the supervision of a music department professor experienced in providing music therapy.

Outcome Measures

This study measured the blood pressure of the participants in the control and experimental groups and distributed questionnaires to collect information on their general and disease-related characteristics,

anxiety levels, music preference, and patient satisfaction. The questionnaire completion time was approximately 10 min; the participants were asked to complete the questionnaire by themselves, if possible. For patients with visual impairments or those who were weak, the authors read out the questionnaire items and collected their responses.

Anxiety

The study measured anxiety using the six dimensions (anxiety, depression, anger, vitality, fatigue, and confusion) of the Profile of Mood States (POMS) [35], which was modified by Lee [30]. The anxiety scale consisted of the following parameters: tension, insecurity, excitement, embarrassment, comfort, displeasure, restlessness, agitation, and worry, which the participants rated on a 5-point scale. The total score ranged from 9–45; higher scores indicated greater anxiety. Cronbach's α coefficients were .84, .90, and .83 in the studies by McNair et al. [35], Lee [30], and the current study, respectively.

Blood pressure

This study measured participants' blood pressure before and after the music therapy intervention when the patients were lying on a bed in the injection room. After wrapping the blood pressure cuff around the left upper arm, this study measured patients' systolic and diastolic blood pressure using an electronic sphygmomanometer, HEM-7121 (OMERON, Vietnam). A lower value within the normal range indicated lower state anxiety.

Pulse

This study measured participants' pulse in a similar manner to that of their blood pressure using the same electronic sphygmomanometer. A lower value within the normal range indicated lower state anxiety.

Satisfaction

This study measured participants' satisfaction using a single-item scale that determined the degree of satisfaction with the overall nursing care provided. The score ranged from 0 (not satisfied at all) to 10 (very satisfied); higher scores indicated higher levels of patient satisfaction.

Statistical Analyses

This study analyzed the collected data using Jamovi 0.9.6.4 software (The Jamovi Project Version 1.6, 2021). This study measured participants' general and disease-related characteristics using the frequency, percentage, mean, and standard deviation. This study confirmed the normality of the dependent variable using the Shapiro–Wilk test and the significance level was set at $p < .05$. This study analyzed the homogeneity between the experimental and control groups using the t-test, χ^2 , and Mann–Whitney U tests. This study measured the intervention's effects on the experimental and control groups using the t-test and Mann–Whitney U test. The significance level was set at $p < .05$ (two-tailed).

3. Results and Discussion

Among the 60 participants, one participant in the experimental group dropped out due to deteriorating health, and two participants in the control group dropped out due to unclear responses and refusal to participate further. Accordingly, this study included the data of 57 participants (29 and 28 in the experimental and control groups, respectively) in the final analysis (Figure 1).

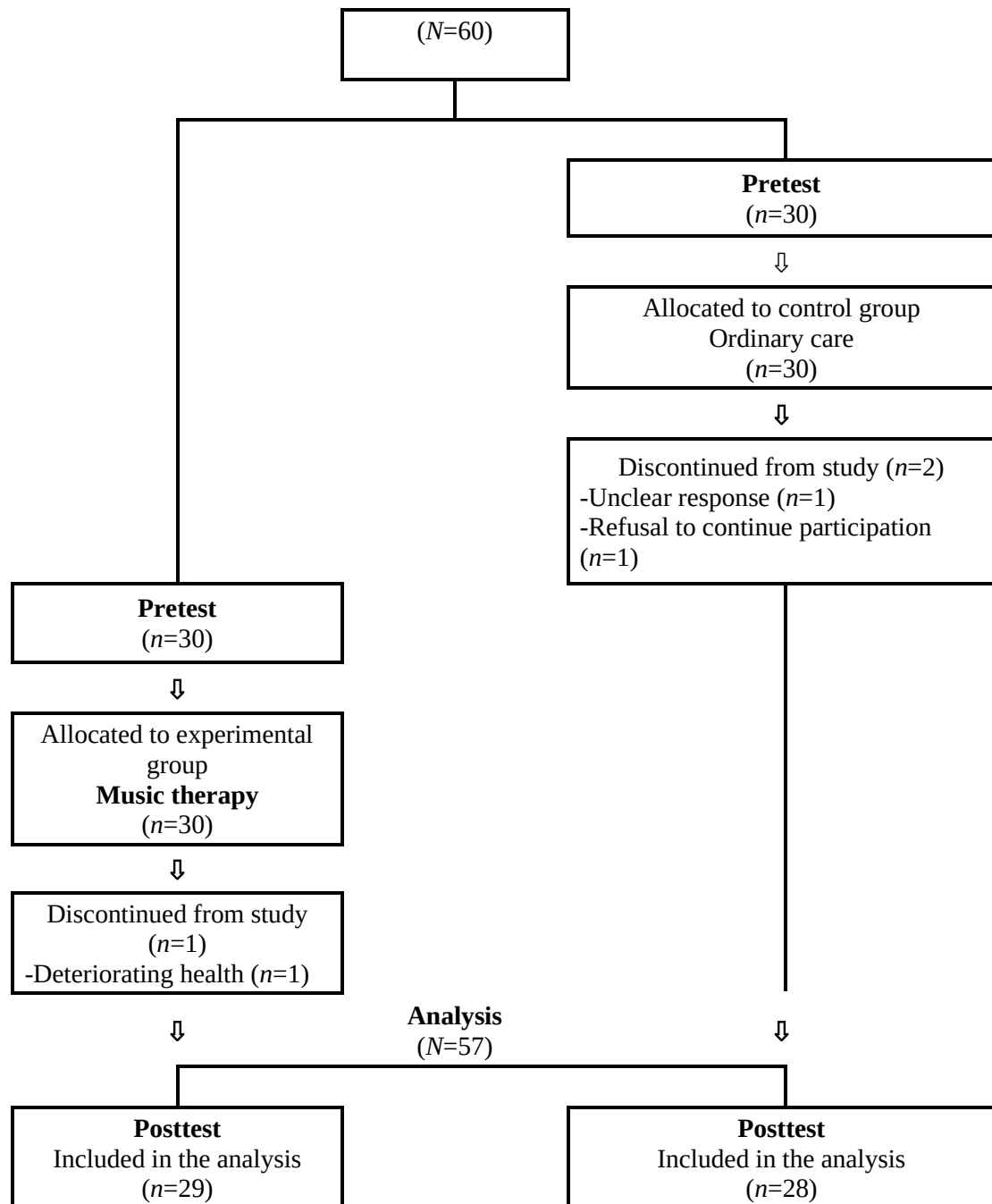


Figure 1. Study procedure

Participants' Homogeneity

The mean ages of participants in the experimental and control groups were 52.1 ± 11.7 and 53.2 ± 9.92 years, respectively. The homogeneity test for each item revealed no statistically significant difference, confirming the homogeneity of the two groups.

Table 1. Participants' general characteristics and homogeneity (N=57)

Characteristic	Division	Experimental group (n=29)	Control group (n=28)	χ^2 / t	P
		n (%) or M±SD	n (%) or M±SD		
Age (years)	<50	10 (34.5)	11 (39.3)	3.97	.264
	50–60	14 (48.3)	10 (35.7)		
	>60	5 (17.2)	7 (25.0)		
	M±SD	52.1±11.7	53.2±9.92		
Gender	Female	24 (82.8)	19 (67.9)	1.71	.191
	Male	5 (17.2)	9 (32.1)		
Marital status	Married	23 (79.3)	23 (82.1)	0.07	.786
	Other	6 (20.7)	5 (17.9)		
Religion	Yes	18 (62.1)	19 (67.9)	0.29	.863
	No	11 (37.9)	9 (32.1)		
Level of education	High school or lower	13 (44.8)	16 (57.1)	0.86	.352
	College or higher	16 (55.2)	12 (42.9)		
Employed	Yes	11 (37.9)	8 (28.6)	0.56	.453
	No	18 (62.1)	20 (71.4)		

Participants' Disease-Related Characteristics and Homogeneity

Patients with female reproductive system/breast cancer accounted for 37.9% and 46.4% of the participants in the experimental and control groups, respectively, and had the highest prevalence rate in both groups. Among the treatment methods, receiving surgery and chemotherapy had the highest prevalence rate in both groups.

The average illness duration was 25.58±23.95 and 24.92±22.67 months in the experimental and control groups, respectively. The majority of participants in the experimental (82.1%) and control (62.1%) groups had been undergoing treatment for <36 months. The homogeneity test for each item revealed no statistically significant difference in participants' disease-related characteristics, thereby confirming the homogeneity of the two groups.

Table 2. Participants' disease-related characteristics and homogeneity (N=57)

Characteristic	Division	Experimental group (n=29)	Control group (n=28)	χ^2 / t	P
		n (%) or M±SD	n (%) or M±SD		
Diagnosis	Female reproductive system/breast cancer	11 (37.9)	13 (46.4)	2.73	.603
	Digestive system cancer	7 (24.1)	9 (32.1)		
	Other	11 (37.9)	6 (21.4)		
Treatment method	Surgery+chemotherapy	12 (41.4)	15 (53.6)	5.84	.211
	Surgery+chemotherapy+radiation therapy	6 (20.7)	7 (25.0)		
	Other	11 (37.9)	6 (21.4)		
Illness duration	<36 months	23 (82.1)	18 (62.1)	1.70	.094
	≥36 months	5 (17.9)	11 (37.9)		
	M±SD	25.58±23.95	24.92±22.67		

Normality Test for Prior Dependent Variables

Table 3 presents the results of the normality test using the Shapiro–Wilk test and the Levene test for the equality of variance for the prior dependent variables. The anxiety, systolic blood pressure, and patient satisfaction scores did not show normal distribution between groups, whereas diastolic blood pressure and pulse showed normal distribution.

Table 3. Normality test for prior dependent variables and Levene test for equality of variance (N=57)

Variable	Shapiro–Wilk		Levene	
	W	P	F	P
Anxiety	.887	<.001	2.998	.089
Systolic blood pressure	.785	<.001	2.042	.159
Diastolic blood pressure	.973	.221	8.994	.004
Pulse	.968	.130	.410	.524
Satisfaction	.904	<.001	.143	.706

Homogeneity Test for Prior Dependent Variables

There was no statistically significant difference in the prior dependent variable results between the experimental and control groups, thereby confirming the homogeneity of the two groups (Table 4).

Table 4. Homogeneity test for the prior dependent variables (N=57)

Variable group	Experimental group (n=29)	Control group (n=28)	U / t	p
	M±SD	M±SD		
Anxiety	18.97±6.43	16.46±3.47	310*	.126
Systolic blood pressure	109±12.45	112.46±24.79	317*	.155
Diastolic blood pressure	73.46±12.19	70.28±7.1	1.21	.230
Pulse	70.66±10.78	72.68±11.81	0.67	.501
Satisfaction	7.62±1.82	7.86±1.68	377*	.636

*Mann–Whitney U test.

Difference in Variables Before and After the Intervention Between the Experimental and Control Groups

There was a statistically significant difference between the experimental and control groups regarding the state anxiety (U=282, $p=.046$) and satisfaction level (U=262, $p=.016$) scores. However, the analysis of the difference in the changes in the two groups' systolic blood pressure (U=311, $p=.13$) and pulse ($t=-0.5$, $p=.61$) scores revealed no statistically significant difference (Table 5).

Table 5. Differences in variables before and after the intervention between the experimental and control groups (N=57)

Variable		Group	Pretest	Posttest	Difference	U	p
			M±SD	M±SD	M±SD		
State anxiety		E(n=29)	18.97±6.43	13.63±3.56	5.34±4.41	282*	.046
		C(n=28)	16.46±3.47	15.30±3.51	1.18±1.79		
Blood Pressure	Systolic blood pressure	E(n=29)	109±12.5	113±13.5	-3.62±11.4	311*	.130
		C(n=28)	116±14.8	122±13.7	-6.36±10.4		
	Diastolic blood pressure	E(n=29)	70.3±7.1	71.7±11.1	-1.45±8.83	1.88	.065
		C(n=28)	73.5±12.2	77.6±12.6	-4.18±6.74		
Pulse		E(n=29)	70.7±10.8	67.1±9.28	3.59±8.38	-0.50	.610
		C(n=28)	72.7±11.8	70.0±11.0	2.68±4.70		
Satisfaction		E(n=29)	7.62±1.82	9.1±1.21	-1.48±1.7	262*	.016
		C(n=28)	7.86±1.86	8.0±1.91	-0.14±0.35		

*Mann–Whitney U test; E=experimental group; C=control group.

Discussion

This study determined the effects of music therapy with preferred music on the anxiety, blood pressure, pulse, and satisfaction of patients with cancer receiving intravenous vitamin C in the outpatient

injection room of a long-term care facility.

The application of music therapy significantly reduced state anxiety in the experimental group. This result concurs with that of Firmeza et al. [36], who find that patients with head and neck cancer have decreased anxiety when listening to Vivaldi's *The Four Seasons*; Fernando et al. [37] and Rossetti et al. [38], who reveal that patients with cancer undergoing therapy have decreased anxiety when listening to classical music; and Bilgic et al. [39], who show that patients receiving chemotherapy have decreased anxiety during music therapy.

Moreover, this study's finding that music therapy decreases participants' anxiety is consistent with the prior studies' results that have shown that preferred music decreases the anxiety of patients with burn injuries when undergoing dressing change [40], laparoscopic colectomy [10], and receiving spinal anesthesia [13, 16, 17, 22, 23, 24]. Therefore, it is probable that using preferred music for patients receiving short-term therapy in outpatient settings can promote emotional stability and reduce state anxiety.

Differences in blood pressure and pulse between the experimental and control groups were not statistically significant in this study. Lee and Kim [41] reported a significant decrease in blood pressure and pulse after music therapy was provided to patients receiving whole-body irradiation prior to hematopoietic stem cell transplantation. Music therapy also significantly decreased the blood pressure and pulse of patients with chronic renal failure during hemodialysis [42] and of patients with head and neck cancer [36]. However, Fernando et al. [37] report that playing classical music for patients with cancer does not significantly decrease blood pressure and pulse, which is consistent with the current study's results. Intravenous infusion of 250–1,000 ml of vitamin C over a short period might have temporarily increased participants' blood pressure in both groups due to increased blood volume. The effects on blood pressure and pulse might also have been caused by the momentary changes in vital signs due to individual physiological responses to music therapy and diverse external environments. Therefore, when physiological variables, such as blood pressure and pulse, are used as anxiety indicators, it is necessary to stringently control the internal and external environmental factors, include a higher number of participants, and repeat studies on the effects of music therapy on vital signs.

There are few available studies on the effects of music therapy on patient satisfaction. This study's application of music therapy demonstrated significantly improved satisfaction in the experimental group. This finding confirms that when applied as a nursing intervention during surgery, music therapy can significantly increase patients' subjective satisfaction [7, 9, 10, 43, 44].

In this study, patients were allowed to listen to the music of their choice, as preference and familiarity are considered important in music therapy. Preferred music acts on the limbic system of the listener's brain and leads to emotional stability, while non-preferred music may have a negative effect as it may be considered as noise [45]. Therefore, preferred music provides patients with an immersive experience that aids their emotional stability, which, in turn, contributes to reduced anxiety levels during cancer treatment. Jeong [45] compared the mediating effects of preferred and non-preferred music and revealed that preferred music reduced anxiety, while non-preferred music induced negative reactions, including arousal, excitement, and increased anxiety.

This study has the following limitations. First, this study was conducted using patients with cancer receiving outpatient treatment in a long-term care facility. It could not be conducted with participants with similar diagnoses due to the relatively small number of participants and the variations in the required dose of vitamin C for each participant. Accordingly, further research is needed to provide more in-depth insights. Despite these limitations, this study is significant because it shows that the application of preferred music during the treatment of patients with female reproductive system/breast or digestive system cancer decreases their anxiety levels and improves satisfaction

4. Conclusion and future scope

Patients' preferred music increases the effectiveness of music therapy during treatment. Therefore, it should be

considered in future applications of music therapy as part of nursing practices. Further studies are needed to revalidate this study's results by enrolling participants of all ages from various regions, with variations in anxiety levels and the doses of vitamin C required, and with similar types of cancer.

Declarations

Ethics approval and consent to participate: Written informed consent was obtained from all participants. The Institutional Review Board of C University (CSIRB-****) approved the study.

Consent for publication: Consent to publish unidentifiable data was obtained from all participants.

Availability of data and materials:

Competing interests: The authors declare no conflicts of interest.

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Authors' contributions:

Conceptualization; Kang JY, Lee DY

Data curation; Kang JY, Lee DY

Formal analysis; Kang JY, Lee DY, Park HS

Investigation; Kang JY

Project administration; Lee DY, Park HS

Supervision; Park HS, Lee DY

Validation; Park HS, Lee DY

Roles/Writing - original draft; Kang JY, Lee DY

Writing - review & editing; Lee DY, Kang JY

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