

Research Article

Effect of music intervention on anxiety levels in cancer patients receiving radiotherapy

Kanser hastalarında radyoterapi sırasında müzik dinlemenin anksiyete seviyelerine etkisi

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Abstract

Aim: Diagnosis and treatment of malignancies may cause distress in patients. Complementary treatments like music intervention to relieve anxiety of cancer patients is a new paradigm. We aimed to evaluate the effect of music intervention on anxiety in patients undergoing radiotherapy.

Material and Methods: One hundred patients who received radiotherapy with curative intent were included in the study. Patients were divided into music intervention and control groups. Each group consisted of 50 patients but three patients from the music intervention group and 2 patients from the control group were excluded from the analysis because they could not completely fill in the questionnaires. In music intervention group patients selected the type of music they desired to listen freely during radiotherapy. Music intervention was not used in the control group during radiotherapy. Anxiety levels were evaluated with STAI-I and BAI questionnaires after the first session of radiotherapy in both groups. STAI-II was implemented before radiotherapy

Results: Forty-eight patients in the control and 47 patients in the music intervention group were included in the analyses. The mean STAI-I scores after radiotherapy were 42.1 ± 11.1 and 29.9 ± 6.7 in the control and music intervention groups, respectively with a statistically significant intergroup difference ($p=0.000$). The mean BAI scores after RT were 19.96 ± 6.3 and 13.3 ± 3.1 in the control and music intervention groups, respectively with a statistically significant difference. ($p=0.000$).

Conclusion: Music intervention during radiotherapy sessions may be effective on reducing the radiotherapy-related anxiety in cancer patients.

Keywords: Cancer, Anxiety, Music interventions, Radiotherapy

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Öz

Amaç: Kanser tanı ve tedavisi hastalarda kaygıya neden olabilmektedir. Kanserli hastaların kaygılarını azaltmak için müzik müdahalesi gibi tamamlayıcı tedaviler güncel yaklaşımlardır. Bu çalışmada Radyoterapi alan hastalarda müzik müdahalesinin kaygı üzerine etkisini değerlendirmeyi amaçladık.

Gereç ve Yöntemler: Küratif amaçlı radyoterapi alan 100 hasta çalışmaya dahil edildi. Hastalar müzik müdahale ve kontrol gruplarına ayrıldı. Her grup 50 hastadan oluşmakta ancak müzik müdahale grubundan 3, kontrol grubundan 2 hasta anketleri tamamlayamadıklarından analize dahil edilmediler. Müzik müdahale grubundaki hastalar radyoterapi sırasında dinleyecekleri müzik türünü kendileri seçtiler. Kontrol grubuna radyoterapi sırasında müzik dinletilmedi. Her iki grupta ilk radyoterapi uygulaması sonrası kaygı düzeyleri STAI-I ve BAI anketleri ile değerlendirildi.

Bulgular: Kontrol grubunda 48 hasta ve müzik grubunda 47 hasta analiz edildi. Radyoterapi sonrası ortalama STAI-I skorları kontrol ve müzik gruplarında sırasıyla 42.1 ± 11.1 ve 29.9 ± 6.7 olarak bulundu ve istatistiksel olarak farklılık vardı ($p=0.000$). Radyoterapi sonrası ortalama BAI skorları kontrol ve müzik gruplarında sırasıyla 19.96 ± 6.3 and 13.3 ± 3.1 olarak bulundu ve istatistiksel olarak farklılık vardı ($p=0.000$).

Sonuç: Radyoterapi sırasında müzik dinlemek kanser hastalarında kaygıyı azaltmada etkili olabilmektedir.

Anahtar Kelimeler: kanser, kaygı, müzik müdahaleleri, radyoterapi

Introduction

Cancer is one of the most common cause of death worldwide and the incidence of cancer is rapidly increasing [1]. Radiotherapy (RT) plays an essential role in the treatment of cancer patients and nearly 50% of cancer patients receive radiotherapy during their disease process [2]. Cancer and cancer treatment cause psychological distress which reduces the quality of life in patients. In cancer patients, radiotherapy increases the level of anxiety and depression [3]. Besides the reduced quality of life cancer-related anxiety is associated with decreased overall survival. As cancer treatment-related anxiety significantly reduces the quality of life and survival, various therapeutic interventions are being used to reduce this stress including music intervention [4]. In a study patient distress related to RT was found to be a prognostic factor associated with decreased survival [5]. As a clinical model of psychotherapy, music therapy is being applied to a wide range of populations in the healthcare system [6]. Various music intervention activities are involved in the treatment of cancer related anxiety. Music intervention is an effective and non-invasive method in the treatment of the fear of hospital and the stress that patients experience due to the stage of their disease [7].

Music intervention reduces anxiety and improves the quality of life in cancer patients [8,9]. Music has an effect on cingulo-frontal cortex. Cingulo-frontal cortex is activated by the music interventions which decrease the anxiety and pain [10]. The activation of cingulo-frontal cortex by music intervention is

observed on functional magnetic resonance imaging of brain [11]. Music therapy decreases pain and anxiety which are related to invasive procedures like colonoscopy, bronchoscopy and cystoscopy. As easily applied and effective assessment tools, State-Trait Anxiety Inventory (STAI) and Visual Analogue Scales are being used to measure the anxiety and pain felt by the patients during these procedures [12-16]

As the patient anxiety is an important issue related with quality of life and the survival and music intervention was observed to be effective in reducing anxiety in many medical procedures, we conducted this observational survey study to analyse the effect of music intervention on anxiety experienced during radiotherapy.

Material and Methods

This is a single-center observational survey study evaluating the music interventions on anxiety related to RT in cancer patients who received curative RT between June 1, 2022 and September 15, 2022. This study included 100 patients with cancer diagnosis who received curative RT. Patients willing to participate in the study voluntarily, were informed about all aspects of the study. The participants were informed that, that was a survey study and their treatment schedule or treatment results would not be affected by this study. All participants signed the informed consent form of the study before answering the questionnaires. Patients older than 18 years of age with sufficient literacy and cognitive level to respond to a written questionnaire in Turkish language, and those receiving curative radiotherapy were included in

the study. Patients receiving anti-anxiety or anti-depressant drugs, palliative radiotherapy, cases with hearing loss, and radiotherapy history were excluded from the study

After the approval of the institutional ethical board (date: May 25, 2022; decision no: 2022-05/1861) patients were divided into control group (n=50) and music intervention (n=50) groups. Three patients from the music intervention and 2 patients from the control group excluded from the study because they did not fill in the questionnaires completely. All patients received standard curative radiotherapy doses required for their cancer type and stage; and standard treatment schedules were not altered. The patients of the music intervention group music with headphones during the radiotherapy session.

Three questionnaires were used in the study;

1) Demographic-Clinical Data Questionnaire: A demographic and clinical data questionnaire developed by researchers consisting of information about age, educational level, diagnosis, blood pressure, and heart rate was used to evaluate the demographic and clinical data of participants. The participants filled the demographic part of the questionnaire. Clinical data was filled by the investigator doctor. Additionally, blood pressures and heart rates before and after the radiotherapy session were measured by an investigator doctor and written on this form.

2) The State-Trait Anxiety Inventory (STAI): STAI questionnaire has two sections that evaluate state and trait anxiety, with 20 questions in each section. The scale's adaptation to Turkish, validity and reliability studies were carried out by Öner and Le Comte. The emotions or behaviors expressed in the state anxiety inventory items are answered by marking one of the options none, a little, a lot, and entirely, according to the degree of intensity. The scores obtained on the state anxiety scale theoretically vary between 20 and 80 points. In the evaluation of the scale, it is accepted that those who score below 36 do not have anxiety, those who score between 37 and 42 have mild anxiety, and those who score 42 and above have high anxiety [17].

3) Beck Anxiety Inventory (BAI): BAI is an anxiety inventory focusing on anxiety's somatic symptoms, consisting of 21 questions. Responses range from 0 (not at all) to 3 (severely). Evaluation is made by summing the scores. The results according to total scores are like this; 0-9, normal or no anxiety; 10-18, mild to moderate anxiety; 19-29, moderate to severe anxiety; and 30-63, severe anxiety [18].

The demographic-Clinical Data questionnaire and STAI-II was

answered only before the radiotherapy section (the blood pressure and heart rate were measured before and after the session). All participants answered STAI-I and BAI questionnaires after the first radiotherapy session. Questionnaires were administered to all participants under the supervision of the investigator doctor. Questionnaires were administered to the patients participating in the study at different times, thus preventing patients from interacting with each other. In order not to cause bias, the patients in the control group were not given any information about listening to music.

In music intervention group patients selected the music freely without being tied to a specific list. Investigator doctors conducted an interview with patients to decide the type of music to listen to the music group. During this interview; the patient was asked what kind of music he/she likes, the patient-specific music list was created together with the patient. During the RT session, patients in music group listened their specific music list created in the interview with noise cancelling headphones to minimize the ambient noise of treatment room. All patients were watched from the camera on the treatment console during the treatment.

The aim of this study was to evaluate the effect of music interventions on radiotherapy anxiety. The primary endpoint was to evaluate the anxiety levels of participants. Secondary endpoints were physiological functions such as blood pressure and heart rate that may be related to anxiety.

Statistical Analysis

Statistical analyses were performed with SPSS software (SPSS: An IBM Company, version 25.0, IBM Corporation, Armonk, NY, USA). The Kolmogorov-Smirnov test was used to analyze normal distribution of data. All measurements are expressed as means with standard deviations, medians, and minimum and maximum values. We compared blood pressures, heart rates, STAI score and BAI score between music and control group by using paired sample t test for normally distributed data and Mann Whitney U for nonnormally distributed data. P values <0.05 were statistically significant.

Results

We randomized 100 cancer patients and included 95 patients receiving curative radiotherapy in this study. Patient characteristics were resulted in table 1.

The primary endpoint was to evaluate the anxiety levels and the secondary endpoints were the vital signs related like blood pressure and heart rate to anxiety. The baseline vital signs

and STAI-II scores of patients were not statistically different. Baseline results of the patients were summarized in table 2.

Vital signs of the patients (systolic and diastolic blood pressure, heart rate) after RT decreased statistically significant in music group. Before RT systolic blood pressure of the patients were 125.52 ± 9.3 ; and 125.43 ± 8.3 in control group and music group respectively ($p=0.877$). Before RT diastolic blood pressure of the patients were 80.73 ± 6.1 and 80.21 ± 5.9 in control group and music group respectively ($p=0.562$). After RT systolic blood pressure of the patients were 138.85 ± 10.8 and 126.730 ± 12.7 in control group and music group respectively ($p=0.000$). After RT diastolic blood pressure of the

patients were 87.60 ± 12.16 and 83.19 ± 11.3 in control group and music group respectively ($p=0.061$).

The heart rate of the patients after RT were 75.9 ± 7.3 and 70.68 ± 7.7 in control group and music group, respectively ($p=0.001$).

The mean STAI-I scores after RT were 42.1 ± 11.1 and 29.9 ± 6.7 in control group and music group respectively. This difference between the groups was statistically significant ($p=0.000$). The mean BAI scores after RT 19.96 ± 6.3 and 13.3 ± 3.1 in control group and music group respectively. This difference between the groups was statistically significant ($p=0.000$). Results were summarized in table 3.

Table 1: Characteristics of Patients

		All Patients N = 95	Control Group N = 48	Music Group N = 47
Mean Age (y)(range)		65.54 (52-81)	66.1 (52-81)	64.94 (59-74)
Gender	Male	41	19	22
	Female	54	29	25
Disease Site	Lung	29	14	15
	Prostate	13	7	6
	Breast	15	8	7
	GIS	19	8	11
	Head and Neck	9	5	4
	Other	10	6	4

Table 2: Patients baseline clinical characteristics

Parameters	All Patients N = 95 Mean± SD (range)	Control Group N = 48 Mean± SD (range)	Music Group N = 47 Mean± SD (range)	P value	Statistical Test
Before RT					
SBP (mm Hg)	125.47 ± 8.8 (105-140)	125.52 ± 9.3 (105-140)	125.43 ± 8.3 (105-140)	0.877	Mann-Whitney Test
DBP (mm Hg)	80.47 ± 6 (65-90)	80.73 ± 6.1 (65-90)	80.21 ± 5.9 (65-90)	0.562	Mann-Whitney Test
Heart Rate (b.p.m)	68.79 ± 6.4 (50-80)	68 ± 6.7 (50-80)	69.60 ± 6 (57-80)	0.237	Mann-Whitney Test
STAI-II Score	46.40 ± 5.7 (34-59)	45.33 ± 6.9 (34-59)	47.49 ± 4 (41-59)	0.174	Mann-Whitney Test

Abbreviations: RT: Radiotherapy; Min: minute; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; b.p.m: Beats Per Minute; STAI: State-Trait Anxiety Inventory;

Table 3: Patients' post-radiotherapy clinical characteristics

Parameters	All Patients N = 95 Mean± SD (range)	Control Group N = 48 Mean± SD (range)	Music Group N = 47 Mean± SD (range)	P value	Statistical Test
After RT					
SBP (mm Hg)	132.84 ± 13.2 (105-160)	138.85 ± 10.8 (120-160)	126.70 ± 12.7 (105-150)	0.000	Mann-Whitney Test
DBP (mm Hg)	85.42 ± 11.9 (60-115)	87.60 ± 12.16 (65-115)	83.19 ± 11.3 (60-115)	0.061	Mann-Whitney Test
Heart Rate (b.p.m)	73.32 ± 7.9 (50-89)	75.9 ± 7.3 (62-89)	70.68 ± 7.7 (50-88)	0.001	T- Test
STAI-I Score	36.08 ± 11 (20-62)	42.1 ± 11.1 (20-62)	29.9 ± 6.7 (20-54)	0.000	Mann-Whitney Test
BAI Score	16.71 ± 6 (9-33)	19.96 ± 6.3 (10-33)	13.3 ± 3.1 (9-22)	0.000	Mann-Whitney Test

Abbreviations: RT: Radiotherapy; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; b.p.m: Beats Per Minute; STAI: State-Trait Anxiety Inventory; BAI: Beck Anxiety Inventory



Discussion

With the increasing evidence that music intervention which is easily applicable, tolerable and low-cost it is started to be used in the treatment of symptoms such as anxiety and pain related to primary treatment of the patients. Anxiety is a serious problem in cancer patients in the diagnosis and treatment process so we conducted this study to evaluate the effect of listening to music on radiotherapy anxiety.

In a study Elith et al complementary treatments like music, aromatherapy and guided imagery were found to reduce the anxiety in head and neck cancer patients who were immobilised for radiotherapy. STAI-I inventory was used in the study and the anxiety levels were reduced by complementary treatments [19]. In our study only music therapy was used to be able to evaluate the effect of only one complementary treatment method. In a study, in which the effect of listening to music before RT simulation on anxiety was evaluated. It was reported that there was a strong decrease in state anxiety levels for the music therapy cohort with an average post-simulation change effect of 8,2 units ($p < 0.0001$), while state anxiety actually increased in the no music therapy cohort, with a mean change effect of -1.2 units [20]. In our study, we obtained that the STAI-I scores were lower in the group listening to music during RT.

Chen et al. aimed to analyze the effects of music intervention on anxiety reduction before RT in oncology patients by using STAI and vital signs. The mean change of pre- and post-test STAI scores in both the music group and the control group showed a significant decrease from baseline post test (all $p < 0.005$). In vital signs, music therapy decreased systolic blood pressure and heart rate ($p < 0.005$) [21]. When vital signs were evaluated in our study, it was observed that diastolic blood pressure, systolic blood pressure and heart rate decreased statistically in favor of the music group. In a study of O'Steen et al the effect of patient self-selected music on radiotherapy anxiety was evaluated. They observed that music decreases the radiotherapy anxiety but could not reach a statistically significant result. In our study music was selected by the participants also, and we observed a statistically significant decrease in anxiety levels [22]. In the O'Steen et al's study all participants were women, in our study the group was heterogeneous in the terms of gender, this could effect the radiotherapy anxiety levels of the patients. In recent music studies the kind of music was chosen either by the researcher or by the participant. Preferred music by the participant may

be more related to reduced anxiety than the preferred music by the researcher [23,24]. In our study participants in music group listened the music they preferred and the anxiety decreased by this music intervention.

This study have some limitations. The present study only performed music intervention once in participating subjects prior to radiotherapy, and collected only one set of pre- and post intervention measurements of the STAI scales and vital signs rather than repeating either music therapy or measurements, that is, no test was conducted immediately after the intervention. Anxiety levels were not measured during or after radiotherapy to evaluate duration of effects.

Conclusion

We obtained that music interventions reduces the anxiety levels of cancer patients receiving radiotherapy. So music intervention which is a therapy method with low-cost and without side effects could be recommended as a standart procedure in radiotherapy clinics to reduce the anxiety and related problems of cancer patients but more studies with more patient numbers should be designed.

Conflict of Interest

The authors have no conflicts of interest to declare.

Financial Disclosure

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