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Original Article

The Effect of Classical Turkish Music on Pain Severity and Anxiety Levels in Patients Undergoing Bone Marrow Aspiration and Biopsy

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ABSTRACT

Background: Bone marrow aspiration is a painful procedure. In addition, the anxiety experienced during the procedure can affect the pain felt during the procedure. This study was conducted as a randomized controlled study to determine the effect of classical Turkish music on pain severity and anxiety levels in patients undergoing bone marrow aspiration and biopsy.

Materials and Methods: The study was performed in an oncology hospital with a total of 30 patients, of whom 14 were in the intervention group and 16 were in the control group. All underwent bone marrow aspiration and biopsy for the first time. Ethics committee approval, institutional permission, and the study participants' written informed consent were obtained. Data were collected using patient information forms and follow-up charts, the Visual Analog Scale, and the State Anxiety Inventory. It was determined that the scores gathered from the State Anxiety Inventory during the first follow-up increased in the second follow-up in both the intervention and control groups, and this increase was statistically significant in the intervention group ($p < .05$). The mean pain severity scores of the patients undergoing the procedure were significantly lower in the intervention group than in the control group ($p < .05$).

Conclusion and Suggestions: This study found that classical Turkish music reduced the severity of pain but increased the levels of anxiety in patients undergoing bone marrow aspiration and biopsy.

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Bone marrow aspiration and biopsy is an invasive procedure that examines the cellular features of bone marrow and the involvement of solid organ tumors or hematological malignancies (Hjortholm, Jaddini, Haaburda, & Snarski, 2013; Yenerel, 2017). Although the skin, subcutaneous, and periosteum layers are anesthetized before the procedure, pain is felt during the procedure because the marrow cavity remains sensitive (Hjortholm et al., 2013; Memiş, 2011; Voigt & Mosier, 2013). The duration and difficulty level of the procedure are also related to pain (Voigt & Mosier, 2013), and age, area of operation, adequate education of the patient before the procedure, and previous experience of pain and anxiety are effective factors in subsequent procedures (Hjortholm et al., 2013). In addition,

preprocedural sedation to prevent pain and discomfort in patients causes some side effects, such as fatigue, dizziness, and nausea. Therefore, a longer period of patient monitoring is needed during and after the procedure (Berenson et al., 2011).

Patients who are scheduled for diagnostic or invasive medical procedures frequently experience fear and anxiety. As a physiological response, respiratory rate, heart rate, blood pressure, perception of pain, and plasma stress hormone levels are affected (Costa et al., 2010; Tan, Yowler, Super, & Fratianne, 2010; Zengin et al., 2013). People with high anxiety levels might experience higher levels of pain during the procedure (Hjortholm et al., 2013). In one study, the anxiety before the bone marrow aspiration and biopsy procedure was reported to have a major effect on pain, and there was a clear relationship between anxiety and pain at all stages of the procedure except for the biopsy stage (Kuivalainen, Pitkaniemi, Widenius, Elonen, & Rosenberg, 2012). Negative patient experiences related to the procedure led to fear, emotional distress, and an increase in postprocedural problems. However, studies and best practices related to the relief of pain patients

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experience during bone marrow aspiration and biopsy procedures are limited (Hjortholm et al., 2013).

Throughout history, medicine has been used to provide relief (Korhan et al., 2014; Tekinsoy Kartın, 2015). In clinical practice, music is a form of treatment that provides relaxation, well-being, and comfort. Music therapy has been used therapeutically to reduce symptoms such as pain and anxiety and increase tolerance of procedures in intensive care units, palliative care, surgical operations, psychiatric wards, oncology, gynecology, pediatrics, and coronary intensive care units and during radiation and chemotherapy (Costa et al., 2010; Korhan et al., 2014; Tekinsoy Kartın, 2015). Various studies indicate that music reduces pain and anxiety (Costa et al., 2010; Gutsell et al., 2013; Korhan et al., 2014; Zengin et al., 2013). Classical Turkish music is slow and relaxing instrumental music that has a relaxing effect on patients' psychological states (Güvenç, 2017; Zengin et al., 2013). No study in the literature has examined the effect of classical Turkish music on pain and anxiety in those who underwent bone marrow aspiration and biopsy for the first time.

The purpose of this study was to examine the effects of the Acemaşiran style of classical Turkish music on the pain and anxiety levels of patients undergoing bone marrow aspiration and biopsy.

Materials and Methods

This research was conducted in a randomized controlled study design in a university hospital's oncology and hematology polyclinic. Inclusion criteria included individuals who were 18 years of age or older, were undergoing the bone marrow aspiration and biopsy procedure for the first time, were minimally literate, had adequate hearing, and knew the Turkish language. Exclusion criteria included those with hearing impairment and hormonal dysfunction (adrenal, pituitary, thyroid, etc.) and those who were on anxiolytic and sedative drugs, were diagnosed with severe anxiety disorder, and had active psychosis or dementia and uncontrolled hypertension.

The sampling choice was made in accordance with the recommendation of our university's biostatistics department. We determined the number of subjects to be included in the sample from the research data because there was no study in the literature using the same variable in a similar experimental setup. As a result of this interim evaluation, we determined the number of samples according to the power analysis value to evaluate the sample power. Initially, we planned to perform an interim evaluation by power analysis. We included 32 subjects in the sample, 16 in the intervention group and 16 in the control group. Patients were randomly assigned to the intervention and control groups via computer. Because two subjects from the intervention group did not want to participate in the final test for the interim evaluation, it was performed with 14 from the intervention group and 16 from the control group. The interim evaluation found that the level of anxiety following the intervention increased in the intervention group despite the decrease in pain severity. Based on ethical principles, we terminated the study at this stage. Thus, the study was completed with a total of 30 subjects, 14 in the intervention group and 16 in the control group. At a 5% error level, the power of the test at the first type error was 50%.

Anxiety and pain levels are not routinely measured in the polyclinic where the research was conducted, and no integrative method is applied to those who express pain.

Data Collection Tools

The researchers collected the research data using the patient information form and follow-up chart, the Visual Analog Scale

(VAS) for measuring pain severity, the State Anxiety Inventory (SAI), the music intervention protocol, and the informed consent form. The SAI is part of the State-Trait Anxiety Inventory.

The researchers prepared the patient information form and follow-up chart by reviewing the relevant literature (Gutsell et al., 2013; Korhan et al., 2014; Ratcliff et al., 2014; Zengin et al., 2013). They included questions on the sociodemographic characteristics of the study participants in addition to questions regarding their blood pressure, pulse rate, respiratory rate, serum cortisol and adrenocorticotropic hormone (ACTH) levels, and medications and fluids administered during the procedure.

The VAS was developed by Price, Bush, Long, and Harkins. It is a reliable and valid scale used to assess the intensity of the subjective perception of pain (Hindistan & Ergüney, 2008; Price et al., 1994; Turkish Neurosurgical Society, Spinal and Peripheral Nerve Surgery Group, n.d.). The study participants were informed that the number 0 on the scale referred to "I don't feel pain," that the number 10 referred to "I feel too much pain," and that as the numbers grew, the intensity of pain increased. The patients were asked to indicate their pain severity on the scale. The distance between the indicated point and the lowest endpoint of the line was measured in centimeters using a ruler, and the numeric value was assigned as the individual's pain score.

Spielberger et al. developed the State-Trait Anxiety Inventory in 1970. Öner and Le Compte (1983) accomplished the adaptation of the scale into Turkish and evaluation of its validity and reliability. It includes two separate scales of a 4-point Likert type to measure state and trait anxiety levels, each of which comprises 20 items. The SAI was used in this study. The SAI requires the individual to describe how he or she feels in a specific moment and in specific conditions and to respond concerning his or her emotions regarding his or her current situation. The total score obtained from the scale ranges from 20 to 80. The higher the scores, the higher the levels of anxiety (Lecompte & Öner, 1975; Öner & Lecompte, 1983).

Preapplication

To assess the functionality of the patient information form and follow-up charts used in the study and to determine the study's applicability, a preapplication with five participants was performed. Following the preapplication process, the forms were finalized after some necessary editing. After the preapplication process, no side effects or any signs of discomfort were observed in patients who listened to music. Those who took part in the preapplication process were not included in the study.

Data Collection

The bone marrow aspiration and biopsy procedure was performed on all study participants in a special room where a music system was installed. In the study period, no change was made to the standard treatment of those in the intervention and control group. The patient information form and follow-up charts were completed by researchers through face-to-face interviews before the procedure.

Bone Marrow Aspiration and Biopsy Procedure

In the polyclinic, a doctor and nurse briefly explained the bone marrow aspiration and biopsy procedure. The bone marrow aspiration and biopsy procedure was performed on all patients by the polyclinic physician according to standard procedures. For the procedure, the patients' vital signs were measured. Then 250 mL of 0.9% sodium chloride (NaCl) infusion was started at 200 mL/h, and 50 µg of fentanyl was administered intravenously. Under limited anesthesia with prilocaine, the procedure was performed with a

standard bone marrow biopsy needle through the posterior iliac bone. The bone marrow aspiration and biopsy procedure lasted approximately 15 minutes.

Interventions on the Patients in the Intervention Group

After taking the subjects into the procedure room, the SAI was administered before the procedure. Then the patients' blood pressure, pulse rates, and respiration rates were measured. Subsequently, a blood sample was drawn from each study participant to measure the serum cortisol and ACTH levels. Following 15 minutes of rest in the intervention room, the polyclinic's physician performed the bone marrow aspiration and biopsy procedure. After the procedure was over, the blood pressure, pulse rates, and respiratory rates of the patients were measured again, and blood samples for serum cortisol and ACTH levels were taken. The SAI and VAS were reapplied.

Music Intervention

The intervention group listened to Acemaşiran-type classical Turkish music suggested by the Group for the Research and Promotion of Turkish Music (TÜMATA) from the moment they were taken to the operating room until the end of the procedure. The music intervention protocol was created based on the literature (Doğan Yüksekol, 2015; Owayolu & Owayolu, 2015) and expert opinion.

Music Intervention Protocol

The individual was informed about the process and gave her or his permission. The music player was prepared before the procedure. An appropriate position for the music player was provided for the comfortable performance of the procedure. Because the procedure is not suitable for the use of headphones, music was played directly in the room. Instrumental, Acemaşiran-type classical Turkish music was played until the procedure was completed. Throughout the procedure, communication with the patient was maintained, and symptoms such as discomfort, uneasiness, and so on were observed. The music player was switched off after the procedure was completed. The individual was asked whether he or she felt any discomfort regarding the music or whether there was anything he or she would like to express. The intervention and relevant explanations were recorded on the follow-up chart.

The study participants expressed no problems or complaints regarding the music intervention, which lasted 30 minutes on average.

Interventions in the Patients in the Control Group

The SAI was applied to the patients in the control group; their blood pressure, pulse rates, and respiratory rates were measured, and their blood samples were taken for the measurement of serum cortisol and ACTH levels. After 15 minutes of rest in the intervention room, they underwent the bone marrow aspiration and biopsy procedure. After the procedure, their blood pressure, pulse rates, and respiratory rates were measured again, and blood samples were taken for serum cortisol and ACTH levels. Then the SAI and VAS were reapplied. No music intervention was employed in the control group; only the standard treatment practices took place.

Assessment of the Data

Data were assessed using IBM SPSS Statistics for Windows version 22.0. The Shapiro-Wilk normality test was applied for the distribution of the numerical variables. Descriptive statistics were given as the mean \pm standard deviation and the median minimum value and maximum value (M [$min-max$]). In the categorical variable comparisons, the chi-squared exact test was used, whereas the

Mann-Whitney U test was used for the independent two-group comparisons and the Wilcoxon test for the dependent within-group comparisons. Statistical significance was assumed at $p < .05$.

Ethical Dimensions of the Research

The Ethics Committee of Clinical Research (decision number 2014/329) at the university where the procedure was performed approved the study, and institutional permission from the unit where the study was conducted (registration number 95158125/64) was granted. The contents of the study were explained to those in the intervention and control groups, and their verbal and written informed consent was obtained.

Results

The descriptive characteristics of the subjects participating in the study are provided in Table 1. The intervention and control groups were similar in terms of descriptive characteristics ($p > .05$) (Table 1).

There was no significant difference between the first follow-up of the patients in the intervention group and those in the control group in terms of the SAI mean scores ($p > .05$). The SAI scores of those in both groups at the second follow-up increased compared to the first follow-up, and this increase was statistically significant in the intervention group ($p < .05$). No significant difference was found between the first and second follow-ups of those in both groups in terms of the SAI mean scores ($p > .05$) (Table 2).

The difference between the mean scores of pain that was experienced during the procedure in the intervention and control groups was significant ($p < .05$) (Table 3).

The systolic and diastolic blood pressure of those in the intervention group decreased significantly in the second follow-up compared to the first follow-up ($p < .05$), whereas there were no significant differences between the follow-ups regarding pulse rates, respiratory rates, blood cortisol levels, and blood ACTH levels ($p > .05$). The pulse rate value of the participants in the control group significantly decreased in the second follow-up compared with the first follow-up ($p < .05$). No statistically significant differences were detected between the follow-ups regarding systolic

Table 1
Distribution of Introductory Characteristics of Subjects in the Intervention and Control Groups

Introductory Characteristics	Intervention Group (n = 14)		Control Group (n = 16)	
	n	%	n	%
Gender				
Female	6	42.9	3	18.7
Male	8	57.1	13	81.3
<i>p</i>	.236			
Profession				
Self-employed	3	21.4	5	31.4
Retired	1	7.1	2	12.5
Housewife	5	35.8	3	18.8
Farmer	1	7.1	0	0.0
Student	1	7.1	1	6.2
Laborer	2	14.4	0	0.0
Driver	1	7.1	0	0.0
Engineer	0	0.0	1	6.2
Marketer	0	0.0	1	6.2
Technician	0	0.0	2	12.5
Teacher	0	0.0	1	6.2
Total	14	100.0	16	100.0
<i>p</i>	.419			
Age, years ($\bar{x} \pm ss$)	57.64 \pm 16.07		50.12 \pm 15.33	
<i>p</i>	.201			

Table 2
Distribution of SAI Scores of Subjects in the Intervention and Control Groups According to the First and Second Follow-Up

SAI	Intervention Group (n = 14)		Control Group (n = 16)		Intervention and Control Group	
	First Follow-Up	Second Follow-Up	First Follow-Up	Second Follow-Up	First Follow-Up (p)	Second Follow-Up (p)
($\bar{x} \pm ss$)	40.00 \pm 5.62	44.28 \pm 5.75	41.50 \pm 6.76	43.75 \pm 7.65	.360	.77
Median (Min-Max)	39.00 (33.00-0.00)	43.00 (35.00-7.00)	41.40 (28.00-5.00)	44.50 (26.00-4.00)		
p	.003		.255			

SAI = State Anxiety Inventory.

and diastolic blood pressure, respiratory rates, blood cortisol levels, and blood ACTH levels ($p > .05$) (Table 4).

Discussion and Conclusion

This study, which aimed to determine the effects of classical Turkish music on pain and anxiety of patients undergoing bone marrow aspiration and biopsy, found that the SAI scores of those in both groups at the second follow-up increased compared with the first follow-up, and this increase was statistically significant in the intervention group ($p < .05$). In addition, the pain severity felt during the procedure was significantly lower in the intervention group compared to the control group ($p < .05$).

The literature stated that classical Turkish music reduces sedative drug dose, anxiety, and pain perception (Çiğerci & Özbayır, 2016; Koç et al., 2009), thus helping accelerate the healing process (Çiğerci & Özbayır, 2016). Studies using classical Turkish music found that it decreased pain perception and the amount of analgesics in intensive care and surgery unit patients who underwent coronary artery surgery (Çiğerci & Özbayır, 2016). It also reduced acute procedural pain in patients with port catheters, which require an invasive procedure, and reduced anxiety as opposed to our study (Zengin et al., 2013). There was no significant difference among the anxiety scores of pregnant women with preeclampsia (Toker & Kömürçü, 2017).

However, other studies found that anxiety before bone marrow aspiration and biopsy procedure had a major effect on pain, and there was a clear relationship between anxiety and pain at all stages of the procedure except for the biopsy stage (Kuivalainen et al., 2012). Music interventions significantly decreased the pain in patients during colonoscopies (Costa et al., 2010) and in palliative cancer patients (Gutgsell et al., 2013) and had a positive effect on short- and long-term pain in patients with breast cancer who had undergone radical mastectomy (Li et al., 2011).

In a study conducted of patients who were given spinal anesthesia, a music intervention was found to decrease anxiety as opposed to our study (Lee et al., 2017). However, another study found that music interventions had no long-term effect on the quality of life of patients who underwent hematopoietic stem cell transplantation but provided short-term relaxing and energizing effects (Ratcliff et al., 2014).

We think that music therapy is seen as a separate process by the participants and that an unfamiliar life experience may be a factor in changing the anxiety levels of individuals. In addition, music

preferences and varying procedure lengths might also cause the results observed.

All the patients in our study listened to the same style of classical Turkish music (instrumental). In studies where the type of music was determined based on the patients' preferences, the music intervention was reported to provide a significant reduction in anxiety and stress experienced during the procedure (Rossetti et al., 2017) and to improve patient satisfaction, pain scores, and reluctance about the procedure (Costa et al., 2010). In a systematic review and meta-analysis examining the effect of music and interior design on surgery patients, it was noted that the music intervention was more effective on pain and anxiety when the music was chosen by patients, whereas the greatest effect was on anxiety. The same study also emphasized that preselected music did not have any effects on anxiety (Vetter et al., 2015).

It has been found that patients scheduled to undergo diagnostic or invasive procedures are often frightened and anxious; as a result, their physiological responses, such as respiratory rate, heart rate, blood pressure, perceptions of pain, and plasma concentrations of stress hormones, are influenced (Costa et al., 2010; Tan et al., 2010; Zengin et al., 2013). Our study found that the systolic and diastolic blood pressure of those in the intervention group decreased significantly in the second follow-up compared with the first ($p < .05$), and there were no significant differences between the follow-ups regarding pulse rates, respiratory rates, blood cortisol levels, and blood ACTH levels ($p > .05$). Another study conducted with patients who underwent port catheter placement found that classical Turkish music played before and during the procedure decreased stress hormone levels, heart rates, and respiratory rates, as opposed to our findings, and decreased systolic and diastolic blood pressure, similar to our findings (Zengin et al., 2013). A meta-analysis revealed that the effect of music interventions on blood pressure and heart rates was not clear in patients with cardiac catheterization; music intervention was effective in some studies and not effective in others (Jayakar & Alter, 2017). In our study, the participants' first experience of an invasive procedure and the variability of the individual responses to the procedure might have affected their physiological parameters.

In conclusion, this study found that the Acemaşiran style of classical Turkish music increased anxiety levels of patients undergoing bone marrow aspiration and biopsy but decreased pain and systolic and diastolic blood pressure, therefore increasing tolerance to the procedure. The music had no effect on pulse rates, respiratory rates, and blood cortisol and ACTH levels. We recommend that future studies be conducted in a larger sample group with different music options based on patient preferences.

Limitations and Generalizability of the Study

This study was limited to patients undergoing bone marrow aspiration and biopsy for the first time in a university hospital's oncology and hematology polyclinic. The study was concluded due to the increased anxiety levels of the patients following an interim evaluation. Therefore, the sample size and the strength of the study

Table 3
Distribution of Postprocedure VAS Scores for Subjects in the Intervention and Control Groups

VAS	Intervention Group (n = 14)		Control Group (n = 16)	
	($\bar{x} \pm ss$)	Median (Min-Max)	($\bar{x} \pm ss$)	Median (Min-Max)
	1.55 \pm 1.78	1.00 (0.00-5.00)	3.36 \pm 2.35	3.8 (0-6.70)
p	.038			

VAS = Visual Analog Scale.

Table 4
Distribution of Blood Pressure, Pulse Rates, Respiratory Rates, Blood Cortisol Levels, and ACTH Levels of Subjects in the Intervention and Control Groups in the First and Second Follow-Ups

Measurement Variables	Intervention Group (n = 14)		Control Group (n = 16)		Intervention and Control Group	
	First Follow-Up	Second Follow-Up	First Follow-Up	Second Follow-Up	First Follow-Up	Second Follow-Up
	($\bar{x} \pm ss$)/Median (Min-Max)	($\bar{x} \pm ss$)/Median (Min-Max)	($\bar{x} \pm ss$)/Median (Min-Max)	($\bar{x} \pm ss$)/Median (Min-Max)	(p)	(p)
Systolic blood pressure	125.71 \pm 20.64/125.00 (90.00–160.00)	118.57 \pm 22.13/120.00 (90.00–160.00)	117.50 \pm 10.00/120.00 (100.00–130.00)	114.37 \pm 10.93/115.00 (100.00–130.00)	.188	.472
p	.013		.132			
Diastolic blood pressure	76.42 \pm 13.36/80.00 (60.00–100.00)	72.14 \pm 13.11/70.00 (60.00–100.00)	71.25 \pm 11.47/70.00 (60.00–100.00)	71.87 \pm 10.46/75.00 (60.00–90.00)	.253	.472
p	.034		.655			
Pulse rates	88.42 \pm 6.23/86.00 (80.00–100.00)	88.57 \pm 6.58/86.00 (80.00–98.00)	94.25 \pm 8.57/92.00 (80.00–118.00)	90.62 \pm 8.60/87.00 (80.00–112.00)	.033	.818
p	.804		.025			
Respiratory rates	20.85 \pm 1.29/20.00 (20.00–24.00)	21.00 \pm 1.03/21.00 (20.00–22.00)	22.00 \pm 1.78/22.00 (20.00–26.00)	21.25 \pm 2.17/20.00 (20.00–28.00)	.058	.705
p	.705		.052			
Blood cortisol levels	16.23 \pm 10.40/13.69 (4.38–41.71)	15.73 \pm 9.55/12.06 (5.60–36.59)	16.34 \pm 6.97/17.13 (3.71–27.71)	16.27 \pm 6.28/16.88 (5.90–24.88)	.519	.678
p	.198		.737			
Blood ACTH levels	18.40 \pm 13.25/15.65 (80.90–46.75)	34.80 \pm 59.11/14.85 (2.17–233.16)	18.8 \pm 11.79/16.68 (6.64–52.93)	27.00 \pm 19.44/18.06 (7.33–74.10)	.739	.430
p	.245		.173			

ACTH = Adrenocorticotrophic hormone.

are not at the desired level to achieve solid results. For the reasons stated above, the results of this study can be generalized only for this group. Moreover, the use of a single type of music was another limitation. If the choice of music had been left to the patients, the results might have been different. In addition, frequent changes in the rotation of the physician and nurse who were in charge of the procedure in the polyclinic setting might have caused differences in the study participants' reactions to the process.

Implications for Nursing

Noninvasive, integrative methods of pain management should be routinely integrated into nursing practice. Therefore, to obtain stronger evidence for the management of pain and anxiety, randomized controlled trials such as this study, in which the effects of an integrative method are identified, should be performed, and patients' symptom management should improve based on new findings. In addition, we suggest that other studies, in which patients select the music according to their preferences, should be performed with a larger sample size in light of this study's data.

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