Journal of Holistic Nursing and Midwifery

July 2022, Volume 32, Number 3

Original Paper

Effect of Classical Turkish Music on Pain and Anxiety of Patients undergoing Bone Marrow Aspiration and Biopsy: A Randomized Controlled Clinical Trial

Eda Ergin[1*], Fatma Kahriman[2], Hatice Coşan Ay[2], Şebnem Çınar Yücel[3]

1. Associated Professor, Department of Fundamentals Nursing, Faculty of Health Sciences, Izmir University Bakırcay, Izmir, Turkey.
2. Nurse, Katip Çelebi University Atatürk Education and Research Hospital, İzmir, Turkey.
3. Professor. Department of Fundamentals Nursing, Ege University Nursing School,İzmir, Turkey.

Use your device to scan and read the article online

Citation Ergin E, ahriman F, Coşan Ay H, Çınar Yücel Ş. Effect of Classical Turkish Music on Pain and Anxiety of Patients undergoing Bone Marrow Aspiration and Biopsy: A Randomized Controlled Clinical Trial. J Holist Nurs Midwifery. 2022; 32(3):227-233. https://doi.org/10.32598/jhnm.32.3.2259

Running Title Effect of Classical Turkish Music on Pain and Anxiety

https://doi.org/10.32598/jhnm.32.3.2259

Article info:
Received: 01/06/2021
Accepted: 09/05/2022
Available Online: 01/07/2022

Keywords:
Music, Pain, Anxiety, Bone marrow biopsy

ABSTRACT

Introduction: Bone Marrow Aspiration and Biopsy (BMAB) is a painful procedure that can causes anxiety in patients. Music can help reduce pain and anxiety levels in patients by directing their attention from negative stimuli towards pleasant and encouraging thoughts.

Objective: This study aims to determine the effect of classical Turkish music on pain and anxiety of patients undergoing BMAB.

Materials and Methods: This is a randomized, controlled trial conducted on 68 patients undergoing BMAB who were selected from the hematology outpatient clinics in a hospital in İzmir, western Turkey. They were randomly divided into two groups of control (n=34) who received the general procedure only and the music group (n=34) who listened to classical Turkish music for 15 minutes before the procedure. Data were collected using a demographic form, Visual Analogue Scale (VAS), and State Anxiety subscale of Spielberger's State-Trait Anxiety Inventory. Chi-square was used for comparing categorical variables, and t-test and ANOVA were used for comparing numerical variables. Bonferroni test was used for post hoc comparisons. A P<0.05 statistically significant. In case of a significant difference between the groups, Cohen's d effect size was calculated.

Results: In the music group (Mean±SD age=63.73±14.81 years), 62% were male, 71% were married, 76% had a secondary education or lower, and 49.1% reported that biopsy was for diagnostic purposes. In the control group (Mean±SD age=51.76±19.45 years), 50% were female, 53% were married, 62% had a secondary education or lower, and 50.9% reported that biopsy was for diagnostic purposes. A statistically significant difference was found in the mean VAS scores of both groups before and after the treatment (P=0.001). A significant difference was found in the state anxiety level only in the music group before and after the treatment (P=0.003).

Conclusion: Classical Turkish music prior to BMAB can reduce the pain and anxiety of patients. It is recommended for nurses to use music therapy to reduce the pain and anxiety of patients undergoing BMAB.

[*] **Corresponding Author:**
Eda Ergin, Assistant Professor.
Address: *Department of Fundamentals Nursing, Faculty of Health Sciences, Izmir University Bakırcay, Izmir, Turkey.*
Tel: *+90 (55) 43476449*
E-mail: *eda.ergin@bakircay.edu.tr*

Highlights

• Listening to classical Turkish music prior to Bonmarrow Aspiration and Biobsy (BMAB) reduces the pain and anxiety of patients.

• Music therapy, as a practical and useful strategy, can be used for reducing pain and anxiety levels of patients undergoing BMAB.

• It is recommended to use music to relieve patients in other painful procedures as well.

Plain Language Summary

Patients who are scheduled for diagnostic or invasive medical procedures frequently experience fear and anxiety. People with high anxiety levels might experience higher levels of pain during the surgeries. Classical Turkish music is instrumental music that has a relaxing effect on patients' psychological states. This study was conducted to determine the effect of classical Turkish music on pain and anxiety levels of patients undergoing bone marrow aspiration and biopsy. It was concluded that playing classical Turkish music (Acemaşiran makam) prior to the BMAB reduced the pain and anxiety levels of patients. Music therapy can be used as an effective and safe method to reduce pain and anxiety levels of patients undergoing bone marrow biopsy.

Introduction

Bone marrow biopsy is an invasive procedure performed to determine the characteristics of bone marrow cells, to evaluate solid tissue involvement in tumors, and to determine hematological malignancies [1]. It is a commonly used procedure to determine the effectiveness of treatment for hematological disorders and to monitor the healing process of bone marrow transplant and chemotherapy patients [2]. This procedure is a painful procedure performed in outpatient clinics [3] and causes anxiety in patients [4]. Approximately 56-70% of patients who underwent this procedure reported it as a painful procedure [5], while 50-70% reported moderate to severe pain [6] . In a study by Liden et al. it was reported that 70% of patients who underwent Bone Marrow Aspiration and Biopsy (BMAB) reported pain during the procedure; 17% had the pain 10 minutes after, 64% one day after, 42% three days after, 20% six days after, and 12% one week after the procedure [7]. It was reported that the anxiety experienced during bone marrow biopsy increased the pain experience in patients [1].

Music can help reduce pain and stress levels by directing the patient's attention from negative stimuli to pleasant and encouraging thoughts [8]. Music therapy has become an important part of medicine in recent years. It is used to improve health and help control the physiological, psychological, social, emotional, and spiritual consequences of an illness or disability in humans [9]. The knowledge of the analgesic and anxiolytic effects of music has enabled music therapy to be used in pain and anxiety treatments for many years. Studies have shown that music reduces pain, anxiety, and length of hospital stay; it provides relaxation, maintains social relations, activates immune functions, increases comfort and body resistance, improves the quality of sleep and life, sense of trust, and academic performance, and regulates vital signs [1, 10–13] . However, studies on the prevalence and etiology of pain and anxiety in patients with BMAB, and the effect of music on pain and anxiety are limited [1, 4, 14] . Classical Turkish music is a type of instrumental music that has a relaxing effect on the psychological state of patients [12, 15]. It is one of the oldest Acemaşiran makams which is reported to help reduce pain and anxiety by affecting the bones and brain [15]. Özdemir et al. reported that the classical Turkish music played during BMAB reduced pain and increased anxiety [1]. For this reason, this study aims to examine the effect of classical Turkish music (Acemaşiran makam) on the anxiety and pain of patients undergoing BMAB.

Materials and Methods

This is a randomized controlled trial to examine the effect of music on the pain and anxiety of patients who underwent BMAB. The research was conducted in the Hematology outpatient clinics in a hospital in İzmir, western Turkey, from June to December 2019. This study used the CONSORT checklist for interviews. To

determine the sample size, GPower v. 3.1 software was used based on the data used in a similar study by Özdemir et al. [1]. Accordingly, at 95% confidence interval (α=0.05), a test power of 0.80 and a medium effect size (d=0.5), the minimum number of participants was calculated 68 (34 for each group). Therefore, the study was conducted on 68 patients, randomly divided into music group (n=34) and control (n=34). The Random Sampling method was used. Patients who visited the outpatient clinic on the 1st, 3rd, and 5th days of the week constituted the music group and those visited on the 2nd and 4th days made up the control group.

Inclusion criteria were age 18 years or older, being literate, and consent to participate in the study. Patients who were clinically unstable, had psychiatric, mental, visual, and/or hearing impairments, had pain prior to the procedure, used any analgesic medication, no ability to communicate in Turkish, and used anxiolytics and sedatives were not included in the study. Patients who needed repetitive procedures due to patient-related factors and technical difficulties, for whom BMAB samples could not be obtained, and those wanted to exit the study were excluded from the study. Overall, 188 patients were assessed for eligibility, of whom 120 were excluded from the study because they did not meet the inclusion criteria (Figure 1).

For the collection of research data, three instruments including a demographic form, the Visual Analogue Scale (VAS), and the State-Trait Anxiety Inventory (STAI) were completed by the researcher for the patients through a face-to-face interview with them. The demographic form was prepared based on the relevant literature [1, 11, 12, 16] and included questions surveying the patient's age, gender, bone marrow biopsy history, and interest in music. The VAS is a reliable and valid scale developed by Price, et al. and Harkins to assess the intensity of subjective pain perception [17]. It is used to convert some values that cannot be measured numerically into numerical ones. Two extreme limits of the parameter to be evaluated are written on both ends of a 10-cm line, and the patients are asked to indicate which one is suitable for defining their condition by drawing a line or putting a dot on it. Accordingly, "no pain" is represented by 0 and "unbearable pain" is represented by 10. There are three ranges for pain intensity: <3 for mild pain, 3-6 for moderate pain, and >6 severe pain.

The STAI was developed by Spielberger, et al. and its validity and reliability were confirmed by Öner and Le Compte [18, 19]. The state anxiety subscale of STAI has 10 items with reversed scoring (items 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20) from 4 to 1, and other items are scored from 1 to 4. The total score rages 20-80 which is obtained by summing up of the scores of all items (20 items). A higher score indicates a high anxiety level, while a lower score indicates a lower level of anxiety. Öner and Le Compte stated that scores 0-19 represent no anxiety; 20-39 represents mild anxiety, 40-59 moderate anxiety, and 60-79 severe anxiety, and ≥60 shows the need professional help [19].

The BMAB surgery was conducted in the control group using the standard method, while it was conducted along with plying music in the intervention (music) group. The opinion of experts (faculty members in the Faculty of Fine Arts) was sought during the preparation of music playlist. According to their recommendations, a music was selected that had been used in medicine for a long time and was still being used in music therapy for patients. Acemaşiran makam, which has relieving effects on pain and spasm was selected because it creates a sense of peace and relaxation in patients [15]. Since 15-20 minutes of music is sufficient for patients [1, 11, 12], a 15-minute music was prepared and presented to the treatment group through headphones to prevent external sounds. The ear sponge was changed for each patient.

In the polyclinic, a doctor and nurse briefly explained the BMAB procedure to the patients. Prior to the procedure, the patients' vital signs were measured. Then, 250 mL of sodium chloride 0.9% was infused 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 on the Posterior iliac crest. The bone marrow aspiration process took 5-10 minutes on average. No another application was made during the procedure. After the procedure, the VAS and STAI tools were completed by the patients in both groups.

Statistical analysis of the collected data was conducted in SPSS v. 21 software. Demographic and medical characteristics of patients were described by using frequency, percentage, mean, and standard deviation. The homogeneity of variances was examined by Levene's test, and the normality of data distribution was examined by Shapiro-Wilk test. Based on their results, appropriate statistical tests were performed. Chi-square was used for comparisons of categorical variables, and t-test and ANOVA were used for comparisons of numerical variables. Bonferroni test was used for post hoc comparisons to determine the difference between groups. In all comparisons, the statistically significance level was set

Table 1. Demographic characteristics of patients in study groups (n=34)

Variables		No. (%)		P*
		Control	Music	
Gender	Female	17(50)	13(38)	0.464
	Male	17(50)	21(62)	
Marital Status	Married	18(53)	24(71)	0.212
	Single	16(47)	10(29)	
Education	Secondary education or lower	21(62)	26(76)	0.294
	High school education or above	13(38)	8(124)	
Purpose of the Biopsy	For diagnostic purposes	27(79.4)	26(76.4)	0.500
	For evaluating treatment effectiveness	7(20.6)	8(20.6)	

*Chi-square test

at 0.05. In case of a significant difference between the groups, Cohen's d effect size was calculated for the t-test. Cohen's d values of 0.2, 0.5, and 0.8 indicate small, medium, and large sizes, respectively.

Results

In the music group, 62% were male, 71% were married, 76% had a secondary education or lower, and 49.1% reported that biopsy was for diagnostic purposes. In the control group, 50% were female, 53% were married, 62% had a secondary education or lower, and 50.9% reported that biopsy was for diagnostic purposes. The mean age of patients in the music group was 63.73±14.81 years, and in the control group it was 51.76±19.45 years (Table 1).

Table 2 presents the mean state anxiety and VAS scores in the two study groups. The mean pre-test anxiety score was 43.91±9.38 in the music group and 44.67±14.03 in the control group, and there was no significant difference between the two groups (P=0.793). The mean post-test anxiety score was 39.05±5.22 in the music group and 45.11±5.58 in the control group, and a statistically significant difference was found between the two groups (P=0.001). There was a significant difference in the state anxiety level of the music group before and after the surgery (P=0.003), but not in the control group.

Table 2. Comparing the mean scores for state anxiety and pain between the study groups (n=34)

Variables		Mean±SD		Test results
		Music group	Control	
State anxiety	Pre-test	43.91±9.38	44.67±14.03	P=0.793**
	Post-test	39.05±5.22	45.11±5.58	P=0.001** d=0.64****
	P*	0.003	0.870	
Pain score	Pre-test	0.58±1.67	0.61±1.41	P=0.938**
	During test	3.44±2.28	5.47±2.71	P=0.001** d=1.259****
	Post-test	0.76±1.72	2.23±2.55	P=0.007** d=102.181****
	P***	0.001 ****Post hoc 1-2 and 2-3	0.001 ****Post hoc 1-2, 1-3 and 2-3	

*T-test;**Student-t test;***ANOVA; ****Bonferroni and Tukey post hoc tests

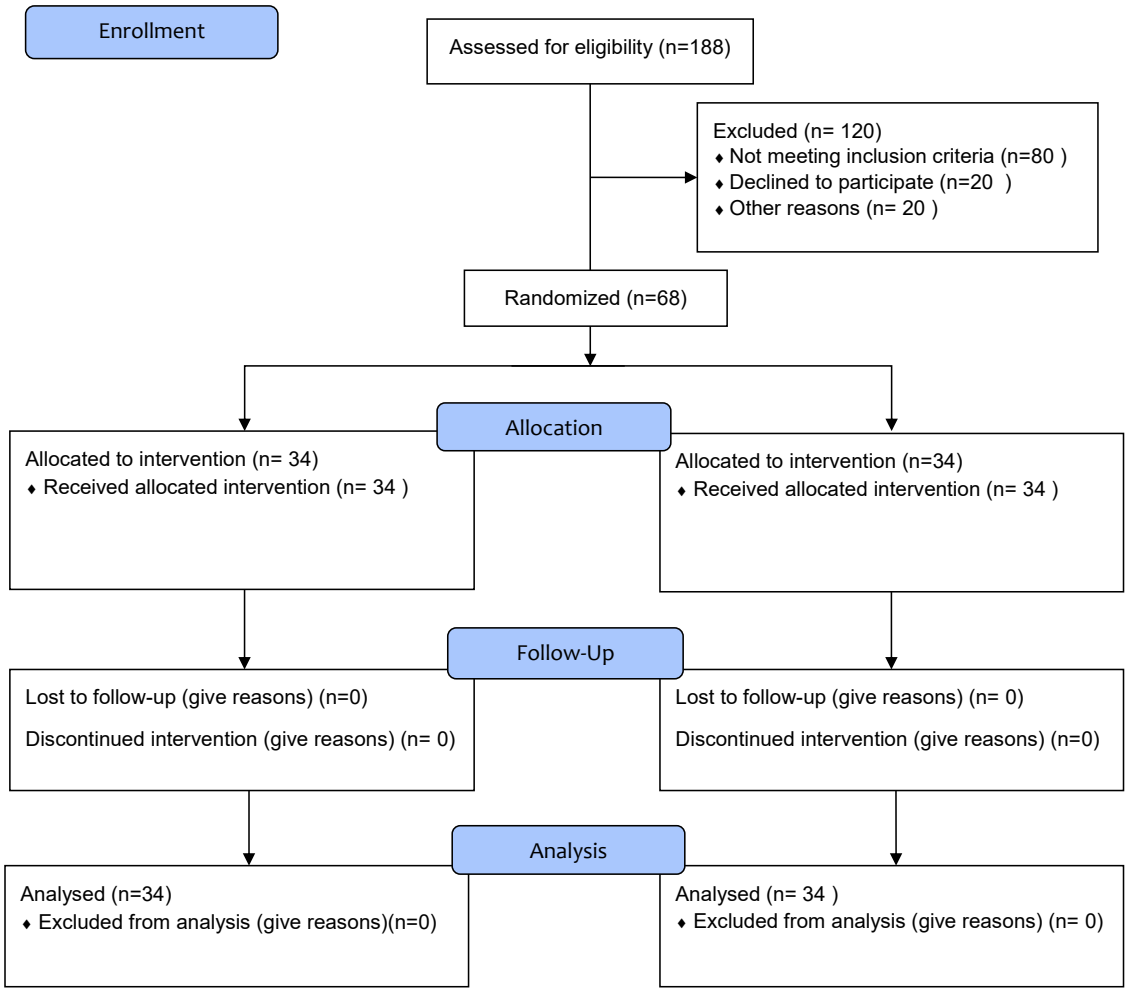

Figure 1. Flow diagram of the study

The mean pre-test VAS score was 0.58±1.67 in the music group and 0.61±1.41 in the control group, and there was no significant difference between the two groups. During the surgery, the mean VAS score was 3.44±2.28 in the music group and 5.47±2.71 in the control group, and the difference between the groups was found to be significant (P=0.001). The mean post-test VAS score was 0.76±1.72 in the music group and 2.23±2.55 in the control group, and the difference between the groups was statistically significant (P=0.007). A significant difference was found in the music (F=68.641, P=0.001) and control (F=68.689, P=0.001) groups in terms of VAS score between the time points (Table 2). A significant difference with a high effect value (d=0.64) was found between the groups in post-test state anxiety, and a significant difference with a high effect value was found between the groups in VAS score during (d=1.259) and after BMAB (d=102.181).

Discussion

This study was conducted to examine the effect of classical Turkish music (Acemaşiran makam) on pain and anxiety of patients undergoing BMAB. It was found that listening to classical Turkish music before BMAB reduced pain and anxiety in patients. Shabanloei et al. examined the effectiveness of music therapy on pain and anxiety control in 100 patients who underwent BMAB in a hematology and oncology center in Tabriz, Iran. In their study, they reported that patients who listened to music had lower levels of state anxiety and pain than those who did not listen to music [4]. Our findings are consistent with their results. In musical studies conducted on different populations, it has also been reported that music reduces pain and anxiety [10–13]. In contrast to our results, Özdemir et al. found that classical Turkish music reduced pain intensity, but increased anxiety levels in patients who underwent BMAB [1].

Turkish classical music (Acemaşiran makam) used in our study is a type of music that influences the brain and bones, inspires creativity in the listener, stimulates stagnant thoughts and emotions, relieves pain and spasms, increases sensory pleasure, and promotes relaxation [15]. In the present study, the music group reported mild anxiety after the procedure, while the patients before the BMAB reported moderate anxiety; the anxiety level in the music group was found to be significantly different from that in the control group, due to the effect of music. In a study conducted on patients undergoing spinal anesthesia, it was found that music therapy reduced their anxiety [20]. Bennett et al. concluded that patients who listened to the music during breast biopsy had reduced anxiety levels [14]. Gabel et al. in their study on dyspnea patients reported that music therapy was a more effective intervention than relaxation therapy in reducing state anxiety [21]. In another study, it was reported that there was no significant difference between anxiety scores following music therapy in pregnant women with preeclampsia [22]. Similarly, Özdemir et al. reported that the music played to patients who underwent BMAB did not affect anxiety levels [1].

BMAB is one of the procedure feared by patient's worldwide. For many patients, the pain experienced during this procedure is considerable [23]. Anxiety about the diagnostic results of BMAB has been reported to increase the pain experience of patients during the procedure [7]. In our study, the mean pain score of the music group during BMAB was found to be lower than in the control group and the difference between the groups was statistically significant. In support of our study, Özdemir et al. and Shabanloei et al reported that music therapy reduced pain levels of patients who underwent BMAB [1, 4] . In another study conducted with different sample groups, it was reported that the Turkish classical music had positive effects on pain levels of patients undergoing oocyte pick-up [24]. Citlik-Saritas et al. reported that the application of classical Turkish music during and after myocardial infarction significantly reduced pain, analgesic drug use, systolic and diastolic blood pressure, and pulse levels [25]. Another study using classical Turkish music revealed that it reduced the perception of pain and the amount of analgesics use in patients undergoing coronary artery surgery [11]. Many other studies have also demonstrated that music is effective for the treatment of acute pain [10–13, 26].

This study was limited to patients who underwent BMAB in the oncology and hematology outpatient clinic of a university hospital. Thus, the results can only be generalized for this group. Moreover, the use of a single musical genre and not letting the patients to choose the music were another limitations. Non-invasive, integrative pain management methods, such as music therapy, should be routinely integrated into the nursing practice. Therefore, in order to obtain stronger evidence for pain and anxiety management, more randomized controlled trials on the effects of an integrative method should be conducted. Furthermore, we recommend that other studies in which patients are allowed to choose the music should be conducted with a larger sample size. Overall, it was concluded that classical Turkish music (Acemaşiran makam) prior to BMAB can reduce the pain and anxiety of patients. Music therapy can be used as an effective and safe method to reduce pain and anxiety levels of patients undergoing BMAB. Music therapy can be used along with the use of analgesics and sedatives in BMAB patients, since it is an inexpensive, simple, and non-invasive method with no side effects.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Non-Invasive Clinical Research at Izmir Bakircay University in Turkey [Code:2019/408]. Written informed consent was obtained from the participants. All proceducres were in accordance with the principles of the Declaration of Helsinki.

Funding

This study was not funded by any organizations.

Authors' contributions

Conceptualization, Methodology, Formal analysis, Writing-original draft, Visualization: Eda Ergin; Conceptualization, Writing-review & editing, Data curation, Supervision: Fatma Kahrıman; Conceptualization, Methodology, Resources, Data curation: Hatice Coşkun Ay; Conceptualization, Methodology, Data curation, Writing-review & editing: Şebnem Çınar Yücel.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgments

The authors would like to thank all patients for their cooperation.

References

[1] Özdemir Ü, Taşcı S, Yıldızhan E, Aslan S, Eser B. The effect of classical turkish music on pain severity and anxiety levels in patients undergoing bone marrow aspiration and biopsy. Pain Management Nursing. 2019; 20(1):82-87. [PMID]

[2] Berenson JR, Yellin O, Blumenstein B, Bojanower D, Croopnick J, Aboulafia D, et al. Using a powered bone marrow biopsy system results in shorter procedures, causes less residual pain to adult patients, and yields larger specimens. Diagnostic Pathology. 2011; 6:23. [DOI:10.1186/1746-1596-6-23] [PMID] [PMCID]

[3] Zahid MF. Methods of reducing pain during bone marrow biopsy: A narrative review. Annals of Palliative Medicine. 2015; 4(4):184-93. [PMID]

[4] Shabanloei R, Golchin M, Esfahani A, Dolatkhah R, Rasoulian M. Effects of music therapy on pain and anxiety in patients undergoing bone marrow biopsy and aspiration. AORN Journal. 2010; 91(6):746-51. [PMID]

[5] Yayla EM, Ozdemir L. Effect of inhalation aromatherapy on procedural pain and anxiety after needle ınsertion into an ımplantable central venous port catheter: A quasi-randomized controlled pilot study. Cancer Nursing. 2019; 42(1):35-41. [DOI:10.1097/NCC.0000000000000551] [PMID]

[6] Sharifi Rizi M, Shamsalinia A, Ghaffari F, Keyhanian S, Naderi Nabi B. The effect of acupressure on pain, anxiety, and the physiological indexes of patients with cancer undergoing bone marrow biopsy. Complementary Therapies in Clinical Practice. 2017; 29:136-41. [DOI:10.1016/j.ctcp.2017.09.002] [PMID]

[7] Lidén Y, Olofsson N, Landgren O, Johansson E. Pain and anxiety during bone marrow aspiration/biopsy: Comparison of ratings among patients versus health-care professionals. European Journal of Oncology Nursing. 2012; 16(3):323-9. [PMID]

[8] Özer N, Karaman Özlü Z, Arslan S, Günes N. Effect of Music on Postoperative Pain and Physiologic Parameters of Patients after Open Heart Surgery. Pain Management Nursing. 2013; 14(1):20-8. [PMID]

[9] Lök N, Bademli K. [Effectiveness of music therapy in Alzheimer patients: Systematic review (Turkish)]. Psikiyatr Guncel Yaklasimlar. 2016; 8(3) 266-74. [DOI:10.18863/pgy.238188]

[10] Çelebi D, Yılmaz E, Şahin ST, Baydur H. The effect of music therapy during colonoscopy on pain, anxiety and patient comfort: A randomized controlled trial. Complementary Therapies in Clinical Practice. 2020; 38:101084. [PMID]

[11] Ciğerci Y, Özbayir T. The effects of music therapy on anxiety, pain and the amount of analgesics following coronary artery surgery. Turkısh Journal of Thoracıc and Cardıovascular Surgery. 2016; 24(1):44-50. [DOI:10.5606/tgkdc.dergisi.2016.12136]

[12] Zengin S, Kabul S, Al B, Sarcan E, Doğan M, Yildirim C. Effects of music therapy on pain and anxiety in patients undergoing port catheter placement procedure. Complementary Therapies in Medicine. 2013; 21(6):689-96 . [PMID]

[13] İnangil D, Irmak Vural P, Doğan S, Körpe G. Effectiveness of music therapy and emotional freedom technique on test anxiety in Turkish nursing students: A randomised controlled trial. European Journal of Integrative Medicine. 2020; 33:101041. [DOI:10.1016/j.eujim.2019.101041]

[14] Bennett DL, Swan JS, Gazelle GS, Saksena M. Music during image-guided breast biopsy reduces patient anxiety levels. Clinical İmaging. 2020; 65:18-23. [PMID]

[15] Guvenc O. Research-Promotion Group for theTurkish Music [Internet]. 2017 [cited 2018 Aug 29]. Available from: https://tumata.com/en/turkish-music-therapy/turkish-tonalities-and-their-effects/

[16] Korhan EA, Uyar M, Eyigör C, Hakverdioğlu Yönt G, Çelik S, Khorshıd L. The effects of music therapy on pain in patients with neuropathic pain. Pain Management Nursing. 2014; 15(1):306-14. [PMID]

[17] Price DD, Bush FM, Long S, Harkins SW. A comparison of pain measurement characteristics of mechanical visual analogue and simple numerical rating scales. Pain. 1994; 56(2):217-26. [DOI:10.1016/0304-3959(94)90097-3]

[18] Spielberger CD, Gonzalez-Reigosa F, Martinez-Urrutia A, Natalicio, LF, Natalicio DS. The state-trait anxiety inventory. Revista Interamericana de Psicologia/Interamerican Journal of Psychology. 1971; 5:3-4. https://journal.sipsych.org/index.php/IJP/article/view/620/524

[19] Oner N, Lecompte A. State-Trait Anxiety Inventoryhandbook. Istanbul, Turkey: Bogaziçi UniversityPublications [Internet]. 1983. Available from: https://www.salihyildiz.net/wp-content/uploads/2021/02/DURUMLUK-VE-SUREKLI-KAYGI-OLCEGI-izinli.pdf

[20] Lee WP, Wu PY, Lee MY, Ho LH, Shih WM. Music listening alleviates anxiety and physiological responses in patients receiving spinal anesthesia. Complementary Therapies in Medicine. 2017; 31:8-13. [DOI:10.1016/j.ctim.2016.12.006] [PMID]

[21] Gäbel C, Garrido N, Koenig J, Hillecke TK, Warth M. [Effects of monochord music on heart rate variability and self-reports of relaxation in healthy adults (German)]. Complementary Medicine Research. 2017; 24(2):97-103. [DOI:10.1159/000455133] [PMID]

[22] Toker E, Kömürcü N. Effect of Turkish classical music on prenatal anxiety and satisfaction: A randomized controlled trial in pregnant women with pre-eclampsia. Complementary Therapies in Medicine. 2017; 30:1-9 [DOI:10.1016/j.ctim.2016.11.005] [PMID]

[23] Jaddini E, Hjortholm N, Snarski E. Effective pain reduction during bone marrow biopsy and aspiration - Technique over experience. Acta Haematologica Polonica. 2016; 47[3]:226-31. [DOI:10.1016/j.achaem.2016.04.003]

[24] Orak Y, Bakacak SM, Yaylalı A, Tolun FI, Kıran H, Boran OF, et al. Effects of music therapy on pain and oxidative stress in oocyte pick-up: A randomized clinical trial. Brazilian Journal of Anesthesiology. 2020; 70(5):491-9. [DOI:10.1016/j.bjane.2020.07.006]

[25] Citlik-Saritas S, Saritas S, Cevik-Akyil R, Isik K. The effects of Turkish classical music on physiological parameters, pain and analgesic use in patients with myocardial infarction: A non-randomized controlled study. European Journal of Integrative Medicine. 2018; 22:50-3. [DOI:10.1016/j.eujim.2018.08.001]

[26] Honzel E, Murthi S, Brawn-Cinani B, Colloca G, Kier C, Varshney A, et al. Virtual reality, music, and pain: Developing the premise for an interdisciplinary approach to pain management. Pain. 2020; 160(9):1909-19. [PMID]