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## Effects of Music Intervention During Cesarean Section on the Level of the Mother's Anxiety: A Randomized Controlled Study

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### ABSTRACT

**Objective:** Anxiety felt before and during childbirth can have negative effects on maternal and infant health. Music interventions during labor have been shown to mitigate the effects of anxiety in a variety of populations. It is a low-cost and easily accessible technique that also has a high level of acceptability. The aim of this study was to examine the effect of listening to music on the vital signs of women during a cesarean section (C-section) and their level of anxiety.

**Materials and Methods:** This was a single-center, controlled, randomized study. The pregnant women in the intervention group listened to Sufi music via earphones during the operation. The control group received standard treatment without music. The C-section was performed under regional anesthesia in all cases. The State-Trait Anxiety Inventory (STAI) was administered to the patients before and after the procedure.

**Results:** There was no significant difference in the vital sign parameters of the music group and the control group ( $p > 0.05$ ). The preoperative STAI anxiety score was similar in the music ( $45.58 \pm 4.60$ ) and control ( $43.82 \pm 4.33$ ) groups ( $p = 0.183$ ). However, after the operation, the anxiety score of the music group ( $35.88 \pm 5.39$ ) was statistically significantly lower than that of the anxiety score of the control group ( $42.14 \pm 3.75$ ) ( $p < 0.001$ ).

**Conclusion:** The women who listened to Sufi music during a C-section reported less anxiety. Slow, rhythmic music can distract the patient, help them relax, and reduce their anxiety.

**Keywords:** Anxiety, cesarean section, Sufi music

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### INTRODUCTION

The cesarean section (C-section) rate in Turkey is high, recently reported at 51.2% (1), well above the rate of 5% to 15% of deliveries suggested by the World Health Organization (2). Childbirth is a source of stress for women, and a C-section can add to patient stress and anxiety due to the fact that it is a major abdominal surgery that includes risks and potential complications (3, 4). High preoperative anxiety levels have been reported in many women who are to undergo a C-section (5). Since it is not possible for the father or other supporter to attend a patient's C-section in Turkey, isolation may also add to patient anxiety. Premedication to manage anxiety may have potentially negative side effects (6). Therefore, given the prevalence of C-sections and the potentially broad and lasting effects of anxiety, the exploration and use of non-pharmacological, non-invasive interventions for anxiety is valuable.

Spinal anesthesia is currently preferred for childbirth because it can reduce intraoperative blood loss, nausea and vomiting, respiratory depression, and postoperative pain compared with general anesthesia (7). However, background noise in the operating room, such as the sounds of surgical instruments, is known to increase patient anxiety (8). This is sometimes especially difficult for pregnant women during delivery.

Music intervention as a stress management technique is an easy-to-apply, cost-effective, non-pharmacological, and non-invasive method that has been used for centuries (9). It not only supports the psychological well-being of the patient, it may also improve physical parameters, such as blood pressure and heart rate. (10). It has been shown in some studies that listening to music may increase a patient's pain threshold as a result of distracting their attention (11). Music appears to reduce pain by stimulating the autonomic nervous system and releasing endorphins and natural opioids from the pituitary gland (12, 13). The effect can cause a decrease in blood pressure and heart rate by reducing catecholamines (14). These results generally vary depending on the tempo of the music; slow-paced and intermittent music has been associated with a decrease in heart rate, respiratory rate, and blood pressure, while fast-paced music has been associated with an increase in these parameters (6). Music can stimulate the release of endorphins from the brain, lowering adrenocorticotrophic hormone levels in the blood. Calming music can affect muscle tension, pylomotor reflexes, brainwave frequencies, and autonomic nervous system reactions (15). Music can have physiological and psychological effects. It can have a stimulating or relaxing effect, depending

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on the type of music, and it can be used to create specific emotions (16). The potential therapeutic effect of music has been attributed to its ability to reduce stress and affect arousal (17).

There are studies of the use of Sufi music in the treatment of psychiatric diseases (18). However, studies of the potential effects of Sufi music during a C-section are limited. The objective of this study was to compare the anxiety scores and vital signs of patients who underwent an elective C-section with the addition of music therapy with those of a control group.

The primary goals of the study were to:

- 1) Compare the state anxiety score in the music and control groups before and after the operation
- 2) Determine whether music affected patients' blood pressure, heart rate, respiratory rate, or partial oxygen (O<sub>2</sub>) pressure level

## MATERIALS and METHODS

### Ethical Considerations

Ethical approval for the research was obtained from the Necmettin Erbakan University Meram Faculty of Medicine, Department of Pharmaceuticals and the Non-Medical Research Ethics Committee (no: 2020/2957). All of the participants were informed about the study and provided written consent. The study was conducted according to the Declaration principles of the Declaration of Helsinki.

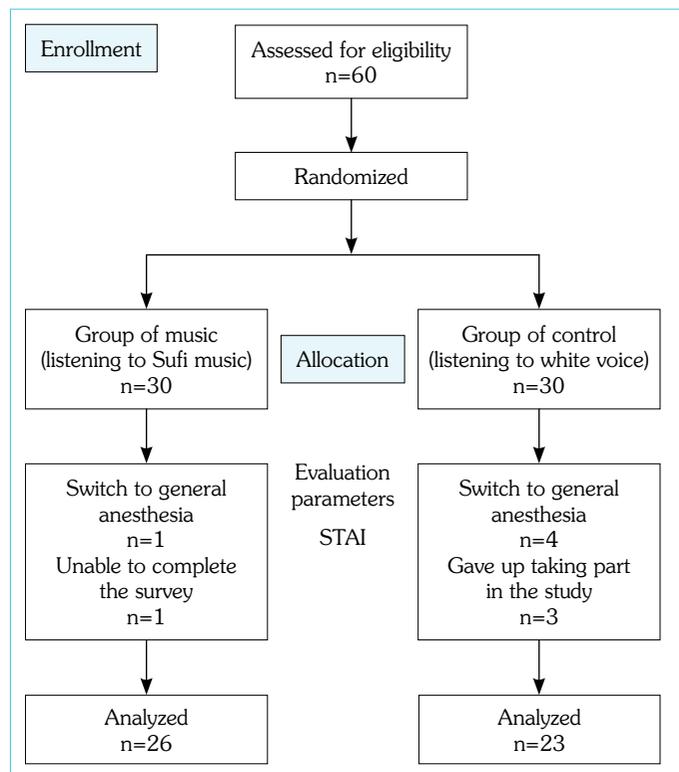
### Study Design

The study was performed in accordance with the CONSORT (Consolidated Standards of Reporting Trials) guidelines between January 2021 and March 2021 as a single-center, controlled, randomized study.

**Inclusion Criteria:** Patients >18 years of age with singleton term pregnancies (>37 weeks) who underwent elective cesarean section (obstetric indications or patients with previous cesarean section) under regional anesthesia were included in the study.

**Exclusion Criteria:** Pregnant women with maternal hypertensive disorders (chronic hypertension or preeclampsia), insulin-dependent diabetes mellitus, intrauterine growth retardation, pregnancy at the 41<sup>st</sup> week, premature rupture of membranes, multiple pregnancies, in utero fetal death, known fetal anomalies, hearing impairment, or psychiatric disorders were excluded from the study.

**Participants:** Potential participating patients were enrolled in the study after being informed by a single researcher (JEH) about the purpose of the study and how data would be collected and used. Eligible participants were told that they would participate in a pain relief study during the operation. They were not informed about the role of music in order to preserve single-blind test conditions. After obtaining informed consent in writing and verbally, the following data were collected from all participants before the procedure: age, parity, previous C-section information, smoking history, and information about existing illnesses. The participants were randomized into an intervention group that would listen to Sufi music and a control group that received standard care. Randomization was done by the researchers using the coin-flip method; tails determined the music group and



**Figure 1. Flow chart of the study**

STAI: State-Trait Anxiety Inventory

heads defined the control group. Of the 60 pregnant women initially included in the study, 5 were excluded because they were switched to general anesthesia during the operation, 3 decided not to participate in the study, and 3 did not entirely complete the questionnaire (Fig. 1).

### Intervention

The music selected to be played during the C-section was Sufi music with a slow rhythm (ranging from 60 to 72 beats per minute as measured by a metronome), a low to medium tone, and a harmonious melody (<https://www.youtube.com/watch?v=h374RP-fUoX0>).28). The music was provided via earphones before the spinal anesthesia when the pregnant woman was taken to the intervention table before the C-section. During the spinal anesthesia, instructions were given to the patient at a low decibel level. Unnecessary staff conversations were prevented to avoid background noise. The patient was able to communicate with hospital staff. The music continued to play throughout the operation. The control group heard the normal ambient sounds during the procedure without any music intervention.

Two interviews were conducted with the patients, before and after the C-section. Fifteen minutes before admission to the operating room, the researcher completed a participant information form in a face-to-face visit to obtain sociodemographic and obstetric characteristics and administer the State-Trait Anxiety Inventory (STAI). During and after the operation, blood pressure, heart rate, respiratory rate, and O<sub>2</sub> saturation values were regularly recorded. After the operation, the STAI-S scale was re-applied by the researcher at the 30<sup>th</sup> minute in the post-anesthesia care unit.

**Table 1.** Overview of characteristics

	Music group (n=26)	Control group (n=23)	p
Age (years)	31.25±5.81	29.64±5.97	0.321
Number of births	2 (0–4)	2 (0–5)	0.717
Number of C-sections	1 (0–4)	1 (0–4)	0.335
**STAI-Trait	51.42±6.74	51.36±5.67	0.974
Smoker	4 (66.7%)	2 (33.3%)	0.674
Non-smoker	22 (52.4%)	20 (47.6%)	
Had COVID-19	3 (60.0%)	2 (40%)	1.000
Had not had COVID-19	23 (54.2%)	20 (45.8%)	

\*: Categorical variables were analyzed using a chi-squared test or Fisher's exact test. Continuous variables were analyzed with a t-test; \*\*: STAI: State-Trait Anxiety Inventory

## Instruments

### State-Trait Anxiety Inventory

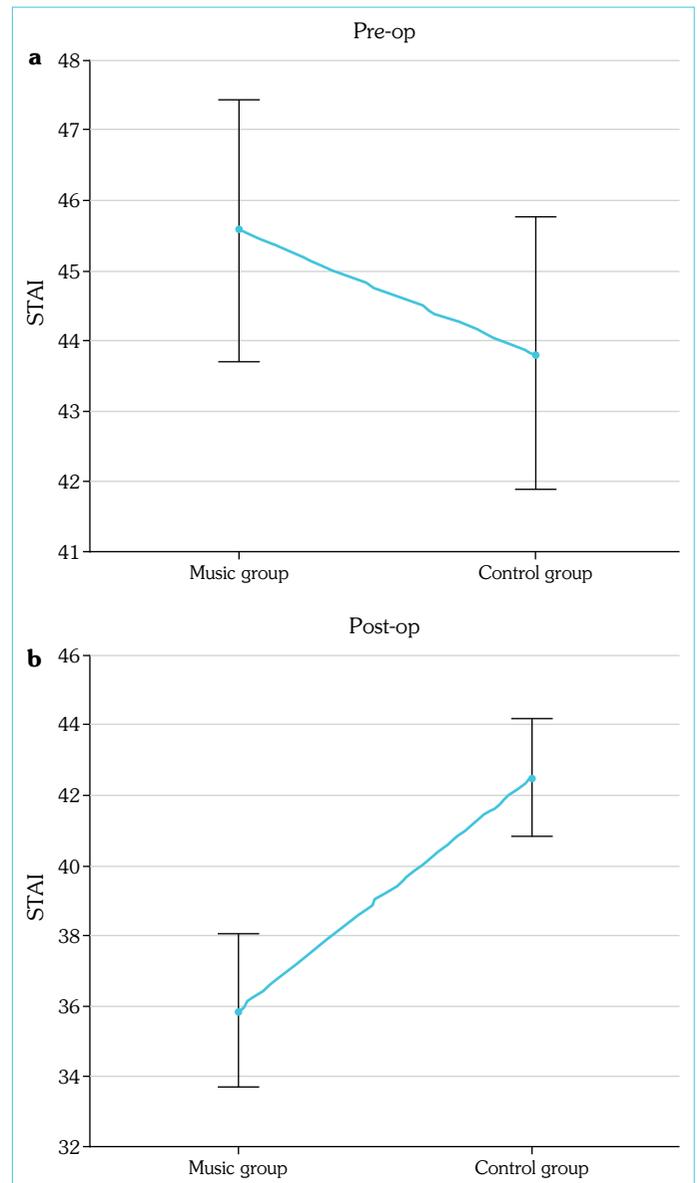
The STAI, developed by Spielberger et al. (19), consists of 2 scales of 20 items used to assess 2 components: the STAI-S measures the state anxiety level, and the STAI-T measures the trait anxiety level (19). The scale uses a 4-point Likert-type scale with answers that express a range of “not at all/almost never,” to “very much so/almost always.” The STAI contains positive (direct) items that express negative emotions and negative (inverted) items that express positive emotions. The negative statements in the STAI-S are items 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20. The negative statements in the STAI-T are items 21, 26, 27, 30, 33, 36, and 39. Separate total weights of direct and inverted items are calculated and the sum of the inverse expressions is subtracted to yield a total. A predetermined and unchanging value of 50 for the STAI-S and 35 for the STAI-T is added to that number to provide the sum value anxiety score. If more than 3 statements are not answered from among the 20 items, the form is considered invalid. The possible scores of both scales vary between 20 and 80. A higher score indicates a greater level of anxiety.

### Vital Signs

Vital signs of systolic (SBP) and diastolic blood pressure (DBP), heart rate (HR), and respiratory rate (RR) were monitored by the researcher.

### Statistical Analysis

IBM SPSS Statistics for Windows, Version 24.0 (IBM Corp., Armonk, NY, USA) was used to perform the data analysis. All of the data obtained from the face-to-face interviews were evaluated and the means and SD of the numerical data were calculated. Conformity to normal distribution was evaluated with the Kolmogorov-Smirnov test, and categorical and numerical data were compared using appropriate statistical analyses, such as a chi-squared test, and independent t-test. Values of  $p < 0.05$  were considered statistically significant. Pre- and postoperative data were compared using paired sample t-tests of the case and control groups.



**Figure 2.** The preoperative and postoperative subjective measure of the course of anxiety in both groups

## RESULTS

A total of 49 pregnant women were included in this study: 26 in the music intervention group and 23 in the control group. The mean age of the participants included in the music group was 31.25±5.81 years and the mean age of the participants in the control group was 29.64±5.97 years. There was no statistical difference between the demographic variables of the music group and the control group ( $p > 0.05$ ) (Table 1).

No significant difference was seen between the vital signs of the music group and the control group during or after the procedure ( $p > 0.05$ ).

According to the STAI-S scale results recorded before the operation, the anxiety score of the music group was 45.58±4.60 and that of the control group was 43.82±4.33; there was no statistically significant difference between the groups ( $p = 0.183$ ). After the procedure, the anxiety score of the music group (35.88±5.39)

**Table 2.** Preoperative and postoperative comparison of subjective and objective measures in both groups

	<b>Music group Mean±SD</b>	<b>Control group Mean±SD</b>	<b>t</b>	<b>p</b>
Systolic blood pressure (mmHg)				
Pre-op	118.35±20.37	121.68±17.84	-0.598	0.553
Post-op	121.50±14.36	119.50±15.96	0.457	0.650
p	0.354	0.663		
Diastolic blood pressure (mmHg)				
Pre-op	62.35±13.91	69.64±16.89	-1.640	0.108
Post-op	67.58±11.0	70.09±9.94	-0.824	0.414
p	0.115	0.911		
Heart rate				
Pre-op	103.08±20.13	100.64±17.50	0.444	0.659
Post-op	93.42±13.49	97.68±19.67	-0.886	0.655
p	<b>0.008</b>	0.549		
Respiratory rate				
Pre-op	14.77±3.31	14.18±2.73	0.662	0.511
Post-op	13.46±2.26	13.83±1.65	-0.613	0.543
p	<b>0.008</b>	0.589		
Oxygen saturation				
Pre-op	97.27±1.71	97.32±1.42	-0.684	0.498
Post-op	98.54±1.44	97.55±2.28	1.221	0.228
p	0.003	0.128		
STAI-State				
Pre-op	45.58±4.60	43.82±4.33	1.353	0.183
Post-op	35.88±5.39	42.14±3.75	-4.576	<b>&lt;0.001</b>
p	<b>&lt;0.001</b>	0.071		

\*: Variables were analyzed using t-test, paired-sample t-test; STAI: State-Trait Anxiety Inventory

was statistically significantly lower than the anxiety score of the control group (42.14±3.75) ( $p<0.001$ ). The heart rate and respiratory rate of the women in the music group were significantly lower postoperatively than before the operation ( $p<0.001$ ). In the control group, no change was seen in vital parameters before and after the operation ( $p>0.05$ ) (Table 2).

In the music group, the mean anxiety score before the operation was 45.58±4.60, while the postoperative anxiety score was lower, 35.88±5.39 ( $p<0.001$ ). The control group did not demonstrate a change in anxiety level before and after the operation ( $p=0.071$ ) (Fig. 2).

## DISCUSSION

The present study is one of the few randomized controlled studies in Turkey that has examined the effect of music on anxiety during a C-section. Our results indicated that the postoperative anxiety score of pregnant women who underwent C-sections while listening to Sufi music was significantly lower than that of the control group. In the music group, the postoperative anxiety score was also lower than the preoperative anxiety score.

It is generally known that waiting for and undergoing a surgical procedure can be stressful. A lot of the anxiety experienced by patients is due to a fear of complications (20). Many anesthesiologists prefer epidural or spinal anesthesia for a C-section. When uterine manipulation is necessary, the mother often feels some discomfort. It is important that the expectant mother be as comfortable and cooperative as possible for a C-section delivery performed with regional anesthesia. Music used as a relaxation tool may enable the mother to more easily tolerate the surgical procedure (21).

A previous study demonstrated that there was a decrease in SBP in the group that listened to music before undergoing a C-section, while the control group had an increase in DBP and RR (22). It has been shown that HR, SBP and DBP, and the need for sedation were significantly reduced in patients who listened to music during a colonoscopy procedure. Additionally, in both of these studies, anxiety levels were lower in the groups that listened to music (20). In the intraoperative period in this study there was no significant difference in the HR, SBP, DBP, RR, or partial  $O_2$  pressure between the groups. This may be explained by the fact that uterotonic drugs (oxytocin) administered during spinal anesthesia or postpartum can cause hypotension, reflex tachycardia, and respiratory changes, which may have affected the accuracy of the analysis.

The literature to date provides different results regarding the effect of music on patients' anxiety before and during surgery. Some authors report that music has been effective in decreasing anxiety (20, 22, 23). Throughout history, music has been used to soothe stress and anxiety in pregnant women. A meta-analysis suggested that music has a significant effect on reducing situational anxiety before surgical procedures (24). However, there are also studies stating that listening to music did not affect anxiety and pain outcomes (25, 26). In the present study, no significant difference was observed between the music group STAI-S score and that of the control group before the operation. After the operation, however, the anxiety level of the music group was significantly lower than that of the control group.

It is not clearly known whether a specific type of music has a greater effect on anxiety (27). Some studies have shown that the effect of music on anxiety was insufficient to create a significant difference in state or trait anxiety (20, 21, 26). However, other research has indicated that music reduced state anxiety during surgical procedures (23, 27). Listening to music has a positive effect on state anxiety. In a meta-analysis, Gürbüz et al. (28) concluded that Sufi music may have a more beneficial effect when played once rather than repeatedly during a medical or surgical procedure (28). In the present study, music was provided only during the operation. Sufi music was chosen for its relaxing qualities. Intraoperative music had a positive effect in our study, but it cannot be said whether this effect is specific to Sufi music, since we did not compare it with other types of music. New comparative studies are needed to evaluate the effect of other types of music on anxiety during a C-section.

## CONCLUSION

Our results demonstrated that the anxiety of patients who listened to slow, rhythmic Sufi music during a C-section was lower than that of a control group. Music can help to distract the patient from negative thoughts and reduce stress. There were no significant changes in heart rate and blood pressure or partial O<sub>2</sub> pressure level. The assisting staff of the anesthesia or surgical team can easily use music perioperatively to aid in patient relaxation during cesarean delivery.

## Limitations

The most important limitation of this study is the determination of anxiety level during the cesarean section with a postoperative questionnaire. The relief experienced after the birth may make it more difficult to recall and express how anxious they were during surgery.

**Ethics Committee Approval:** The Necmettin Erbakan University Clinical Research Ethics Committee granted approval for this study (date: 18.12.2020, number: 2020/2957).

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – JEH, ND; Design – JEH, ND; Supervision – JEH, ND; Resource – JEH; Materials – JEH; Data Collection and/or Processing – JEH; Analysis and/or Interpretation – ND; Literature Search – JEH, ND; Writing – JEH, ND; Critical Reviews – JEH, ND.

**Conflict of Interest:** The authors have no conflict of interest to declare.

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