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Clinical trial

The effect of music on the results of a non-stress test: A non-randomized controlled clinical trial

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ABSTRACT

Introduction: The non-stress test (NST) is one of the most commonly used tests to assess foetal well-being because of its high sensitivity, fast implementation, and ambulatory use. This study was conducted to determine the effect of music played to pregnant women during the non-stress test on the test result.

Methods: A non-randomized controlled clinical trial was conducted in the NST polyclinic from March 3, to June 25, 2013. The population of the study included women who had applied to the NST polyclinic, had experienced a minimum of one live birth, had previously undergone the NST, and whose gestational week was ≥33. The sample comprised 96 pregnant women who met the study criteria. Pregnant women visiting the NST polyclinic on Mondays were included in the experimental group, while those visiting on Wednesdays were included in the control group. A Participant Introductory Form and NST Findings Registry Form were used for data collection. The data were evaluated using descriptive statistics, *t*-test for independent groups, chi-square test, and Fisher's exact test.

Results: The study revealed that the experimental group felt happier/more comfortable than the control group ($p < .05$). In addition, averages of foetal movement numbers, acceleration numbers, and reactive NST results in the experimental group were higher than the control group ($p < .05$). The experimental group had a higher reactive NST result than the control group ($p < .05$). The results of this study did not suggest a significant difference in the average heart rate of the experimental and control groups ($p > .05$).

Conclusion: Our study findings demonstrate that music played to pregnant women during NST increases foetal movement and acceleration numbers and leads them to experience more positive feelings during the test.

1. Introduction

The non-stress test (NST) has become one of the most commonly used methods to assess foetal well-being during the antenatal period as it is a non-invasive, painless, and ambulatory diagnostic method that can be interpreted easily [1–7]. Although the NST is a non-invasive and painless procedure, it may cause anxiety in pregnant women as it lasts for about 20 min, and women need to remain motionless during the procedure [7,8]. Anxiety in pregnant women may affect the test result and cause misevaluation by increasing the false-positive rate [5,7,9]. Increased false-positive rates in the NST result may lead to an increase in operative delivery [2,10,11]. Both antepartum and intrapartum NST procedures are performed by nurses in many healthcare facilities in Turkey. Accordingly, nurses are responsible for eliminating factors that cause anxiety in pregnant women before and during the procedure and, therefore, may affect the result of NST [12].

There is an ample amount of evidence in the literature demonstrating the positive effects of music therapy on anxiety [5,13–18]. Although music is a non-invasive relaxation technique that is considered among nursing practices, it is regarded as an aesthetic therapy method allowing the participation of patients in their own care based on their opinions [3,17–21]. There are many studies in the field of obstetrics and gynaecology suggesting that music reduces pain and anxiety during childbirth [5,8,17,21]. However, there are limited studies on the effects of music on the NST [5]. Studies have shown that music played during pregnancy or NST reduces the anxiety levels of pregnant woman [28], increases foetal heart rate [29,30], foetal movement rate [5,30] and the number of accelerations [5,29,30]. Studying the effect of music on NST with different music pieces and in different cultures will contribute to the literature. This study was conducted to determine the effect of playing music for pregnant women during the NST on NST results.

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2. Materials and methods

2.1. Study design

This non-randomized controlled clinical trial was conducted in the NST polyclinic of a training research hospital.

2.2. Participants

This study was conducted at a training research hospital NST polyclinic between March 3, and June 25, 2013. NST is performed for pregnant women who visit the pregnancy follow-up clinic after their 33rd gestational week. An average of 8000 women undergo NST per year in the hospital where the study was conducted. The study population included women who visited the NST polyclinic who had experienced at least one live birth, had NSTs before, and whose gestational week was greater than 33. The study population was determined by power analysis. The sample comprised 96 (48 experimental and 48 control group) pregnant women who met the inclusion criteria, who were at 0.5 effect size and 95% confidence interval with a 5% of margin of error according to the performed power analysis, and who had the power to represent the population with a ratio of 98%.

Pregnant women who presented to the NST polyclinic on dates and times when the investigator was present formed the experimental and control groups with a non-probability sampling method. The data were collected from the experimental group on Mondays and from the control group on Wednesdays to prevent between-group transmission. Each pregnant woman who applied to the polyclinic was included in either the experimental or control group considering their application sequence according to the day Monday and Wednesday of the week. The study was conducted until the required sample number was reached through skipping the pregnant women who had visited the NST polyclinics before and included in the study. The pregnant women had to fulfil the inclusion criteria and meet the required conditions before the NST procedure in order to qualify for the sample.

2.3. The inclusion criteria

- Free from any risk factors (e.g. preeclampsia, IUGG, premature rupture of membranes, gestational diabetes, etc.) during pregnancy
- Had no uterine contraction in the NST result
- Had no high (140/90 and higher) or low (80/60 and lower) blood pressure
- Had no diagnosed cardiovascular disease of the foetus
- *Conditions that had to be met before the NST procedure*
- Ate at least two hours before the NST procedure
- Did not smoke or drink alcohol for at least two hours before the NST procedure
- Urinated immediately before the NST procedure

2.4. Measurements

Two different questionnaires were used for data collection in the study. Data were collected using the Participant Introductory Form and the post-NST, NST Findings Registry Form, which were developed by the investigator based on the literature [5,16,21]. A preliminary investigation was performed on five pregnant women to assess the clarity of the forms. These results were not included in the study.

2.4.1. Participant introductory form

The Participant Introductory Form that was created based on the literature consisted of 12 questions, including four on the pregnant women's socio-demographic characteristics, four on obstetrical characteristics, and four on their level of information about the NST, on which their blood pressure values were noted before the NST procedure.

2.4.2. NST findings registry form

The NST Findings Registry Form consists of two questions and six items of data. The NST Findings Registry Form consisted of two questions on the mood of the pregnant women during the NST procedure and the type of music preferred by the women in the experimental group. While the women's moods were assessed during the NST, the women who were happy and relaxed were evaluated as positive, those who were uncomfortable and nervous were evaluated as negative. Those who did not experience either of these moods were evaluated as neutral. The NST assessed the foetal heart rate and variability, the number of accelerations, decelerations and foetal movements and the status of the test result (as reactive or nonreactive).

2.5. Assessment of the NST findings registry form

The NST was performed using a Philips Avalon FM20 foetal monitor on the pregnant women who agreed to take part in the study. Their NST results were assessed by the investigator who have NST reading certificate. Five doubtful traces (three traces for the experimental group and two traces for the control group) were reassessed by a gynaecologist. The NST result was considered reactive in the presence of at least two accelerations, which were 15 BPM above the baseline for at least 15 s within a 20 min period, during which electronic foetal heart rate traces were printed [4,7,22].

The NST result was considered non-reactive in the absence of at least two accelerations, which were 15 BPM above the baseline for at least 15 s within a 20 min period, during which electronic foetal heart rate traces were printed in the presence of significant variable decelerations or late decelerations or the development of persistent foetal tachycardia at 160 BPM and higher, while the baseline traces were normal [4,7,22].

2.6. Ethical considerations

Prior to the study, ethics committee approval and written permissions were obtained from the biomedical research ethics committee of the university and the institutions where the study was conducted (no. 2012/242). Furthermore, written permission was also obtained from the training research hospital's chief physician's office. The purpose and period of the study and the procedures to be performed were explained to the pregnant women. They were told that they were free to withdraw any time they wanted. Those who agreed to take part were included.

2.7. Nursing intervention

There are ample studies on the effects of music on human health [5,14,23–26]. Existing studies have demonstrated that classical music reduces anxiety [5]. Classical music was therefore available in the selection of music presented to the pregnant women. However, individuals are more affected by their own culture, and their tastes in music vary based on the social and cultural structures of their communities [27]. As a majority of the population in the Southeast region of Turkey where the study was conducted consist of Kurdish and Muslim people and Kurdish is the spoken language, several types of music were included as alternatives to classical music. Two experts in music who were familiar with the region where the study was conducted were consulted before the music being used in the research was determined. At the same time, the appropriateness of the music being used in the study was verified by the preferences of the pregnant women who participated in the pre-application study. None of the pregnant women preferred music other than that in the prepared playlist.

Accordingly, a selection of classical music (Beethoven, Haydn, and Mozart) as well as Turkish art music (Aziz Turkish classical music band), Turkish folk music (Bekir Sıtkı Sezgin and Yavuz Bingöl), Rehavi Makam music (the sound of end-blown flutes), Kurdish music (Aynur