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ORIGINAL RESEARCH

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The effects of Iranian traditional music on cervical dilation and labor progress in the active stage of term pregnancy: A nonrandomized controlled trial

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Abstract

Background and Aims: Childbirth is a multifaceted and distressing event that can profoundly affect mothers' psychological and physical well-being. Noninvasive interventions like music therapy have been explored to improve labor outcomes by decreasing pain and anxiety levels, promoting relaxation, and enhancing maternal–fetal health. This study aimed to investigate the effect of Iranian traditional music on cervical dilation and labor progress in the active stage of term pregnancy.

Methods: This study was a nonrandomized controlled trial that included pregnant women between 20 and 35, with a gravidity of two or three. Participants were assigned to either the intervention group, which received traditional Iranian music therapy during labor, or the control group, which received routine care without the music intervention. The primary outcome was the effect of music therapy on cervical dilation from 4 cm to full dilation (10 cm) during term pregnancy. The secondary outcomes included changes in fetal heart rate, maternal anxiety, and pain scores before and after the intervention. Statistical analyses were performed using appropriate methods, and the results were reported using descriptive and inferential statistics.

Results: The mean age of the intervention group was 28.32 ± 6.13 years, and that of the control group was 28.31 ± 3.47 years ($p = 0.890$). The median duration of labor was not significantly different during the active stage, with 120 min in the intervention group and 137 min in the control group ($p = 0.505$). However, significant differences were observed in fetal heart rate, anxiety score, and pain score changes before and after the intervention between the two groups ($p < 0.05$).

Conclusion: Using traditional Iranian music therapy as a noninvasive intervention during labor can potentially improve maternal and fetal outcomes by reducing anxiety and pain perception. Further research is needed to explore the potential benefits of traditional music therapy in clinical settings.

KEYWORDS

labor progress, music therapy, nonpharmacological interventions, pregnancy

1 | INTRODUCTION

Pregnancy and childbirth are significant life events for women that can profoundly impact their physical and emotional well-being.[1] The experience of labor, in particular, is often associated with intense pain and anxiety, which can lead to adverse outcomes for both the mother and the fetus.[2,3] While pharmacological interventions such as analgesic drugs are commonly used to manage pain and anxiety during labor, they have potential side effects that can concern mothers.[4] As a result, nonpharmacological approaches, such as music therapy, have gained attention as a safer and more accessible alternative for managing pain and anxiety during labor.[5,6]

Music therapy has been shown to influence physiological and psychological states, including pain perception, anxiety, heart rate, and blood pressure.[7] In addition, previous studies have shown that music therapy can effectively reduce pain perception and shorten labor time.[8,9] It is believed that calming music can decrease catecholamine levels, resulting in lower blood pressure and heart rate, inducing relaxation, and increasing the threshold for pain perception.[10] As a result of this relaxation, activity in the sympathetic nervous system is reduced, leading to a decline in blood pressure and heart rate and an increase in peripheral temperatures through vasodilation.[11] Overall, it has been observed that music therapy can lead to better outcomes during labor and childbirth.[12]

Previous studies have investigated the effects of music on labor pain and anxiety, with promising results showing that music therapy can be an effective nonpharmacological intervention.[6,12,13] However, most studies have focused on Western music genres, and the potential therapeutic effects of traditional Iranian music on labor have yet to be fully explored.

Iranian traditional music is a unique genre deeply rooted in the country's rich cultural heritage. Intricate rhythmic patterns, microtonal intervals, and a variety of instrumental and vocal timbres characterize it. This music is believed to have the ability to induce emotional and physiological responses in listeners and has been historically used in Iran for therapeutic purposes.[14,15] Therefore, investigating the potential therapeutic effects of Iranian traditional music on labor can provide valuable insights into the role of music therapy in managing pain and anxiety during labor.

This study aims to investigate the impact of traditional Iranian music on cervical dilation and labor progress during term pregnancy. This study aimed to investigate the effect of Iranian traditional music on cervical dilation and labor progress in the active stage of term pregnancy.

2 | MATERIAL AND METHOD

2.1 | Study design

This clinical trial study followed the principles of CONSORT guidelines and was conducted in 2019 at Shahid Motahari Hospital, affiliated with Jahrom University of Medical Sciences.

2.1.1 | Study duration

The study was conducted from December 20, 2018 to February 18, 2019.

2.1.2 | Study site

The study took place in the labor and delivery unit of Shahid Motahari Hospital, Jahrom University of Medical Sciences.

2.1.3 | Study setting

The study was conducted in the labor and delivery unit of Shahid Motahari Hospital.

2.1.4 | Study population

Participants included pregnant women aged 20–35 years, gravidity two or three, with low-risk pregnancies at term (37–40 weeks) and without medical/mental health disorders, hearing/speaking impairments, recent substance use affecting labor, or exclusion criteria such as fever, fetal distress, opioid use, or recent analgesic administration.

2.2 | Inclusion and exclusion criteria

Inclusion criteria: Participants were pregnant women aged 20–35 years, gravidity two or three, at term pregnancy (37–40 weeks), with low-risk pregnancies, and willing to participate. They provided written informed consent after being informed about the nonprescription of sedatives during labor.

Exclusion criteria: Participants with medical/mental health disorders, hearing/speaking impairments, recent use of substances affecting labor, signs of fever, fetal distress, or opioid use were excluded. Additionally, any participant who expressed dissatisfaction during the study was excluded.

2.3 | Sample size calculation and sampling methods

The sample size was determined to be 90 participants, with 45 individuals per group, based on a 0.6 effect size, a type 1% error rate of 5%, and a power of 80%. A power analysis was also conducted using the G*Power software with an a priori method, revealing an actual power ($1 - \beta$ error probability) of 0.8036969. The sampling method used in this study was purposive sampling.

2.4 | Randomization and blindness

The participants were purposefully allocated into two groups: the case group, which received the music intervention, and the control group,

which did not receive the intervention. The allocation method employed in this nonrandomized clinical trial involved assigning women who attended medical appointments on odd-numbered days of the week to the intervention group and those visiting on even-numbered days to the control group. Out of these participants, 47 were assigned to the intervention group, while 49 were placed in the control group (Figure 1).

Blinding was not feasible due to the specific nature of the music intervention, and hence, the participants and researchers were not blinded.

2.5 | Study procedure

Upon admission, participants were informed about the policy of not prescribing sedatives during labor in both the control and case groups. After obtaining written consent, the research proceeded, and any participant expressing dissatisfaction during the study period was excluded from further.

Trained midwives collected data using the partograph for monitoring cervical dilatation, effacement, fetal station, and uterine contractions every 2 h. Vital signs, fetal heart rate, and clinical parameters were recorded on a labor progress record form. Pain and anxiety were assessed using validated questionnaires administered at 2-h intervals. Vaginal examinations were conducted every 2 h until full cervical dilatation (10 cm).

2.6 | Operational definitions

Pain severity and anxiety levels were assessed using the WONG-BAKER face scale[16,17] and Zung Self-Rating Anxiety Scale (SAS),[18] respectively.

Active phase of labor: Defined as cervical dilation of 4 cm or more, marking the onset of significant pain and anxiety in laboring women.

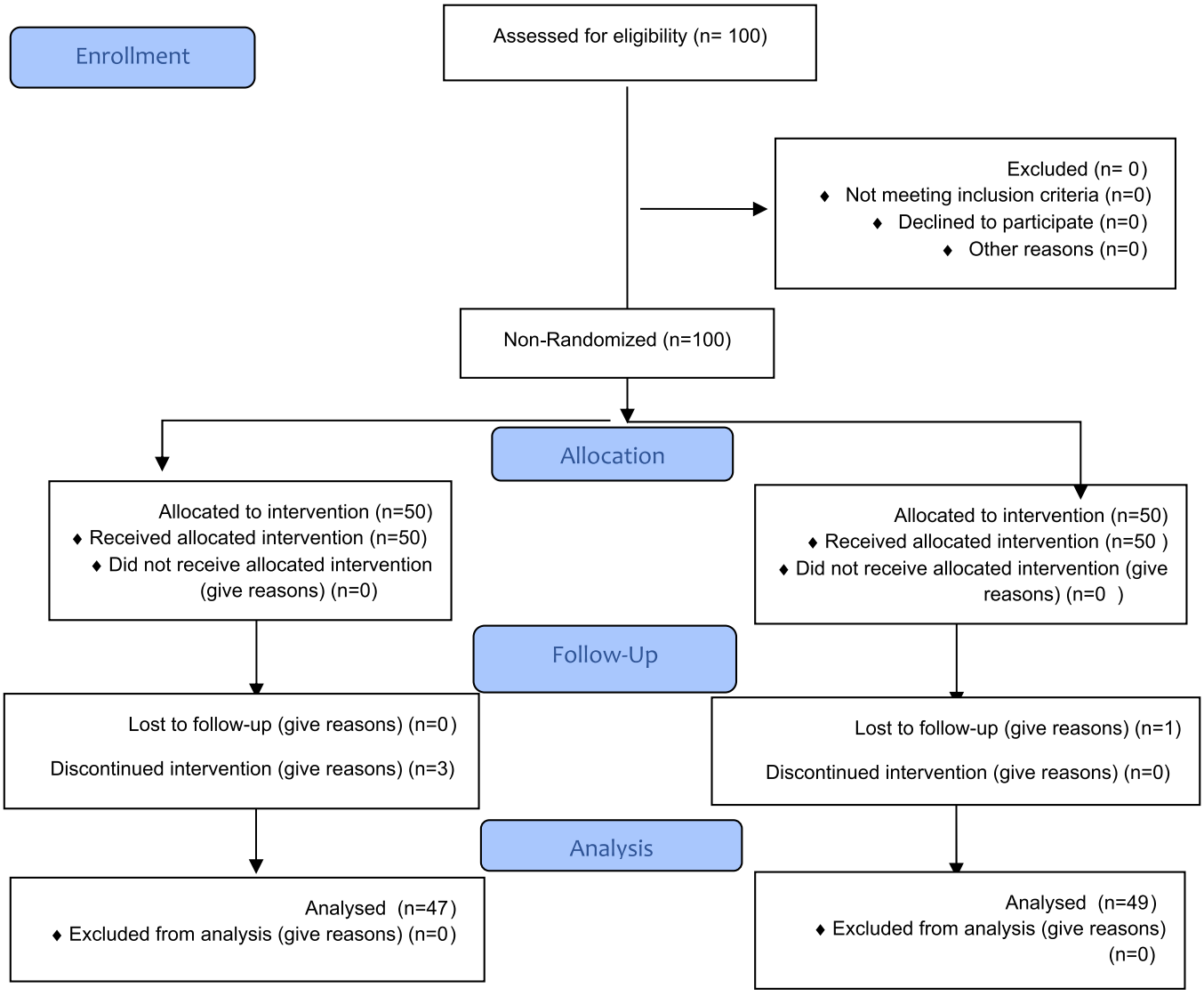

FIGURE 1 Consort diagram of study participants.

2.7 | Study outcomes

Primary outcome: Effect of music therapy on cervical dilation from 4 cm to full dilation (10 cm). *Secondary outcomes*: Changes in fetal heart rate, maternal anxiety, and pain scores pre- and postintervention.

2.8 | Data management

Data collection followed CONSORT guidelines, including demographic information, vital signs, fetal heart rate, and labor progression variables. Pain and anxiety indices were recorded as per the Parkland protocol and analyzed using SPSS 21 software.

2.9 | Intervention

Music therapy involved playing "Golden Dreams" by Javad Maaroufi and "Ba Pir" by Hossein Alizadeh for 10–30 min per session, initiated every 2 h in the intervention group. The music was played in the single-occupancy labor room using an amplifier, allowing the participants to listen. They could turn off the music at any time if they chose not to listen. No intervention was administered to the control group.

To ensure the correctness and reliability of data collection, several steps were taken:

Training: The project executives (midwives) received training on implementing the procedure and completing the questionnaire accurately. This training included guidance on standardized data collection techniques.

Monitoring: The accuracy of patient assessments by the trained midwives was monitored throughout the study. This could involve supervisory checks or periodic evaluations of the midwives' performance to ensure they followed the study protocol correctly.

2.10 | Data analysis

In the statistical analysis, the normality of the data was checked using the Kolmogorov–Smirnov test. Descriptive statistics were reported using the median and the first and third interquartile ranges (IQRs). Inferential statistics were performed using the Mann–Whitney test to compare the intervention and control groups. Additionally, the χ^2 test was used to compare qualitative variables between the intervention and control groups. The analysis was conducted using SPSS 21 software, and a significance level of 0.05 was set.

3 | RESULTS

In this clinical trial, 96 pregnant women were enrolled, with 47 assigned to the intervention group and 49 to the control group. The median (IQR) age of the intervention group was 29 (10) years, and that of the control group was 28 (5) years, with no statistically significant difference between the two groups ($p = 0.890$). Table 1 summarizes the baseline characteristics and clinical parameters of the participants, indicating no significant differences between the intervention and control groups in terms of gravidity, Apgar score at 1 min, maternal age, maternal vital

TABLE 1 Comparison of groups on demographic variables and characteristics of participants' mothers.[b]

Variable	Grouping	Data type	Group		*p* Value
			Intervention group (*n* = 47)	Control Group (*n* = 49)	
Age	—	Median (IQR)	29 (10)	28 (5)	0.890[a]
Apgar score (1 min)	—	Median (IQR)	9 (0)	9 (0)	0.999[a]
Mother heart rate	—	Median (IQR)	80 (2)	81 (2)	0.193[a]
Respiratory rate	—	Median (IQR)	18 (2)	18 (2)	0.234[a]
Systolic blood pressure	—	Median (IQR)	110 (10)	110 (10)	0.648[a]
Diastolic blood pressure	—	Median (IQR)	60 (10)	60 (10)	0.387[a]
Body temperature	—	Median (IQR)	36.8 (0.3)	36.7 (0.3)	0.146[a]
Fetal heart rate	—	Median (IQR)	140 (4)	140 (4)	0.571[a]
Pain score	—	Median (IQR)	2 (1)	2 (0.5)	0.947[a]
Anxiety score	—	Median (IQR)	39 (16)	38 (11)	0.079[a]
Gravid					
Second		*n* (%)	34 (72.3)	33 (67.3)	0.594[b]
Third		*n* (%)	13 (27.3)	16 (32.7)	

Abbreviations: IQR, interquartile range; SD, standard deviation; —, not applicable.

[a]Mann–Whitney test.

[b]χ^2.

TABLE 2 Assessment of maternal vital signs, fetal features, pain scores, and anxiety scores following music therapy intervention in the intervention and control groups based on median, interquartile ranges, and differences.

	Before intervention (baseline) median [IQR]			After intervention median [IQR]			Difference median [IQR]		
Variable	Case	Control	*p* Value[a]	Case	Control	*p* Value[a]	Case	Control	*p* Value[a]
Mother heart rate	80 [80–82]	81 [80–82]	0.193	80 [80–82]	82 [80–5]	0.046	0 [2–20]	0 [0–4]	0.110
Respiratory rate	18 [18–20]	18 [18–20]	0.234	18 [18–20]	18 [18–0]	0.454	0 [0–2]	0 [0–2]	0.721
Systolic blood pressure	110 [100–110]	110 [100–110]	0.648	110 [100–110]	110 [100–110]	0.491	0 [0–10]	0 [10–10]	0.618
Diastolic blood pressure	60 [60–70]	60 [60–70]	0.387	60 [60–60]	60 [60–70]	0.012	0 [0–10]	0 [10–10]	0.421
Body temperature	36.8 [36.6–36.9]	36.7 [36.5–36.9]	0.146	36.9 [36.6–37]	36.9 [36.9–37]	0.937	0 [−0.02 to 0.025]	0.09 [0.1–0.39]	0.375
Fetal heart rate	140 [140–144]	140 [138–142]	0.571	140 [140–144]	140 [138–140]	0.001	0 [0–2]	−2 [−4 to 0]	0.001
Pain score	2 [2–3]	2 [1.5–2]	0.947	4 [3–4]	4 [2.5–5]	0.656	1 [0–2]	1 [1–3]	0.006
Anxiety score	39 [33–49]	38 [37–48]	0.079	38.5 [33–51]	41 [40–48.5]	0.631	0 [1–2]	2 [0.5–4]	0.001

[a]Mann–Whitney test.

signs, fetal heart rate, pain score, anxiety score, and gravid ($p > 0.05$).

The effect of original Iranian music on labor progression, specifically cervical dilation from 4 cm to full delivery during term pregnancy, was assessed. The median [IQR] duration of labor was 120 [106.25] min for the intervention group and 137 [86.25] min for the control group ($p = 0.505$), as shown in Table 2.

Maternal heart rate did not significantly change after the intervention in the experimental group ($p = 0.650$) but increased significantly in the control group ($p = 0.029$). However, there was no significant difference in the change rate of maternal heart rate before and after the intervention between the experimental and control groups ($p = 0.120$).

There was no significant change in maternal systolic blood pressure after the intervention in the experimental group ($p = 0.532$), while it decreased significantly in the control group ($p = 0.031$). Similarly, there was no significant difference in the change rate of maternal systolic blood pressure before and after the intervention between the experimental and control groups ($p = 0.719$).

Maternal body temperature significantly increased in the control group ($p = 0.023$) but did not change significantly in the experimental group ($p = 0.774$). However, there was no significant difference in the change rate of maternal body temperature before and after the intervention between the experimental and control groups ($p = 0.390$).

Fetal heart rate per minute significantly decreased in the control group ($p = 0.001$) but did not change substantially after the intervention in the experimental group. Comparison of the difference in fetal heart rate per minute between the experimental and control groups showed a significant difference ($p = 0.001$), with the control group showing a greater decrease in fetal heart rate.

Pain scores did not significantly change after the intervention in the experimental group ($p = 0.356$) but significantly increased in the control group ($p = 0.001$). The increase in pain scores was expected due to the nature of the delivery process. Evaluation of the increase in pain scores between the intervention and control groups showed a significantly lower increase in the intervention group ($p = 0.007$).

Anxiety scores significantly increased in both the control and intervention groups ($p = 0.027$). Comparison of the change rate in anxiety severity between the experimental and control groups revealed a significant difference ($p = 0.001$), with the control group showing a higher increase in anxiety scores.

4 | DISCUSSION

The present study evaluated the effect of original Iranian music on labor development based on the cervix's opening from 4 cm to full delivery during term pregnancy. The results suggest that the use of music therapy during labor may have a positive impact on reducing pain scores and fetal distress. However, it did not significantly affect the duration of labor or other maternal and fetal outcomes. The study also found that anxiety scores significantly increased in both the intervention and control groups, but the increase was considerably lower in the intervention group.

Pregnancy and childbirth are widely acknowledged as being among the most challenging and anxiety-inducing periods in a woman's life, resulting in significant stress levels for the expectant mother.[6] Exposure to stress triggers the activation of the stress regulatory system, which includes the sympathetic nervous system and the hypothalamus–pituitary–adrenal cortex system.[19] Watkins' physiological framework proposes that music's sensory input has the potential to impact both the endocrine system and the autonomic nervous system. As a result, individuals experiencing stressful phases, such as childbirth, could benefit from engaging in music therapy.[20,21]

The experimental group exhibited significant reductions in anxiety scores and pain levels following the musical intervention compared to the control group. This finding aligns with previous studies that have demonstrated the therapeutic effects of music in reducing anxiety and providing pain relief during childbirth.[22–27] Kimber et al. observed that music was particularly beneficial in managing and controlling labor pain.[28] Watkins conducted research indicating that nonvocal music characterized by low pitch, slow tempo, simple repetitive rhythm, and quiet qualities can effectively reduce anxiety. Ghose et al. also observed that the anxiolytic effects of music are enhanced when using culturally familiar melodies. These findings align with the type of music employed in our study, further supporting its potential for reducing anxiety.[20,29] According to the gate control theory, music can distract from pain or reduce pain levels by suppressing the transfer of pain signals to the reticular activating system and thalamus.[23,30] Music is a multifaceted tool for alleviating pain and anxiety, employing cognitive distraction to shift attention away from discomfort.

Additionally, it can stimulate feelings of pleasure and cultivate a pathway for meditation, facilitating an opportunity to engage with positive emotions.[24,25,29,31] Tournaire et al. claimed that interventions like music therapy that establish a connection between the body and mind could be effectively utilized during labor as a different therapeutic approach. These interventions have the potential to alleviate pain, enhance personal satisfaction, and improve the overall experience of labor and childbirth for expectant mothers.[32] Listening to music can lead to the suppression of both auditory and pain pathways, as these pathways interact and inhibit each other. Activating this pathway can potentially influence the inhibition of central pain transmission, resulting in pain relief.[33,34] Music therapy can potentially elicit parasympathetic feedback by inducing relaxation, which, in turn, can stimulate the pituitary gland to release neuropeptides, including endorphins. These neuropeptides play a role in pain reduction, contributing to the analgesic effects of music therapy.[30,35]

Other study results showed that fetal heart rate in our control group had significantly decreased, but no significant alterations in fetal heart rate were observed in the experimental group. Contrary to our finding, Shao et al. observed that fetal heart rate decreased significantly in the experimental group in preterm labor women.[36] In their study, Surucu et al. found no significant difference in fetal heart rate between the experimental and control groups.[37] It is well-established that maternal anxiety can increase the baseline fetal heart rate.[38] Laderman et al. conducted research indicating maternal stress is associated with the blood's catecholamine levels. These catecholamines can influence fetal heart rate, potentially explaining the role of music as an anxiolytic in modulating fetal heart rate.[39] Maternal labor pain and anxiety can contribute to progressive metabolic acidosis in the fetus, leading to fetal heart rate deceleration.[40,41] According to the study by Nicolet et al., fetal bradycardia was related to maternal pain.[42] In general, music has the potential to reduce anxiety and pain in expectant mothers, which may consequently have an impact on fetal heart rate during the labor process.

The results of this study showed that there was no significant difference in maternal heart rate before and after the intervention between the control and experimental groups. However, in the control group, maternal heart rate significantly increased after the intervention, whereas this was not observed in the experimental group. Additionally, the baseline tracing of maternal heart rate during labor revealed that heart rate would accelerate following the progression of labor.[43] Pain and stress can potentially accelerate maternal heart rate, but music intervention has been observed to decrease heart rate in such circumstances significantly. Soothing music has been found to lower catecholamine levels, reducing heart rate and blood pressure.[10,44] The relaxation response elicited by music can decrease sympathetic system activity, resulting in a decline in both heart rate and blood pressure.[11]

The cultural specificity of Iranian music and its impact on non-Iranian individuals during labor is a multifaceted issue that warrants careful consideration. While Iranian music, deeply rooted in the country's cultural and historical context, can evoke strong emotional responses among those familiar with it, the reception and effectiveness of this music during labor may vary for non-Iranian individuals due to cultural differences.

The radif-dastgah system, a foundational element of Persian classical music with its 12-maqam structure, reflects a rich historical heritage that may not be immediately accessible or relatable to those outside the Iranian cultural sphere.[45] In light of this unique cultural context, it is important to consider the general adaptability of music therapy across different cultures. Similar therapeutic benefits may be achievable with culturally relevant music from other traditions. Music is a universal language, yet its emotional and psychological impact is deeply rooted in cultural familiarity and personal experiences. Therefore, tailoring music therapy interventions to the cultural backgrounds and preferences of the target population is essential. Future research should explore the effects of various culturally specific music genres on labor and other medical conditions to establish a broader understanding of the universal principles underpinning music therapy. By recognizing and integrating the cultural dimensions of music, healthcare providers can enhance the efficacy and acceptance of music therapy interventions in diverse populations.

4.1 | Strengths and limitation

This study has several limitations. Firstly, this study, attributed to its nonrandomized design, is the potential for selection bias. Because the allocation to the intervention and control groups was based on the specific days of the week, there is a risk of systematic differences between these groups due to factors related to the days on which participants attended their appointments.

Secondly, the reliance on self-reporting for specific outcome measures, such as anxiety and pain scores, introduces the possibility of individual interpretation and subjective biases. Thirdly, the study primarily focused on immediate labor outcomes, lacking an

assessment of the long-term effects of music therapy on maternal and neonatal health. Lastly, the study did not account for other influential factors in labor progress and outcomes, such as maternal medical conditions or interventions during labor.

Despite the limitations above, this study also possesses notable strengths. One strength is the selection of traditional Iranian music therapy as the intervention, which aligns with the study population's cultural background, enhancing the findings' ecological validity. Additionally, the study conducted a thorough evaluation by assessing multiple outcome measures, including cervical dilation, fetal heart rate, maternal anxiety, and pain scores. This comprehensive approach contributes to a more robust understanding of the effects of music therapy on labor progress and maternal well-being.

5 | CONCLUSION

In conclusion, the use of music therapy during labor may have a positive impact on reducing pain scores and fetal distress. However, it did not significantly affect the duration of labor or other maternal and fetal outcomes. The study also found that anxiety scores significantly increased in both the intervention and control groups, but the increase was significantly lower in the intervention group. Therefore, music therapy during labor may be a helpful adjunct to traditional pain management techniques, and further research is needed to understand its potential benefits fully.

AUTHOR CONTRIBUTIONS

Athar Rasekh Jahromi: Conceptualization; investigation; writing—original draft; methodology; data curation; supervision; resources. **Vahid Rahmanian**: Conceptualization; investigation; writing—original draft; writing—review and editing; validation; methodology; formal analysis; project administration; software; visualization. **Fatemeh Kiani**: Writing—original draft; data curation; visualization. **Asra Ansari**: Investigation; writing—original draft; validation; data curation. **Nikta Taghipour**: Investigation; writing—original draft; data curation; visualization.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data sets generated and analyzed during the current research are not publicly available due to concerns regarding individual privacy. However, they can be obtained from the corresponding author upon reasonable request.

ETHICS STATEMENT

Patients in our study provided written informed consent after being fully informed about the purpose of the research and assured of the confidentiality of their information. The study protocol received approval from the ethical committee of Jahrom University of Medical Sciences (code: IR.JUMS.REC.1397.044) and was registered in the Iranian registry of clinical trials (code: IRCT20150407021653N17). We also followed the CONSORT guidelines (http://www.consort-statement.org/) for reporting clinical trials, ensuring that relevant guidelines and regulations followed all methods.

TRANSPARENCY STATEMENT

The lead author Vahid Rahmanian affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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