Efficacy of Music Therapy and *Zingiber officinale* Roscoe Aromatherapy for Reducing Pain during the First Stage of Labor: A Randomized Controlled Trial

Pontip Paoin, M.D.*, Pichita Prasongvej, M.D.*, Athita Chanthasenanont, M.D.*, Titchayakorn Niumpradit, M.D., Densak Pongrojpaw, M.D.*, Komsun Suwannarurk, M.D.***

**Department of Obstetrics and Gynecology, Thammasat University, Pathum Thani 12120, Thailand. , **Chulabhorn International College of Medicine, Thammasat University, Pathum Thani 12120, Thailand.*

ABSTRACT

Objective: To study the pain-reducing effect of music therapy and aromatherapy with ginger essential oil (GEO; Zingiber officinale Roscoe) in the first stage of labor.

Materials and Methods: This randomized controlled trial was conducted from May 2022 to March 2023 in the delivery room of Thammasat University Hospital in Thailand. Participants were nulliparous pregnant women who came with actual labor pain and cervical dilation of 3 cm. They were divided into three groups: control, music, and aromatherapy. The control group received intrapartum care according to hospital guidelines, while participants in the music group listened to a "Musical Journey through Pregnancy" music playlist, and the aromatherapy group inhaled GEO. A visual analog scale was used for pain assessment every 2 hours. Interventions and pain assessment continued until the end of the first stage of labor or until cesarean section was indicated.

Results: Three hundred pregnant women were recruited. The mean age of the participants was 27.7 years old, and no difference in BMI among the three groups. Participants in the music and aromatherapy group had statistically significantly less labor pain than participants in the control group when cervical dilation was between 4 and 7 cm (6,1±0.7, 1.9±0.7, 2.6±0.4 when cervical dilation was 4-5 cm and 8.0±0.7, 2.8±0.4, 3.6±0.3 when cervical dilation was 6-7 cm in the control, music, and aromatherapy groups, respectively ($p < 0.001$). However, at cervical dilation of 8-10 cm, there was no difference among the three groups regarding labor pain. Both intervention groups had significantly shorter labor time and less estimated blood loss during vaginal delivery than the control group ($p < 0.001$).

Conclusion: Music and aromatherapy decreased labor pain, labor time, and estimated blood loss compared to the control group.

Keywords: Labor pain; music therapy; aromatherapy (Siriraj Med J 2023; 75: 707-712)

INTRODUCTION

Labor pain is one of the most painful experiences in a woman's life. It results from contraction of the uterus, dilation of the cervix, and dilation of the adjacent pelvic organs. This pain has significant physiological effects on the health of the mother and fetus.[1] Therefore, its minimization in the intrapartum period is considered crucial. Conventional methods can reduce pain during labor[2] but also have disadvantages, such as decreased consciousness during labor, respiratory distress in the

Corresponding author: Pichita Prasongvej
E-mail: pichita.pra@gmail.com
Received 27 June 2023 Revised 10 August 2023 Accepted 13 August 2023
ORCID ID:http://orcid.org/0000-0002-0485-4367
https://doi.org/10.33192/smj.v75i10.263860

newborn[3], slowing of the fetal heart rate[1], maternal respiratory suppression, nausea, vomiting, dizziness, and drowsiness.[1,4] For these reasons, non-pharmacological methods such as music therapy, yoga, relaxation, and other methods are becoming more popular worldwide.[5]

Several studies have shown that music therapy can reduce anxiety, stress, and pain in pregnant women[5-10] by stimulating the brain to produce dopamine and endogenous opioids.[8] In addition, music therapy has been found to improve heart rate variability in pregnant women.[9] Other studies have shown that geranium, frankincense, lavender, jasmine, and rose essential oils can relieve anxiety and labor pain.[11,12] Ginger essential oil (GEO; Zingiber officinale Roscoe) is an essential oil extracted from the ginger plant and abundant in Southeast Asia. It is currently available worldwide and is used to relieve pain in various organs through various mechanisms.[13] However, studies on labor pain after inhalation have not yet been conducted. These two alternative therapies are simple, inexpensive, and have no serious side effects. Therefore, we aim to investigate the efficacy of music therapy and GEO aromatherapy for pain relief in the first stage of labor.

MATERIALS AND METHODS

This randomized controlled trial was conducted among pregnant women admitted to the delivery room of Thammasat University Hospital from May 2022 to March 2023. A flowchart of the study according to the Consolidated Standards of Reporting Trials (CONSORT) is shown in Fig 1. The inclusion criteria were nulliparous, pregnant women aged 15 to 45 years old, singleton pregnancy, gestational age of ≥ 37 weeks, initial cervical dilation of 3 cm, use of oxytocin for labor augmentation, and ability to understand and communicate Thai language. Exclusion criteria were women who had an indication for cesarean section since admission, did not have a cephalic presentation, and had schizophrenia, anosmia, deafness, or chronic diseases that can exacerbate back pain or Covid-19 infection. Women who experienced adverse effects such as nausea and dizziness after inhaling GEO disliked the smell of GEO after using it for more than 10 minutes, experienced headaches or pain in their ears when listening to music for more than an hour, disliked the music, or were uncomfortable using headphones, or removed headphones for more than an hour were excluded from the study. Women who received opioid or regional anesthesia during delivery and women who wanted to end their participation in the study were also later excluded from the study.

After admission to the delivery room, research assistants presented and explained the research objectives to potential candidates who met the inclusion criteria. If they decided to participate in the study, their consent was obtained. Baseline data and clinical symptoms were recorded on a data collection form. Participants were

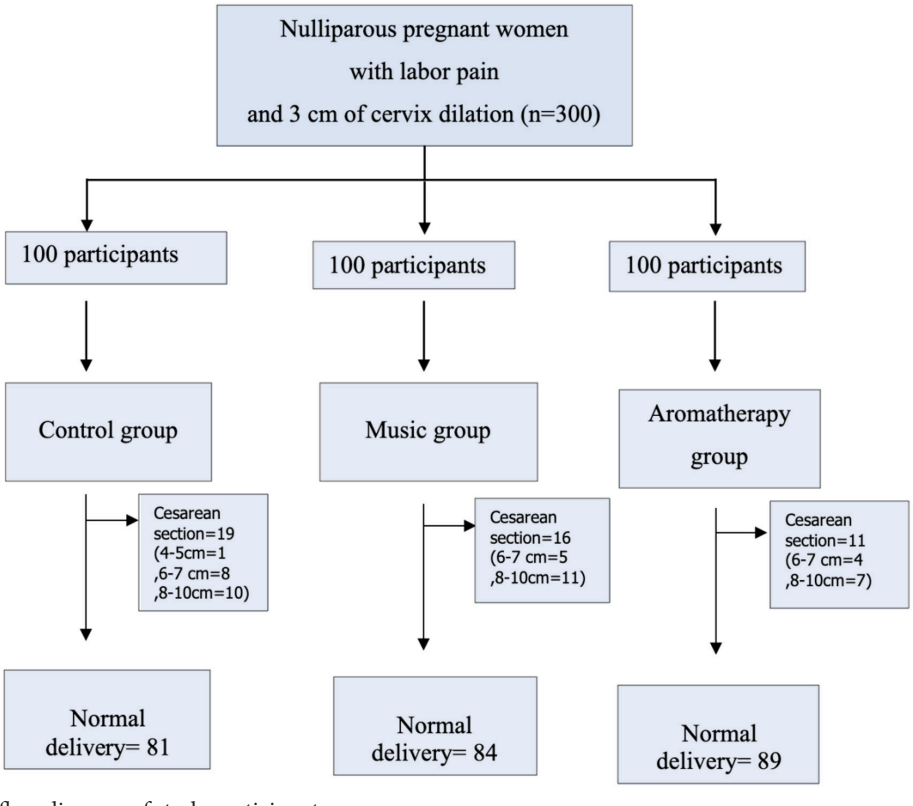

Fig 1. The CONSORT flow diagram of study participants

randomly assigned to three experimental groups: the control group, the music group, and the GEO aromatherapy group. The consecutively numbered assignments were sealed in opaque envelopes. Each group was placed in a different room. The control group received routine treatment, while the music group listened to a collection of music entitled "Musical Journey through Pregnancy"[10] through headphones, consisting of 8 songs that were uplifting, gentle, and natural sounds. The aromatherapy group inhaled the GEO reed diffuser placed next to the bed, and participants in all groups were in different rooms. All three groups received interventions and were assessed for pain every 2 hours using a visual analog scale (VAS) until the end of the first stage of labor or cesarean section was indicated. Satisfaction was assessed after the end of labor. The pain scale was divided into mild (pain score 0-3), moderate (pain score 4-6), and severe (pain score 7-10) pain groups for further and more precise information.

Statistical analysis

The sample size was calculated using the formula with two independent groups, and the mean values of 3.82 and 4.39 were used from a previous study.[14] With an alpha-type error rate of 1% (two-sided) and statistical power of 80% (one-sided), the estimated sample size per group was 93. With an expected sample loss of 5%, the final size was adjusted to 100 cases per group, resulting in a total of 300 participants in the study.

Descriptive statistics were reported as mean, percentage, frequency, and standard deviation. Statistical Package for the Social Sciences version 23 (SPSS Inc., Chicago, IL, USA) was used for data analysis. One-way analysis ANOVA was performed, and a p-value < 0.05 was considered statistically significant.

RESULTS

A total of 300 nulliparous pregnant women were randomized equally to the control, music, and aromatherapy groups, with no participant withdrawal. The average age was 27.7 years old. The gestational age of each group was approximately 38 weeks. About half (145/300) of participants had a normal BMI. Almost all participants had no underlying diseases. There were no significant differences in participants' characteristics between groups, as shown in Table 1.

Our study showed no differences in baseline VAS scores among the three groups. The mean VAS at cervical dilation of 4-5 cm were 6.1, 1.9, 2.6, and at the dilation of 6-7 cm, were 8.0, 2.8, and 3.6 for the control, music, and aromatherapy groups, respectively. The VAS score for cervical dilatations of 4-5 cm and 6-7 cm was significantly lower in both intervention groups than in the control group (p < 0.001), and the VAS score in the music group

TABLE 1. Demographic of the participants (100 case each).

Demographic	Control	Music	Aroma	*P*-value*
Age (years), mean ± SD	28.0±4.7	28.0±5.6	27.07±4.9	0.303
Gestational age (weeks), mean ± SD	38.5±1.1	38.1±3.2	38.1±1.0	0.344
BMI, n (%)				0.803
Underweight	28 (28)	29 (29)	30 (30)	
Normal	45 (45)	49 (49)	51 (51)	
Overweight	19 (19)	16 (16)	16 (16)	
Obese	8 (8)	6 (6)	3 (3)	
Gestational weight gain (kg), mean ± SD	13.1±4.4	12.9±4.9	12.0±5.1	0.254
Underlying disease, n (%)	2 (2)	1 (1)	4 (4)	0.359
Pregnancy complication, n (%)				0.409
GDM	11 (11)	10 (10)	9 (9)	
PIH	7 (7)	2 (2)	3 (3)	
Others	3 (3)	6 (6)	4 (4)	

*; Analysis of variance p-value <0.05 indicates statistically significant

Abbreviations: BMI: Body mass index, GDM; Gestational diabetes mellitus, PIH; Pregnancy induce hypertension

was significantly lower than in the aromatherapy group ($p < 0.001$).

In addition, the VAS score was further subdivided into severity levels. With cervical dilation of 4-5 cm, all participants in both intervention groups had mild pain. In contrast, most participants in the control group had moderate pain. At cervical dilation of 6-7 cm, all participants in the music group had mild pain; three-fourths of participants in the aromatherapy group also had mild pain, while most participants in the control group had severe pain, as shown in Table 2.

In both intervention groups, the first and second stages of labor were significantly shorter than in the control group. There were no differences in the rate of cesarean deliveries among the three groups, the most common indication being (15, 16, and 11 cases in the control, music, and aromatherapy groups, respectively, in that order). Another indication that led to cesarean delivery in the control group was abnormal fetal heart rate. Moreover, the estimated blood loss (EBL) for vaginal delivery was significantly lower in both intervention groups than in the control group ($p < 0.001$). However, no difference was found for cesarean delivery ($p = 0.305$). The mean birth weight was 3.0-3.1 kg in all groups. Almost all neonates in all groups had standard Apgar scores in the first and fifth minutes of life, except for one case in the control group with an Apgar score of 5.6 in the first and fifth minutes of life, subsequently. All pregnant women in both intervention groups reported high satisfaction with a score of 7-10 out of a total of 10 points, while about four-fifths of participants in the control group were only moderately satisfied with a score of 4-6 out of a total of 10 points.

DISCUSSION

The management of labor pain is one of the significant issues in obstetrics, for which various methods of relief are being explored. Previous studies showed that noninvasive complementary and adjunctive strategies, namely music therapy and aromatherapy, significantly reduce initial labor pain[7,15,19] (and other clinically relevant outcomes.[10,15] In addition, many studies have found that both interventions can reduce anxiety in stressful situations.[5,6,9,11,16,20] Currently, no study uses GEO inhalation and compares GEO aromatherapy with music therapy for pain relief in the first stage of labor. Therefore, we propose these two therapies for nulliparous pregnant women to treat labor pain in the first stage of labor.

TABLE 2. Pain score and severity score of the participants during various cervical dilatation.

Cervical dilate (cm)	Control	Music	Aroma	*P*-value*
3, mean ± SD	1.3±0.5	1.4±0.5	1.4±0.5	0.338
4-5, mean ± SD	6.1±0.7§	1.9±0.7¶	2.6±0.4	<0.001
Pain severity score, n (%)				<0.001
Mild	0	99 (100)	92 (100)	
Moderate	79 (80.6)	0 (0)	0 (0)	
Severe	19 (19.4)	0 (0)	0 (0)	
6-7, mean ± SD	8.0±0.7§	2.8±0.4¶	3.6±0.3	<0.001
Pain severity score, n (%)				<0.001
Mild	0 (0)	95 (100)	62 (72.9)	
Moderate	3 (3.3)	0 (0)	23 (27.1)	
Severe	87 (96.7)	0 (0)	0 (0)	
8-10, mean ± SD	9.1±0.3	9.0±0.8	9.0±0.7	0.859
Pain severity score, n (%)				
Mild	0 (0)	0 (0)	0 (0)	
Moderate	0 (0)	0 (0)	0 (0)	
Severe	91 (100)	95 (100)	96 (100)	

*; Analysis of variance p-value <0.05 indicates statistically significant, §; Significant difference from the other 2 group, ¶; Significant difference from aroma group, Pain score 0-3; mild, 4-6; moderate, 7-10; severe pain

TABLE 3. Obstetrics data of the participants (100 case each).

	Control	Music	Aroma	*P*-value*
Time labor (min)†				
1st stage	513.0±178.7§	381.8±145.8	383.5±160.8	<0.001
2nd stage	23.1±14.7§	15.0±10.4	15.3±10.1	<0.001
C/D‡	19(19)	16(16)	11(11)	0.284
V/DEBL (ml)†	347.0±212.2§	144.1±100.7	150.0±85.3	<0.001
BW (kg)†	3.1±0.4	3.1±0.4	3.0 ±0.4	0.095
Apgar ≥7‡				0.367
1 min	99 (99)	100 (100)	100 (100)	
5 min	99 (99)	100 (100)	100 (100)	
Satisfaction‡				<0.001
Moderate (4-6)	81 (81)	0 (0)	0 (0)	
Excellent (7-10)	19 (19)	100 (100)	100 (100)	

*; Analysis of variance p-value <0.05 indicates statistically significant, †; mean± standard deviation, §; Significant difference from the other 2 group, ‡; n (%)

Abbreviations: C/D; cesarean delivery, V/DEBL; vaginal delivery estimate blood loss, BW; birth weight

In our study, participants were distributed among the research groups, and there were no significant differences in demographic characteristics. Most participants in the three groups had no underlying diseases, and there were no differences in cervical dilation, baseline pain scores, or augmentation rates.

Our study showed that participants in both intervention groups had significantly less labor pain than the control group when cervical dilation was 4-7 cm. Based on these results, we can assume that both music and aromatherapy are effective in reducing pain in the early active phase of the first stage of labor, which is consistent with previous studies in both the music[7,17,18] and aromatherapy groups[14,16,19] In addition, our study found that music therapy was more effective than GEO aromatherapy in reducing labor pain in the early active phase. The mechanism for pain relief in both interventions is unclear. However, music and aromatherapy may stimulate brain substances that serve as natural analgesics. However, in the late active phase of labor (cervical dilation of 8-10 cm), no significant difference in the severity of labor pain was observed among the three groups in our study. A lower focus on both interventions can explain this, as pain is more intense in the late active phase of labor.

Furthermore, we could hypothesize that music therapy is beneficial in shortening the duration of the first and second stages of labor, which is consistent with Gonzalez's study.[10] Although this result contradicts a previous study by Guo[15], which found that music can prolong the first stage of labor, these different results may be explained by differences in the type of music and the duration of music listening.

Additionally, GEO aromatherapy has significantly reduced the duration of the first and second stages of labor. This finding contrasts the results reported by Tanvisut[14] and Yazdkhasti.[19] It could be due to differences in the type of aromatherapy, the duration during which the participants were exposed to the fragrances, and the diffuser used.

Our study also showed that both intervention groups had a statistically significant reduction in EBL during vaginal delivery, consistent with the results reported by Guo.[15] However, the mechanisms responsible for these results remained unexplained. Both intervention groups showed higher satisfaction levels than the control group, which may be due to the calming effect of these interventions, which helped to reduce stress during the waiting period.

Our study is the first to report the effectiveness of music therapy in reducing the time of the second stage of labor. In addition, our research reports for the first time that the scent of GEO can effectively reduce labor pain during the early active phase of the first stage of labor, the duration of labor, and EBL for vaginal birth.

Our results could be a milestone for future studies. At the same time, we are aware of the study's limitations, such as the lack of blindness to interventions and the fact that it is a single-center design.

CONCLUSION

This study showed that music and GEO aromatherapy effectively reduced labor pain in the early active phase of the first stage of labor, with music therapy being an effective therapy. In addition, music and GEO aromatherapy reduced the duration of the first and second phases of labor, estimated blood loss during vaginal delivery, and had higher satisfaction levels among participants in both intervention groups. This study recommends both therapies as a cost-effective and complementary approach for treating initial labor pain in the delivery room.

ACKNOWLEDGMENTS

This study was supported by the Research Fund of the Faculty of Medicine, Thammasat University. The authors would like to thank Assoc. Prof. Dr. Dittakarn Boriboonhirunsarn for his kind help in preparing the manuscript.

Conflict of interest

Authors declare no conflict of interest for this article.

REFERENCES

1. Peter HP. Obstetric pain. In: McMahon S, Koltzenburg M, Tracey I, Turk DC, editors. Wall and Melzack's textbook of pain. 6th ed. Philadelphia: Elsevier Saunders; 2013. p.772-92.
2. Czech I, Fuchs P, Fuchs A, Lorek M, Tobolska-Lorek D, Drosdzol-Cop A, et al. Pharmacological and non-pharmacological methods of labour pain relief-establishment of effectiveness and comparison. Int J Environ Res Public Health. 2018;5:2792-802.
3. Thomson G, Feeley C, Moran VH, Downe S, Oladapo OT. Women's experiences of pharmacological and non-pharmacological pain relief methods for labour and childbirth: a qualitative systematic review. Reprod Health. 2019;16:71-90.
4. Zanfini BA, Catarci S, Vassalli F, Laurita Longo V, Biancone M, Carducci B, et al. The effect of epidural analgesia on labour and neonatal and maternal outcomes in 1, 2a, 3, and 4a Robson's classes: a propensity score-matched analysis. J Clin Med. 2022; 11:614-32.
5. Smith CA, Levett KM, Collins CT, Armour M, Dahlen HG, Suganuma M. Relaxation techniques for pain management in labour. Cochrane Database Syst Rev. 2018;3:CD009514.
6. Santiváñez-Acosta R, Tapia-López ELN, Santero M. Music therapy in pain and anxiety management during labor: A systematic review and meta-analysis. Medicina (Kaunas). 2020; 56:526-36.
7. Buglione A, Saccone G, Mas M, Raffone A, Di Meglio L, Toscano P, et al. Effect of music on labor and delivery in nulliparous singleton pregnancies: a randomized clinical trial. Arch Gynecol Obstet. 2020;301:693-8.
8. Lunde SJ, Vuust P, Garza-Villarreal EA, Vase L. Music-induced analgesia: how does music relieve pain. Pain. 2019;160:989-93.
9. Teckenberg-Jansson P, Turunen S, Pölkki T, Lauri-Haikala M-J, Lipsanen J, Henelius A, et al. Effects of live music therapy on heart rate variability and self-reported stress and anxiety among hospitalized pregnant women: a randomized controlled trial. Nord J Music Ther. 2019;28:7-26.
10. Garcia Gonzalez J, Ventura Miranda MI, Requena Mullor M, Parron Carreno T, Alarcon Rodriguez R. Effects of prenatal music stimulation on state/trait anxiety in full-term pregnancy and its influence on childbirth: a randomized controlled trial. J Matern Fetal Neonatal Med. 2018;31:1058-65.
11. Tabatabaeichehr M, Mortazavi H. The effectiveness of aromatherapy in the management of labor pain and anxiety: a systematic review. Ethiop J Health Sci 2020;30:449-58.
12. Bertone AC, Dekker RL. Aromatherapy in obstetrics: a critical review of the literature. Clin Obstet Gynecol. 2021;64:572-88.
13. Andrei C, Zanfirescu A, Nițulescu GM, Negreș S. Understanding the molecular mechanisms underlying the analgesic effect of ginger. Nutraceuticals. 2022;2:384-403.
14. Tanvisut R, Traisrisilp K, Tongsong T. Efficacy of aromatherapy for reducing pain during labor: a randomized controlled trial. Arch Gynecol Obstet. 2018;297:1145-50.
15. Guo H, Que M, Shen J, Nie Q, Chen Y, Huang Q, et al. Effect of music therapy combined with free position delivery on labor pain and birth outcomes. Appl Bionics Biomech. 2022;2022:8963656.
16. Hamdamian S, Nazarpour S, Simbar M, Hajian S, Mojab F, Talebi A. Effects of aromatherapy with Rosa damascena on nulliparous women's pain and anxiety of labor during first stage of labor. J Integr Med. 2018;16:120-5.
17. Hosseini SE, Bagheri M, Honarparvaran N. Investigating the effect of music on labor pain and progress in the active stage of first labor. Eur Rev Med Pharmacol Sci. 2013;17:1479-87.
18. Xavier T, Viswanath L. Effect of music therapy on labor pain among women in active labor admitted in tertiary care hospital Kochi. Int J Intg Med Sci. 2016;3:444-8.
19. Yazdkhasti M, Pirak A. The effect of aromatherapy with lavender essence on severity of labor pain and duration of labor in primiparous women. Complement Ther Clin Pract. 2016;25 81.
20. Wongdama S, Siriussawakul A, Ratta-apha W, Suraprasit P, Kanjanapiboon K, Thanakiattiwibun C, et al. Effects of Music on Preoperative Anxiety in Patients Undergoing Hair Transplantation. Siriraj Med J. 2023;75:13-9.