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REVIEW

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Sounds of comfort: the impact of music therapy on labor pain and anxiety in primigravida women during vaginal delivery: a systematic review and meta-analysis

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Abstract

Background Music therapy has been widely used in medical practices, demonstrating positive effects on diverse medical procedures. In the context of labor pain management, evidence suggests that music can positively influence pain perception and overall well-being during labor, serving as a distraction and stress reducer. This systematic review and meta-analysis aim to comprehensively evaluate the impact of music therapy on labor pain in primigravida women during vaginal delivery.

Methods Following PRISMA guidelines, a thorough literature search was conducted in Google Scholar, PubMed, and Cochrane Central Register of Controlled Trials up to November 2023. Nine randomized control trials (RCTs) met the inclusion criteria, involving primigravida women undergoing vaginal delivery with music therapy intervention. Quality assessment was performed using the Cochrane Risk of Bias assessment tool.

Results A meta-analysis of the fixed effects was performed using mean differences (MD). Pooled analysis of Visual Analog Scale (VAS) scores revealed statistically significant reductions in pain intensity during latent (MD: − 0.73; 95% CI − 1.01; − 0.45); during the active phase (MD: − 0.56; 95% CI − 1.06; − 0.07) and the second stage (MD: − 0.69; 95% CI − 0.85; − 0.54). The findings indicated no statistically significant variances related to the integration of music therapy in addressing anxiety, both in the latent phase (MD: − 0.88; 95% CI − 1.86; -2.02) and the active phase of labor (MD: -0.30; 95% CI − 1.74; 1.13).

Conclusions In conclusion, the collective evidence presented in this systematic review underscores the potential of music, especially for women giving for the first time. in mitigating labor pain and anxiety across different stages, offering a holistic approach to enhance the overall childbirth experience for women.

Keywords Pain Management, Music therapy, Labor pain, Primigravida, Vaginal delivery, Anxiety

Background

Music has long played a vital role in medical practices, complementing diverse physical, mental, and surgical procedures [1]. The World Federation of Music Therapy defines music therapy as 'the professional use of music and its elements as an intervention in medical, educational, and everyday environments with individuals,

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groups, families, or communities who seek to optimize their quality of life and improve their physical, social, communicative, emotional, intellectual, and spiritual health and wellbeing. Research, practice, education, and clinical training in music therapy are based on professional standards according to cultural, social, and political contexts.' (WFMT, 2011) [2]. Within operating theaters, the integration of music is well-established, supported by literature showcasing its pre-operative efficacy in distracting and alleviating stress. This not only heightens pain thresholds but also cultivates a more serene surgical environment [3–7].

In the realm of labor pain management, numerous studies have explored music's role as a non-pharmacological intervention. Evidence suggests that music positively influences pain perception and overall well-being during labor, serving as a distraction, stress reducer, and promoter of a positive emotional state [8]. Fear and anxiety during labor can have detrimental effects on both the mother and fetus, impacting their physiological well-being and the overall delivery process. This can hinder uterine contraction and perfusion, potentially resulting in prolonged delivery and uterine hypoxia [9, 10]. By providing a means for women to redirect their focus from pain sensations, music emerges as a valuable element in enhancing the childbirth experience.

In trials involving first-time mothers in the active phase of labor, the introduction of music significantly reduced both the sensation and distress of pain compared to a control group. Music, considered a mild to moderate strength intervention, consistently delivered substantial relief over a 3-h labor period, delaying the onset of affective pain by one hour. Women in the music therapy group consistently reported lower levels of pain and anxiety during labor, coupled with improved maternal hemodynamics and decreased postpartum analgesic requirements [11–14]. Furthermore, obstetrics studies have demonstrated improved fetal parameters, such as heart rate variability [15], and promising results in maternal stress management, reflected in decreased stress levels [16], through the use of music. Therefore, there is a strong endorsement for its incorporation. However, for widespread adoption, thorough evaluation through reliable and comprehensive studies remains paramount.

To address concerns raised by Smith et al. regarding bias, variability between studies, and the limited number of patients evaluated [17], this meta-analysis aims to alleviate these issues. Additionally, it seeks to bolster previous meta-analyses by incorporating newly conducted studies into the analysis, while filling the existing gaps by synthesizing and meticulously analyzing the clinical data [18].The primary objective is to thoroughly assess the impact of music on pain and anxiety throughout the three distinct stages of labor—latent, active, and transitional. Through a meticulous examination of relevant studies, this study aims to contribute to a deeper understanding of how music can function as a beneficial and safe adjunct, enhancing the overall childbirth experience for women [3]. The objective of this research is to highlight the efficacy of music as a non-pharmacological intervention for the management of pain and anxiety during labor. By incorporating new data and systematically analyzing evidence across different stages of labor we get a comprehensive understanding of the effect of music therapy in mitigating the levels of pain and anxiety during different stages of labor. Due to limited sample sizes, inconsistent findings and variability of methodology in previous studies this study was performed to achieve a clearer and more accurate understanding of music therapy.

Methods

This meta-analysis was conducted following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) [19]. Our Protocol was registered with the PROSPERO, The International Prospective Register of Systematic Reviews (CRD#42,023,487,299).

Data sources and search strategy

An electronic search of Google Scholar, PubMed, and Cochrane Central Register of Controlled Trials was conducted up to November 2023 using the search strategy created by Boolean operators. The following detailed medical subject heading (MESH) terms and keywords were used for the database searches: ("music therapy"[MeSH Terms] OR ("music"[All Fields] AND"therapy"[All Fields]) OR"music therapy"[All Fields]) AND ("labor pain"[MeSH Terms] OR ("labor"[All Fields] AND"pain"[All Fields]) OR"labor pain"[All Fields] OR ("labor"[All Fields] AND"pain"[All Fields]) OR"labor pain"[All Fields]). A comprehensive search was done to identify relevant studies by title and abstract, followed by full-text reviews by two independent authors (RV and AF). We applied no language restrictions and included studies in non-English languages, and the relevant data were translated for interpretation using the Google Translate service. The pertinent literature references were thoroughly examined to identify potential studies that met the eligibility criteria. Disagreements were settled through the establishment of consensus among the involved parties. In cases where consensus could not be reached, the intervention of a third researcher (SO) was sought for arbitration.

Inclusion and exclusion criteria

The inclusion criteria for this meta-analysis encompassed double-arm studies that systematically examined the impact of music therapy during the concluding months of pregnancy on labor outcomes. Specifically, primigravida women (aged >18) devoid of health complications who underwent vaginal delivery. Prospective Randomized control trials (RCTs) were included, that focused on comparing the effects of music therapy on control groups, which either did not undergo music therapy or received alternative therapeutic interventions. The primary outcomes of interest included the measurement of pain intensity and anxiety, gauged through using the Visual Analog Scale (VAS). To maintain methodological rigor, observational studies, case reports, and book chapters were deliberately excluded from consideration. The exclusion criteria further encompassed clinical trials lacking accessible results, nonrandomized trials, reviews, non-human studies, editorials, abstracts, reviews, comments, letters, expert opinions, studies lacking original data, and duplicate publications.

Data extraction

For Baseline Characteristics two investigators (RV and AF) independently extracted the following information from each included study: first author, year of publication, country, design of the study, subject type, sample size, categories, demography, participant baseline characteristics, follow up period, treatment methodology, and primary outcome evaluation. Any discrepancy between data extractions was resolved by the discussion or consultation with the third author (SO).

Risk of bias and quality assessment

The included RCTs were evaluated for quality using the Cochrane Risk of Bias assessment tool (RoB 1 tool) [20]. The Cochrane RoB 1 tool evaluated the studies' quality under seven domains; Adequate Sequence Generation, Allocation Concealment, Blinding of Participants and Personnel, Blinding of Outcome Assessment, Incomplete Outcome Data, Selective Outcome Reporting, and Other Bias. The risk of bias was assessed as low risk of bias, unclear risk of bias, and high risk of bias. Two independent authors (RV and AF) evaluated it, and any discrepancy was resolved by discussing or consulting with the third author (SO).

Statistical analysis

Review Manager (RevMan, version 5.4; Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2020) was used for all statistical analyses. We calculated the mean difference (MD) and its 95% confidence interval to assess continuous variables. To assess potential variations in statistical patterns across trials, the Higgins I2 statistics were employed. The I2 statistic discloses the proportion of variance between studies attributed to heterogeneity rather than chance or sampling discrepancies. An I2 value exceeding 75% signified substantial heterogeneity [21]. A forest plot was generated, visually portraying the effect sizes of each study alongside their corresponding confidence intervals. This visual depiction featured the aggregated pooled effect estimate, presenting a comprehensive graphical overview of the meta-analysis outcomes. *P*-value <0.05 was considered statistically significant.

Results

Literature search and study characteristics

The study selection process is illustrated in Fig. 1 which presents a thorough PRISMA flowchart 2020. Following the preliminary literature search, a total of 1,336 articles were identified. After removing 30 duplicates, the remaining articles underwent a shortlisting process based on the title and abstract removing 1294 articles, followed by a full-text review of 12 articles removing 2 articles for no access and 1 for study design. In total, 9 studies [11–14, 22–26] were deemed appropriate for inclusion in this meta-analysis. The main characteristics of the included studies, such as the no. of the comparator, the mean age of the participants in the study, and the control groups, are presented in Table 1.

Quality assessment

We assessed the quality of the 9 RCTs using the Cochrane Risk of Bias Assessment Tool (ROB2) [20]. Most of the studies were considered to have a moderate to low risk of bias in all 5 assessing criteria as shown in Fig. 2. Publication bias assessment was omitted since the number of included studies is below the required minimum of 10 for analysis.

GRADE assessment

The evidence regarding the impact of music therapy on labor pain and anxiety was generally rated as low quality. However, for the subgroup of patients assessed during the active phase of labor, the evidence supporting the effectiveness of music therapy was rated as moderate.

Outcomes

Effect of music therapy on labor pain

Pooled analysis reveals statistically significant differences in Visual Analog Scale (VAS) scores, consistently favoring music therapy across various stages. Specifically, there is a notable reduction in the intensity of pain in the latent phase (MD: −0.73; 95% CI −1.01; −0.45); during

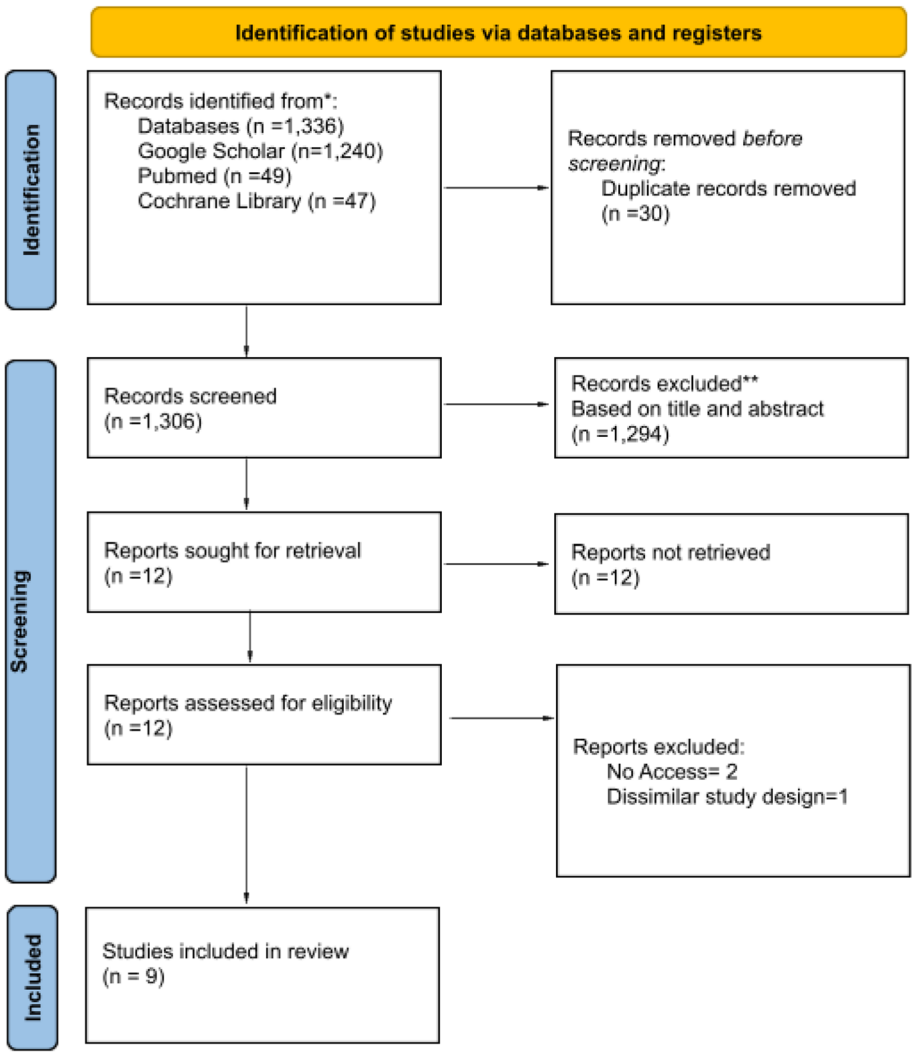


Fig. 1 PRISMA Flow Diagram of the Literature Search Process

the active phase (MD: −0.56; 95% CI −1.06; −0.07) as shown in Fig. 3, and the second stage (MD: −0.69; 95% CI −0.85; −0.54) depicted by Fig. 4. Serap Simavli et al.'s study assessing music therapy's impact on postpartum pain intensity yielded statistically significant results from immediately after childbirth to 24 h postpartum [23], but methodological heterogeneity and bias precluded meta-analysis. Conversely, Kimber et al.'s study found no significant differences in pain intensity with music therapy during labor [13], while Taghinejad, Hamid et al.'s research suggested significantly lower post-intervention pain levels in mothers receiving massage therapy compared to the music therapy group ($p = 0.009$), indicating potential superiority for managing labor pain [25]. F. S. Dehcheshmeh et al.'s study revealed similar effects of music therapy and Hoku ice massage on labor pain [22], yet the lack of specificity regarding the timing and duration of interventions during different labor stages in these studies hinders comprehensive analysis. In separate investigations by Sasitorn Phumdoung et al. and Surucu, Sule Gokyildiz et.al, music therapy demonstrated a significant reduction in perceived pain during the initial hour of labor, with lower Visual Analog Scale (VAS) scores in the experimental group compared to the control group ($p < 0.05$) [11, 14]. However, the diverse methodologies across these studies precluded a meta-analysis.

Effect of music therapy on anxiety

In the context of primiparous patients undergoing labor, four studies [12, 14, 23, 24] investigated anxiety outcomes, and a meta-analysis was conducted on two of these studies [12, 24]. The results revealed non-significant differences associated with the implementation of music therapy, both during the latent phase

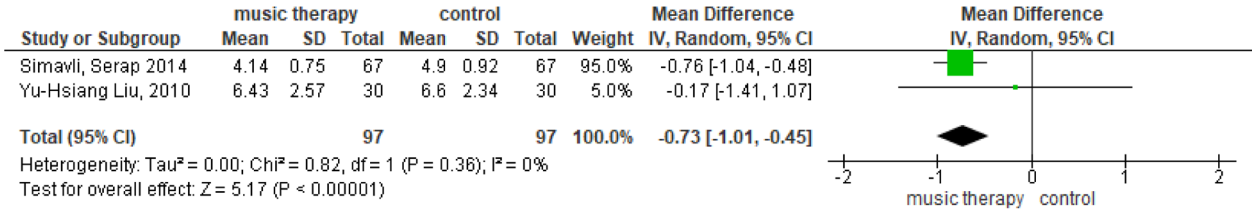
Table 1 Study Characteristics of the Included Studies

First Author and Study Year	Study location	Study design	Groups	No. of Participants (n)	Age Years	Kind of Music	Stage of labor
Phumdoung (2003) [11]	Thailand	Randomized Controlled Clinical Trial	Intervention = Music Control = Conventional therapy	*n* = 55 *n* = 55	20—30	Five types of sedative music	Labor (active phase)
Simavli (2014) [12]	Turkey	Randomized Controlled Clinical Trial	Intervention = Music Control = Conventional therapy	*n* = 77 *n* = 79	25.06 ± 4.33 25.09 ± 4.53	Classical, Turkish artistic music, Turkish folklore, Turkish classical and popular music	Labor (latent phase and active phase) and post-partum
Kimber (2008) [13]	United Kingdom	Randomized Placebo Controlled Clinical Trial (Pilot)	Intervention = massage program with relaxation techniques Placebo = music with relaxation techniques Control = Conventional Therapy	*n* = 30 *n* = 30 *n* = 30	30 28.8 30	Not specified (Women and their birth partner chose their favorite music	Labor (active phase)
Surucu (2017) [14]	Turkey	Randomized Controlled Clinical Trial	Intervention = music in Acemasiran mode Control = Conventional Therapy	*n* = 25 *n* = 25	22.08 ± 2.32 21.04 ± 3.06	classical music, light music, pop music, traditional Chinese music, crystal child music	Labor (active phase)
Dehcheshmeh (2015) [22]	Iran	Prospective Randomized Controlled Clinical Trial	Intervention (Group A) = Music Intervention (Group B) = Hoku Point Ice Massage Control = Conventional Therapy	*n* = 30 *n* = 30 *n* = 30	22.90 ± 2.82 22.30 ± 2.70 21.43 ± 2.58	Sounds of the sea	Labor (active phase)
Simavli (2014) [23]	Turkey	Single-Blinded Randomized Controlled Clinical Trial	Intervention = music (self-selected) Control = Conventional Therapy	*n* = 71 *n* = 70	24.17 ± 3.22 23.39 ± 3.88	classical music, light music, popular music, Turkish art music, Turkish folk music, and Turkish sufi music	Postpartum
Liu (2010) [24]	(Southern) Taiwan	Randomized Controlled Clinical Trial	Intervention = music (self-selected) Control = Conventional Therapy	*n* = 30 *n* = 30	26.6 27.60	Five types of relaxing music: classical, light, popular, crystal children's, and Chinese religious music	Labor (latent phase and active phase)
Taghinejad (2010) [25]	Iran	Randomized Controlled Clinical Trial	Intervention (Group A) = Massage Intervention (Group B) = Music	*n* = 51 *n* = 50	21.3 ± 2.9 21.5 ± 3.1	Soft traditional music (one of five optional types)	Labor (active phase)
Buglione (2020) [26]	Italy	Single-Center Open-Label Parallel Group Randomized Controlled Clinical Trial	Intervention = music (self-selected) Control = Conventional Therapy	*n* = 15 *n* = 15	28.7 ± 3.3 31.1 ± 6.6	Not specified	Labor (latent phase and active phase) and post-partum

Fig. 2 Risk of bias summary. The Cochrane "risk of bias" tool was used for quality assessment. Green for "no risk" and yellow for "unclear risk"

(MD: −0.88; 95% CI −1.86; −2.02) and the active phase of labor (MD: −0.30; 95% CI −1.74; 1.13) as depicted in Fig. 5. Two studies, one by Gokyildiz Surucu S. and another by Simavli S.A., examined anxiety levels in primiparous patients during the postpartum period [14, 23]. Gokyildiz Surucu S. found significant benefits of music therapy in reducing anxiety from one to 24 h postpartum, as measured by a Visual Analog Scale (VAS) [14]. Simavli S.A.'s study revealed that mothers in the music therapy group consistently exhibited statistically significant lower levels of postpartum anxiety compared to the control group at all measured time intervals (1, 4, 8, 16, and 24 h, $p < 0.001$) [23].

Latent phase



Active phase

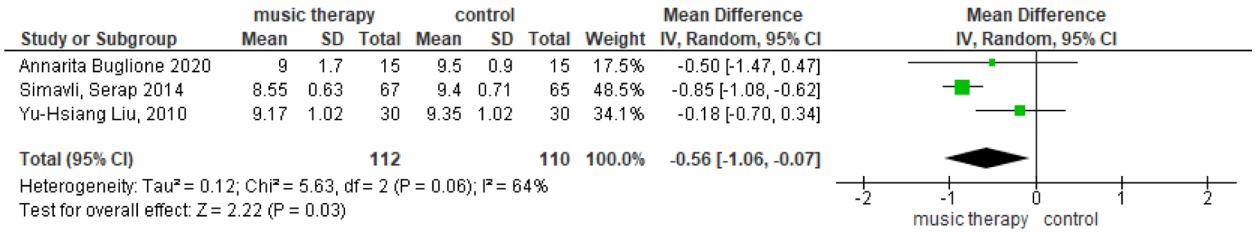


Fig. 3 Forest plot of the effect of music therapy on the intensity of pain during the latent and active phases of labor

Second stage

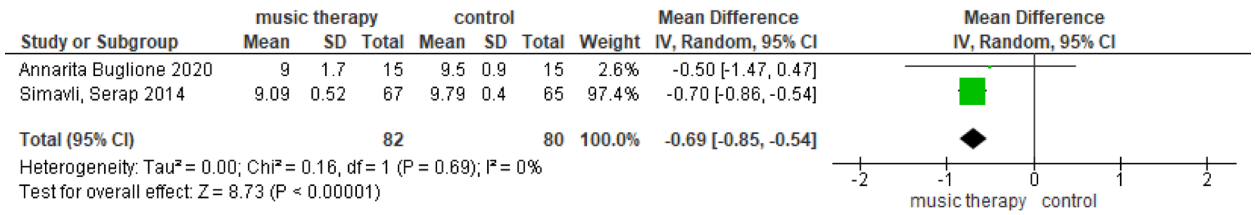


Fig. 4 Forest plot of the effect of music therapy on the intensity of pain during the second stage of labor

Discussion

In this systematic review, the primary objective was to thoroughly assess the impact of music on pain and anxiety throughout the three distinct stages of labor—latent, active, and transitional. The overarching goal was to conduct a comprehensive and impartial analysis of existing evidence, aiming to illuminate the effectiveness and safety of music interventions during each phase. The intention was to provide valuable insights for healthcare practitioners, policymakers, and researchers, empowering them with essential knowledge to make well-informed decisions regarding the integration of music therapy in the management of labor pain and anxiety. Through a meticulous examination of relevant studies, this study aimed to contribute to a deeper understanding of how music can function as a beneficial and safe adjunct, enhancing the overall childbirth experience for women [3].

In our systematic review, music therapy was found to significantly reduce perceived pain during the first hour of labor. In separate investigations conducted by Sasitorn Phumdoung et al. and Surucu, Sule Gokyildiz, the experimental group's Visual Analogue Scale (VAS) scores were lower than those of the control group ($p < 0.05$) [11, 14]. This is also consistent with recent research, where 60 primiparous women participated in a randomized trial conducted by Liu et al. to examine the effects of music on pain and anxiety during labor [24].]. Particularly during the latent phase, the study found significantly decreased levels of pain (MD: − 0.73;

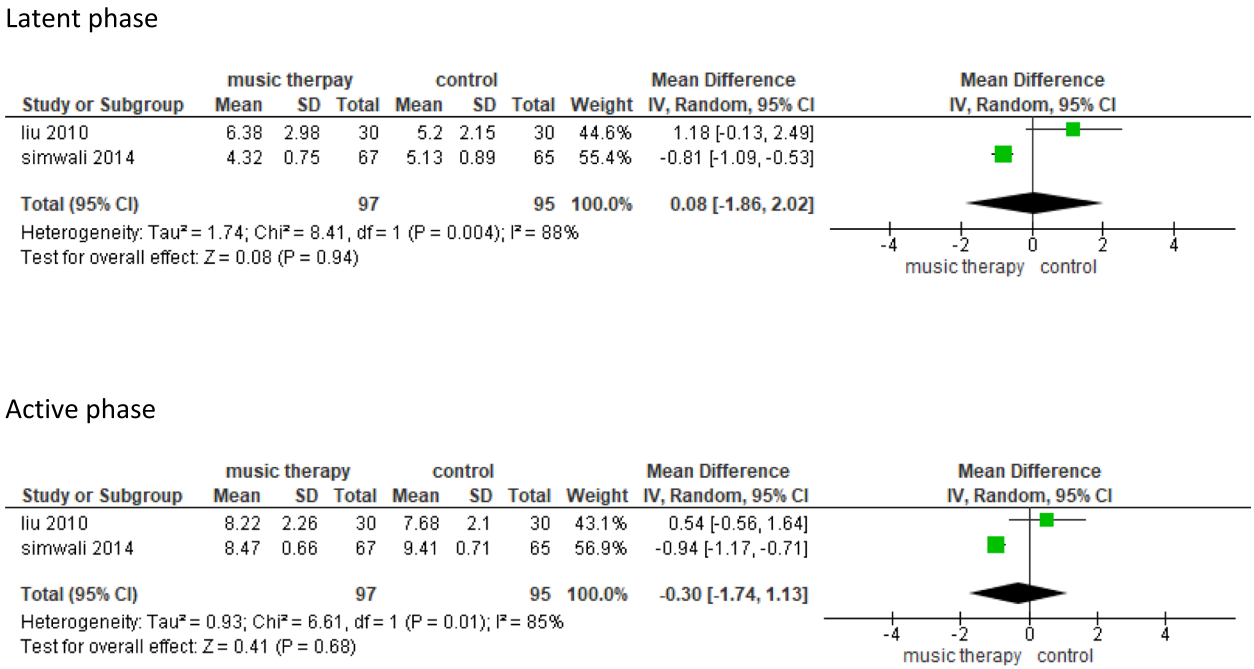


Fig. 5 Forest plot of the effect of music therapy on anxiety during the latent and active phases of labor

95% CI −1.01; −0.45), indicating its potential effectiveness during this stage when contractions are beginning to intensify. On the other hand, Simavli et al.'s study with 156 primiparous women showed that music reduced pain and anxiety both in the active period and during the latent phase [12]. In examining the role of music therapy in alleviating pain during labor, it is imperative to acknowledge varying study outcomes. Kimber et al.'s investigation found no statistically significant differences in pain intensity associated with music therapy during labor [13]. The research conducted by Taghinejad, Hamid et al. presented noteworthy findings, indicating significantly lower post-intervention pain levels among mothers who received massage therapy compared to those in the music therapy group ($p = 0.009$) [25]. This suggests a potential superiority of massage therapy in managing labor pain. Similarly, F. S. Dehcheshmeh et al.'s study reported comparable effects of music therapy and Hoku ice massage on labor pain [22]. The effect of music therapy in reducing pain during the active and second stages of labor although less significant (MD: −0.56 and MD: −0.69, respectively) still underscores its effectiveness throughout labor.

Regarding anxiety management, we did not find a significant association of anxiety relief with music therapy, a marginal difference across the latent and active phases (MD: −0.88; 95% CI −1.86; −2.02 and MD: −0.30; 95% CI −1.74; 1.13, respectively). These findings suggest that music therapy alone may not be sufficient in managing labor-related anxiety during these stages. Our results contradict previous studies. According to a systematic review and meta-analysis by Santiváñez-Acosta R et al. [18] that assessed the effect of music therapy on this variable. They found a significant association in the latent phase (MD: −0.74; 95% CI −1.00; −0.48) and the active phase of labor (MD: −0.76; 95% CI −0.88; −0,64). While the evidence supports the beneficial effects of music therapy, it is considered to be of low quality. However, it should be noted that there are differences in the data, the values were wrong, leading to ambiguous results.

Another systematic review by Lin et al. demonstrated a general reduction in anxiety in the intervention group; however, they did not specify the delivery methods [27].

Labor often entails intense pain, and a notable percentage of women endure severe labor pain even after the administration of analgesic drugs. Fear of pain is one of the most common issues during childbirth, especially with primiparas. It is known that childbirths of fearful women do not go as well as of the women with no fear of childbirth (with higher risk for a longer duration of labor, instrumental delivery (vacuum/forceps), emergency cesarean sections, and poorer childbirth experience) [28–30]. Therefore treating pain, especially with fearful women, is essential. If left untreated, it might expose to poor childbirth experience, which in turn is a risk factor for postpartum depression, posttraumatic stress

disorder after birth, and poor postpartum bonding [29–33]. Given the limitations and side effects of traditional painkillers, there is a growing interest in non-pharmacological methods for pain management during labor [12]. Music therapy has emerged as a promising alternative, showing effectiveness in reducing postoperative pain, cancer pain, procedural pain, chronic pain, and, in initial studies, labor pain [34]. Music not only aids in pain relief but also influences psychological aspects such as relaxation, positively impacting heart rate, respiratory rate, and metabolism [34–40]. Genres such as classical music, slow tempo music and nature sounds have great efficacy in mitigating pain and fostering relaxation [41]. Research by Saanvi Kuppili et al. showed pop and classical music as the most effective genres during music therapy as compared to rock and grunge music [42]. Additionally listening to patients own preferred genre significantly enhances pain tolerance [43]. Riemma, G. et al. reviewed studies on the impact of music on pain and anxiety during clinical procedures. They highlighted that non-pharmacological methods, such as TENS, warming the distension medium, music diffusion, uterine stretching, and low pressure, are effective in reducing both pain and anxiety. The review also emphasized that music helps reduce sympathetic nervous system activation and promotes relaxation, confirming its effectiveness in alleviating pain and anxiety in various clinical settings [44]. Addressing the link between anxiety and increased pain during labor, music therapy offers a holistic approach that extends beyond mere pain relief, garnering popularity as women increasingly opt for nonpharmacological methods during labor. Overall, the accumulated evidence supports the multifaceted benefits of music therapy in enhancing the birthing experience, encompassing pain relief, anxiety reduction, and potential impacts on the duration of labor.

Limitations

It is important to acknowledge the limitations of our meta-analysis lies in the lack of specificity regarding the timing and duration of interventions throughout different stages of labor in the included studies. These factors play a role in impeding a comprehensive analysis of their efficacy and maybe this difference between the findings of our study with those could be attributed to the difference in the selected music type, as well as music duration [5].

Conclusions

This meta-analysis suggests that music therapy is associated with a significant reduction in labor pain intensity during various stages of labor in primigravida women. Despite some variability in study outcomes, the overall evidence supports the integration of music therapy as a non-pharmacological intervention in enhancing the childbirth experience. Further research is warranted to explore its effects on postpartum anxiety and to address potential heterogeneity in study methodologies. Healthcare practitioners can consider music therapy as a valuable adjunct for managing labor pain in primigravida women during vaginal delivery.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12978-025-02023-z.

Supplementary Material 1: Summary of evidence on the effect of music therapy on pain and anxiety management during labor.

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Authors' contributions
Every author: Rayyan Vaid 1, Areeba Fareed 1, Solay Farhat 2, Zeinab Hammoud 2, Muhammad Iqbal Asif 1, Sidhant Ochani 3,Mohammed Hammad Jaber4 equally participated in formulating and designing the study. The literature search and screening, as well as the collection and analysis of data, documenting the figures, interpreting the data, and preparing the manuscript, were all carried out by RV and AF. All authors read and gave consent for the final version of the manuscript.

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Data availability
The dataset supporting the conclusions of this article is included in the article.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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