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Review Article

A Systematic Review and Meta-analysis of the Effects of Music Therapy on Postpartum Anxiety and Pain Levels

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Abstract

Introduction: Postpartum anxiety may be associated with depression, postpartum blues, and maternal mood disorders. This systematic review investigated the effects of music therapy on postpartum anxiety and pain levels.

Methods: English databases including Cochrane, Medline, Embase, Web of Science, Scopus, and PubMed and Persian databases including Scientific Information Database (SID) and the Iranian Registry of Clinical Trials (IRCT) were searched. The data were analyzed in RevMan 5.3 and reported as forest plots. The present study was conducted on postpartum women (i.e., the participants). All randomized controlled trials comparing the effects of music (i.e., the intervention) and placebo or routine care (i.e., the control) on postpartum anxiety and pain (i.e., the outcome) were included in the study.

Results: Out of a total of 60 retrieved articles, four eligible articles were selected and entered the meta-analysis process. According to the results, anxiety (MD=-0.68, 95% CI=-1.90 to -0.54, $P<0.001$) and pain (MD=-1.85, 95% CI=-3.96 to 0.26, $P<0.001$) levels of patients in the music therapy group were reduced more significantly than those in the control group.

Conclusion: The results showed that music therapy can significantly reduce both postpartum anxiety and pain scores. However, due to the high heterogeneity of the studies, more randomized trials using a standard tool such as the Consolidated Standards of Reporting Trials (CONSORT) statement are needed.

Introduction

Postpartum is a temporally unique, and yet an overwhelming and stressful period. This period is an important experience with some short and long-term effects on women's lives, in which accurate diagnosis and treatment of problems is essential. Anxiety is one of the most common postpartum psychological problems with a prevalence rate of 13%-40%.[1] Early maternal mental health problems are associated with detrimental effects on infant development. Postpartum anxiety may have a potential impact on mothers' adjustment to their maternal role. Maternal anxiety may also have adverse consequences such as postpartum depression, behavioral problems in infants, parents' perceived inability to effectively play their parenting role and reduced maternal responsiveness or sensitivity.[2-4] The relationship of postpartum anxiety with reduced maternal attachment,[5] infant feeding disorder,[6] infant mood and cognitive and social development of children[7] has been proved in different studies. Anxiety and pain during childbirth can have extremely negative effects on mothers and infants, reducing mothers' ability to breastfeed their babies.[8,9] Labor pain can also be associated with postpartum blues and mood disorders.[10] Despite the development of effective treatment methods, postpartum mental disorders are often not diagnosed or treated properly.[11,12] Pharmacotherapy and psychotherapy are common strategies adopted for the treatment of anxiety. Pharmacotherapy is, however, associated with the risk of drug dependence, various side effects, drug interactions, and transmission of drugs to infants through breast milk. Music is used as a therapeutic intervention in the advanced human civilization in the 20th century.[13] Listening to beautiful music can enhance labor experience, and due to the effects of this inexpensive, easy and effective method on perceived anxiety and pain levels, it can also minimize the dose of relevant painkillers.[12,14] Music has been shown to significantly reduce stress and aid recovery from critical diseases or surgeries.[8,9] Besides its direct effects on emotions, behaviors and neurotransmitter systems, music may also affect the steroid-producing endocrine glands

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and gonads.[15]

Considering the significant negative consequences of postpartum anxiety and the beneficial effects of music therapy (i.e. the intervention) on postpartum anxiety and pain (i.e. the outcome), this meta-analysis investigated the effects of music therapy on anxiety and pain levels in postpartum women (i.e. the participants).

Materials and Methods

First, the Cochrane Database of Systematic Reviews (CDSR) was searched and no review study was found to investigate the effects of music therapy on postpartum anxiety and pain level. The English databases of Cochrane, Medline, Embase, Web of Science, Scopus and PubMed and the Persian databases of Scientific Information Database (SID) and the Iranian Registry of Clinical Trials (IRCT) were then searched until March 2019 without any time limitation. Keywords of postpartum, postnatal, after childbirth, postnatal, after delivery, after birth, puerperium, puerperal, anxiety, randomized controlled trial, randomized trial, randomized clinical trial and randomized controlled, were used. All the obtained titles and abstracts were separately reviewed by two persons. The full texts of the articles were reviewed, if their titles and abstracts provided inadequate information. Any uncertainty on the suitability of articles for inclusion in this study was resolved through consultation with a third party.

The details of the strategy used for searching the PubMed database are: 1. anxiety; 2. after childbirth OR puerperal OR puerperium OR after birth OR after delivery OR post birth OR postpartum OR postnatal; 3. randomized controlled OR randomized controlled trial OR randomized trial OR randomized clinical trial; 4. #1 AND #2 AND #3.

Other databases were searched, using the same search strategy, and the second and third authors of the present article extracted the data, using a data collection form. (Table 1) Possible disagreements were settled with the help of the first author. The selected articles were assessed in terms of the risk of bias by two independent authors, (i.e. the first and second authors) using the *Cochrane Handbook for Systematic Reviews of Interventions*. Possible disagreements were settled with the help of a third person. (Table 2) The data were analyzed with the help of Review Manager (RevMan 5.3). In all the selected articles, postpartum anxiety and pain were considered as continuous quantitative variables; therefore, the mean and standard deviation of their post-intervention scores were extracted. The heterogeneity of the studies was assessed using I-squared (I^2) and P value. $I^2 > 75\%$ and $P < 0.05$ indicate high heterogeneity. Random effects model was used instead of the fixed effects model if $I^2 > 25\%$.

The current study was conducted on postpartum women (i.e. the participants). All randomized controlled trials comparing the effects of music (i.e. the intervention) and placebo or routine care (i.e. the control) on postpartum anxiety and pain (i.e. the outcome) between 1980 and 2019 were included in the study. The primary and secondary outcomes were postpartum anxiety and pain severity, respectively.

A total of 60 relevant articles were found, out of which 20 titles, 23 abstracts and 17 full texts were selected. Twenty-five duplicated articles were detected with the help of EndNote. Accordingly, the remaining 35 full- text articles were assessed for eligibility. Twenty-two of the studies were irrelevant, and 8 articles did not meet the inclusion criteria. Of 5 remaining articles, 4 eligible articles were selected and entered the meta-analysis process. (Figure 1)

The quality of the selected articles was assessed using the Cochrane collaboration's tool for assessing Risk of Bias in randomized trials. The results are presented in Table 2

Table 1. Characteristics of included studies

Authors/(year)	Study design	Intervention	Comparison	Number of patients in both group	Method of diagnosis	Results
Ebneshahidi & Mohseni[16] (2008)	RCT	Soft open-air headphones and a tape player (WM-EX 190 Cassette Walkman; WM-EX 190 Cassette Walkman, Sony, San Diego	The control group wore headphones with no music administered.	Intervention group (n = 38) Control group (n = 39)	Pain: VAS Anxiety: VAS	There were significant differences between 2 groups according to pain score ($P < 0.05$). Anxiety score had not difference between 2 groups.
Nikandish et al.,[9] (2007)	RCT	Spanish guitar	White music	Intervention group (n = 50) Control group (n = 50)	Pain: VAS Anxiety: VAS	There were not significant differences between 2 groups according to pain score ($P > 0.05$).
Simavli et al.,[8] (2014)	RCT	Self-selected music	They did not receive any music or intervention.	Intervention group (n = 71) Control group (n = 70)	Pain: VAS Anxiety: VAS	Regarding to pain and anxiety score there were significant differences between 2 groups ($P < 0.05$)
Tseng et al.,[13] (2010)	RCT	Music therapy	They did not receive any music or intervention.	Intervention group (n = 37) Control group (n = 40)	The perceived stress scale and state anxiety inventory	There were not significant differences between 2 groups according to anxiety score ($P > 0.05$).

Abbreviations: VAS, Visual analogue scale; RCT, Randomized controlled trial.

Table 2. Risk of bias of included studies

Ebneshahidi & Mohseni[16] (2008)		
Risk of bias		
Bias	**Authors' judgment**	**Support for judgment**
Random sequence generation (selection bias)	Unclear risk	There was no identification about participants selection
Allocation concealment (selection bias)	High risk	There was no randomization in selection of participants
Blinding of participants and personnel (performance bias)	High risk	There was no blinding
Blinding of outcome assessor (detection bias)	Low risk	Nurse was unaware of assignments
Incomplete outcome data (attrition bias)	Low risk	None of the 77 enrolled women was withdrawn from the study for any reason
Selective reporting (Reporting bias)	Low risk	All the pre-specified outcomes in the method section were addressed adequately
Nikandish et al.,[9] (2007)		
Risk of bias		
Bias	**Authors' judgment**	**Support for judgment**
Random sequence generation (selection bias)	Low risk	Patients were randomly allocated into two groups of fifty using computer generated random numbers.
Allocation concealment (selection bias)	Unclear risk	Material and method section was not clear
Blinding of participants and personnel (performance bias)	Low risk	The patient, anesthetists, surgeon and nurses were blinded to the CD selection.
Blinding of outcome assessment (detection bias)	Low risk	Postoperatively patients were evaluated by a research nurse, blinded to the study groups.
Incomplete outcome data (attrition bias)	Low risk	None of the 100 enrolled women was withdrawn from the study for any reason.
Selective reporting (reporting bias)	Low risk	All the pre-specified outcomes in the method section were addressed adequately
Simavli et al.,[8] (2014)		
Risk of bias		
Bias	**Authors' judgment**	**Support for judgment**
Random sequence generation (Selection bias)	Low risk	Randomization was completed using a computerized minimization program to assign participant women to either music group or control group.
Allocation concealment (selection bias)	Unclear risk	The material and method section was not clear
Blinding of participants and personnel (performance bias)	High risk	There was no blinding
Blinding of outcome assessment (detection bias)	Low risk	Patients were asked by a blinded member of the medical staff to mark their pain to eliminate possible hesitancy to report pain scores. (Blinding of personnel)
Incomplete outcome data (attrition bias)	Low risk	None of the 161 enrolled women was withdrawn from the study for any reason
Selective reporting (reporting bias)	Low risk	All the pre-specified outcomes in the method section were addressed adequately
Tseng et al.,[13] (2010)		
Risk of bias		
Bias	**Authors' judgment**	**Support for judgment**
Random sequence generation (selection bias)	High risk	There was no randomization in selection of participants
Allocation concealment (selection bias)	Low risk	Women were assigned via lot to either the experimental or control group
Blinding of participants and personnel (performance bias)	High risk	There was no blinding
Blinding of outcome assessment (detection bias)	High risk	There was no blinding
Incomplete outcome data (attrition bias)	Low risk	None of the 77 enrolled women was withdrawn from the study for any reason
Selective reporting (reporting bias)	Low risk	All the pre-specified outcomes in the method section were addressed adequately

and Figures 2 and 3. Only one article was determined as low risk in terms of all the assessed aspects. About 50% of the articles showed a low risk of random sequence generation, and only 25% of the articles had a low risk of random allocation and blinding of the participants. This study investigated the effect of music on postpartum

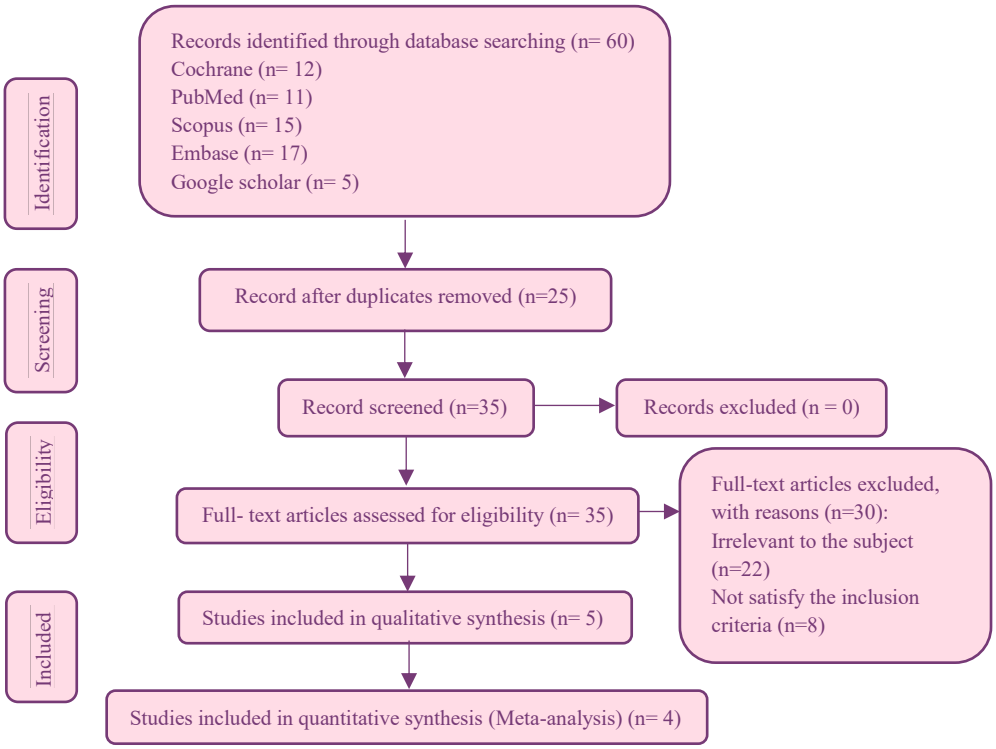

Figure 1. PRISMA flow diagram of article selection progress

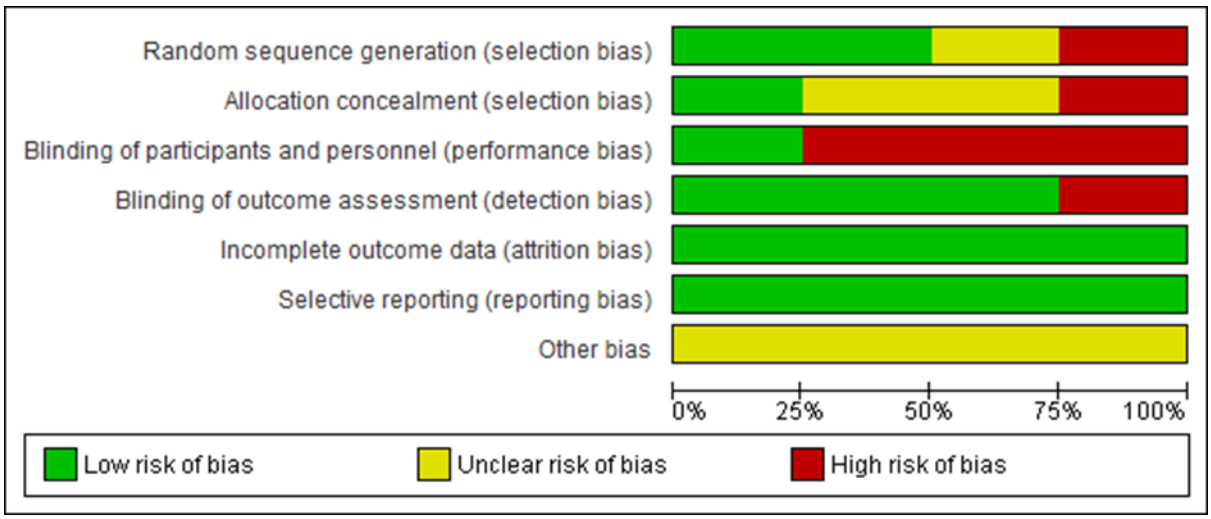

Figure 2. Risk of bias summary: review authors' judgments about each risk of bias item for each included study

anxiety and pain.

Results

The effects of music therapy (intervention group) and routine care (control group) on postpartum anxiety (0.5-8 hours and 2 weeks after delivery).

Ebneshahidi and Mohseni investigated the effect of music therapy on anxiety levels in 80 women aged 18-36 years 0.5 hours after delivery and found no significant difference between the intervention and control groups.[16] Nikandish et al., also studied the effect of music on anxiety levels 0.5 hours after delivery and found no significant difference between the intervention and control groups in terms of anxiety levels.[9] Simvali et al., conducted a study on 141 women, investigating the effect of music on their anxiety levels 0.5 hours after delivery. They found that music significantly reduced postpartum anxiety.[8]

The final meta-analysis of these articles showed a significant reduction in the anxiety levels of patients in the music therapy group (159 participants) compared to those in the control group (159 participants) (MD = -0.96, 95% CI = -2.26 to 0.34, $P < 0.001$). (Figure 4) Tseng et al.,

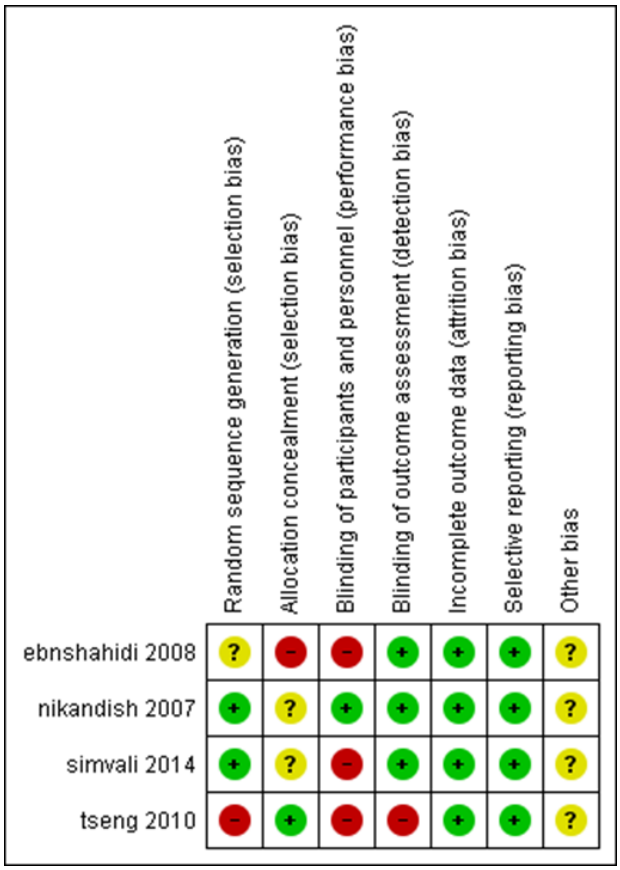

Figure 3. Risk of bias graph: review authors' judgments about each risk of bias item presented as percentages across all included studies

investigated the effect of music on anxiety levels in 77 women aged 15-49 years two weeks after delivery and found no significant difference between the intervention and control groups in terms of anxiety levels.[13]

The effect of music therapy (intervention group) and routine care (control group) on postpartum pain (0.5-8 hours after delivery)

Ebneshahidi and Mohseni investigated the effect of music therapy on pain levels in 80 women aged 18-36 years 0.5 hours after delivery. They found no significant difference between the intervention and control groups in terms of pain level.[16] Nikandish et al., investigated the effect of music on pain levels 0.5 hours after delivery and found a significant reduction in the pain levels perceived by the participants.[9] Simavli et al., conducted a study on 141 women to investigate the effect of music on their pain levels 0.5 hours after delivery, and found that music significantly reduces postpartum pain levels.[8]

The final meta-analysis of these articles showed a significant reduction in the pain level 0.5 hours after delivery in the music therapy group (159 participants) compared to the control group (159 participants) (MD = -1.85, 95% CI = -3.96 to 0.26, $P < 0.001$). (Figure 5)

In a clinical trial conducted by Sen et al., the final pain scores and the need for analgesics were significantly lower in the intervention (music therapy) group than in the control group. This study, however, was excluded from the meta-analysis process, because we could not access the mean and standard deviation of the study by Sen et al.[17]

Table 3 shows the results obtained from the evidence quality assessment process. Based on the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach, the evidence related to the positive effect of music therapy on postpartum pain and anxiety levels is poor in terms of quality and the results are not fully reliable.

Discussion

This study aimed at investigating the effect of music therapy on postpartum pain and anxiety levels. The meta-analysis results showed a statistically significant difference between the intervention and control groups in terms of final pain and anxiety scores.

The mechanism by which music affects pain can be explained by the gate control theory. Feeling of pain is reduced by "gates" that have numerous points for filtration, separation, and modulation of harmful inputs to the central nervous system (CNS). The gates are affected by emotional and cognitive factors through inhibitory systems.[18] This effect may occur through distraction,

Table 3. Quality assessment of randomized trials on music therapy

Quality assessment								
No. of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Publication bias**	**MD (SD)**	**Certainty**
Music therapy versus white music or no music on anxiety 0.5 to 8 hours								
3	Randomized trials	No serious risk of bias	Very serious inconsistency*	No serious indirectness	Serious imprecision[a]	Undetected	-1.31 (-1.53, -1.09)	Very low
Music therapy versus no music on anxiety 2 weeks								
1	Randomized trials	Serious risk	No Serious inconsistency	No serious indirectness	Very serious imprecision[b]	Undetected	0.84(-1.59, 3.27)	Very low
Music therapy versus no music on pain								
3	Randomized trials	No serious risk of bias	Very serious inconsistency*	No serious indirectness	Serious imprecision[a]	Undetected	-1.50(-1.70, -1.30)	Very low

* $I^2 = 92\%$; [a] Total number of participants is less than 400; [b] Total number of participants is less than 400 and wide CI.

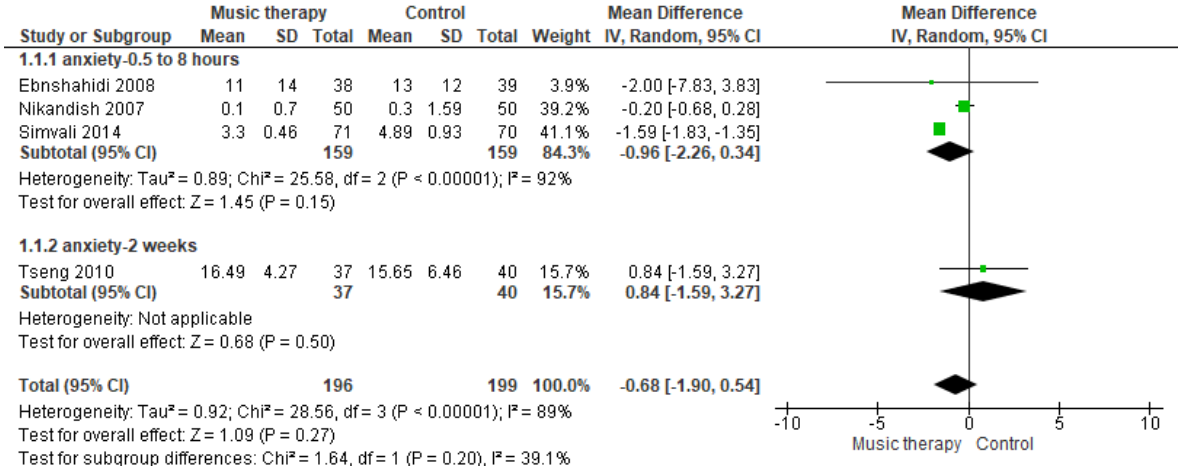

Figure 4. Forest plot of included study- effect of music therapy compared with control group on anxiety

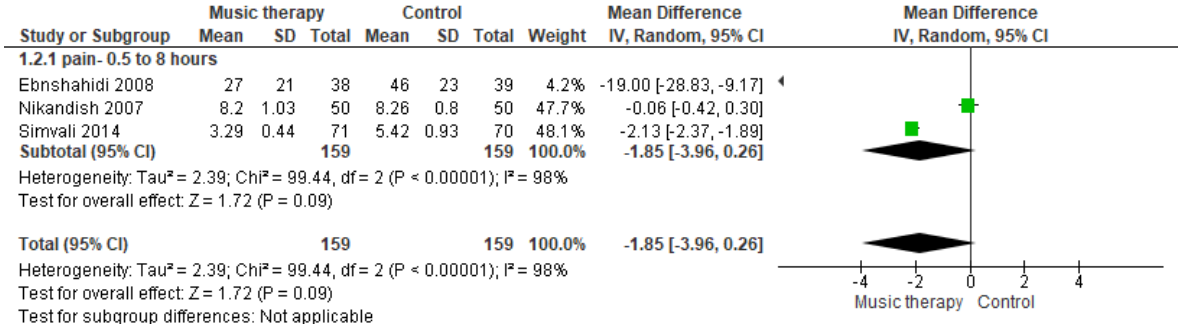

Figure 5. Forest plot of included study- effect of music therapy compared with control group on pain

tension reduction, and sympathetic modulation. Music-induced distraction results in thalamus-mediated selective attention, leading prefrontal cortex to focus more on sound than pain, thereby reducing pain. Relaxing music decreases muscular and mental tension and thus reduces sympathetic stimulation in the hypothalamus, which activates endogenous opiates in the CNS. This reduces the propagation of pain impulses, modulates sensory receptors, and finally reduces pain.[19-23]

Listening to music is associated with reduced subjective stress levels. Music also affects physiological markers of stress. A model of music-evoked emotions is considered in which music initially affects the CNS; then influences the activities of the endocrine, autonomic, and immune systems, and finally results in a great amount of emotional experience. The stress-reducing effects of music may be due to its impact on hippocampal activity, which in turn affects the hypothalamic-pituitary-adrenal (HPA) axis activity.[24] According to research, listening to music results in down-regulation of the HPA axis activity, leading to reduced levels of cortisol.[25] The autonomic nervous system (ANS) is another important stress response system. Listening to music is also associated with down-regulation of the ANS activity, resulting in increased blood pressure and decreased heart rate.[26]

Studies have mainly focused on postpartum depression in recent decades, while postpartum anxiety has been overlooked. According to Spence et al., poor childhood outcomes are associated with higher levels of postpartum anxiety.[27] Prenoveau et al., investigated the relationship of maternal postnatal anxiety with emotional negativity and behavioral problems of 2-year-old children and recommended interventions to prevent the adverse effects of postpartum psychological problems on children.[28] The use of music therapy for the treatment or control of various diseases has been extensively studied. [29-33] A review study investigated the effect of music therapy on multiple sclerosis (MS) patients and came to the conclusion that music therapy significantly reduced the anxiety and depression levels of MS patients.[29] A review study analyzed 42 clinical trials associated with the use of music therapy in pre-operative settings. The results pointed to the role of music therapy in reduction of anxiety and pain levels in surgical patients in more than half of the reviewed articles. The authors recommended the use of music therapy as an inexpensive and non-invasive intervention.[30] In another review study, the authors examined 5 articles to investigate the effect of music therapy on pregnant women and found that this therapeutic method is able to significantly reduce maternal anxiety.[31] Another study of a systematic review shows that music therapy is increasingly being used as an intervention for stress reduction in both medical

and mental healthcare settings.[32] As such, the result of one study have shown that music therapy is effective for depression.[33]

The quality of the selected articles was poor, because bias was not fully controlled in these studies. Performance bias and allocation concealment were rated as high risk and/or unclear in three-quarters of the reviewed articles. Different types of music therapy methods and pain and anxiety measurement tools were used in the selected articles. Some clinical trials may have not been included in this study due to some limitations such as language restrictions. Moreover, only a few studies had examined the effect of music therapy on women after natural childbirth; therefore, cesarean section cases were also included.

On the other hand, all the selected articles were low risk in terms of bias reporting, and a negligible loss to follow-up bias observed in all studies was among the strengths of this study.

Conclusion

According to the results, music therapy is able to significantly reduce postpartum anxiety and pain scores. However, more randomized trials must be performed and assessed, using a standard instrument such as the CONSORT statement due to the high heterogeneity of the reviewed studies. Finally, further studies are required on the effect of music therapy on pain and anxiety levels to detect publication bias in these studies using a funnel plot.

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Not applicable.

Ethical Issues

None to be declared.

Conflict of Interest

The authors declare that they have no competing interests.

Authors' Contributions

SH, RH, MR, KHH: Contributed to the design of the article; SH, RH, KHH: Contributed to the implementation and analysis plan; SH, KHH: Has written the first draft of this article and all authors have critically read the text and contributed with inputs and revisions, and all authors read and approved the final manuscript.

Research Highlights

What is the current knowledge?

Postpartum anxiety may be associated with depression, postpartum blues and maternal mood disorders.

What is new here?

The meta-analysis results showed a statistically significant difference between the intervention and control groups in terms of final pain and anxiety scores.

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