

Influence Of Music Therapy on Milk Ejection in Women with Postpartum Depression– A Systematic Review

Dr. Tanvi Ashok Ghuge¹, Dr. Aryan Yogesh Belwalkar²,
Dr. Gauri Balasaheb Rahane³, Dr. Priti Babasaheb Jaware⁴,
Dr. Mansi Ashok Pagar⁵

¹Assistance Proffesor, Department of pediatrics physiotherapy,
Dr. A PJ Abdual Kalam College of Physiotherapy

²Under gradution, Department of pediatrics physiotherapy,
Dr. A PJ Abdual Kalam College of Physiotherapy

^{3,4,5}Post graduataion, Department of pediatrics physiotherapy,
Dr. A PJ Abdual Kalam College of Physiotherapy

Abstract

Background: Postpartum depression (PPD) is associated with increased maternal stress, anxiety, hormonal disturbances, and impaired mother–infant bonding, which may negatively affect breastfeeding and milk ejection. Music therapy has been suggested as a non-invasive intervention that may reduce maternal stress and anxiety and facilitate oxytocin-mediated milk ejection.

Aim: To determine the influence of music therapy on milk ejection and lactation outcomes in women with postpartum depression.

Methods: A comprehensive literature search was conducted using PubMed, Scopus, Google Scholar, and the Cochrane Library. Studies published in peer-reviewed journals, including randomized controlled trials, observational studies, and experimental studies, were considered. Studies investigating music therapy or music-based relaxation interventions and their effects on lactation, milk ejection, oxytocin release, breastfeeding outcomes, or maternal psychological responses were included. Studies without original data, non-English articles, studies evaluating interventions other than music therapy, and articles without measurable lactation-related outcomes were excluded. Data regarding intervention type, frequency, duration, and outcomes were extracted and synthesized narratively.

Results: The reviewed studies demonstrated that music-based interventions, including passive music listening, lullabies, flute music, and audio-assisted relaxation, were associated with reductions in maternal stress and anxiety and improvements in breast milk production or milk ejection. Interventions commonly ranged from 11 to 30 minutes and were administered once to three times daily. Some studies reported increased milk output and reduced cortisol levels following music intervention, suggesting that relaxation and stress reduction may facilitate oxytocin release and the milk ejection reflex. However, variations in

music type, intervention duration, frequency, and participant characteristics limited direct comparison between studies.

Conclusion: Music therapy appears to be a promising complementary intervention for improving lactation and supporting maternal psychological well-being during the postpartum period. Its potential benefits may be mediated by stress reduction, relaxation, and enhanced oxytocin activity, thereby facilitating milk ejection. Further high-quality randomized controlled trials specifically involving women with postpartum depression are required to establish the effectiveness, optimal type, frequency, and duration of music therapy for improving lactation outcomes.

Keywords: Music Therapy, Postpartum Depression, Milk Ejection, Breast Milk Production, Oxytocin, Lactation, Maternal Stress, Breastfeeding.

1. Introduction

The postpartum period is an important phase of transition in a woman's life and is accompanied by substantial physiological, psychological, and social changes. During this period, mothers experience hormonal fluctuations, physical recovery from childbirth, changes in sleep patterns, and new responsibilities associated with infant care. Although attention in hospital settings is often primarily directed toward the newborn, the psychological well-being of the mother is equally important because maternal health can directly influence breastfeeding, mother–infant interaction, bonding, and overall infant development. These challenges may become more pronounced when the newborn is premature, critically ill, or admitted to a neonatal intensive care unit (NICU), where mothers may experience fear, uncertainty, anxiety, and prolonged separation from their infants. [1,4]

Postpartum depression (PPD) is one of the major psychological problems occurring during the postpartum period. It may present with persistent sadness, anxiety, emotional exhaustion, loss of interest, sleep disturbances, reduced self-confidence, and difficulties in maternal–infant interaction. Maternal psychological distress can interfere with the establishment and continuation of breastfeeding. Mothers of premature or hospitalized neonates may be particularly vulnerable because they frequently experience increased stress related to the infant's medical condition, hospitalization, feeding difficulties, and uncertainty regarding recovery. Such psychological stress may negatively influence breastfeeding practices and maternal milk expression. [1,4]

Breastfeeding is influenced by a complex interaction between maternal psychological status, hormonal regulation, infant suckling, and breast stimulation. Two major hormones involved in lactation are prolactin and oxytocin. Prolactin is primarily responsible for milk synthesis, whereas oxytocin plays a major role in the milk-ejection or let-down reflex. During breastfeeding or breast milk expression, sensory stimulation of the nipple activates neural pathways that ultimately promote oxytocin release. Oxytocin causes contraction of the myoepithelial cells surrounding the mammary alveoli, resulting in movement of milk toward the nipple and facilitating milk ejection. Therefore, adequate oxytocin activity is essential for effective milk transfer and successful breastfeeding.

Maternal stress and anxiety may interfere with the milk-ejection process. Psychological stress can increase sympathetic nervous system activity and may inhibit or delay the oxytocin-mediated milk-ejection reflex.

Consequently, a mother may experience difficulty with milk expression even when milk synthesis is adequate. This creates a potential cycle in which stress contributes to poor milk ejection, reduced milk output or ineffective breastfeeding, and subsequent maternal anxiety regarding inadequate milk supply. In mothers of premature infants, this problem may be particularly important because regular milk expression is often required while the infant is unable to breastfeed directly. [1,4]

The psychological condition of the mother may therefore be an important modifiable factor in supporting lactation. Various non-pharmacological interventions have been investigated to reduce maternal stress and improve breastfeeding outcomes. These include maternal education, relaxation techniques, mother–infant bonding interventions, massage, guided visualization, individualized developmental care, and music-based interventions. Among these approaches, music therapy has attracted attention because it is non-invasive, relatively inexpensive, easy to administer, and can be incorporated into hospital and home-based care. [3,5,6]

Music has the potential to influence emotional, physiological, and behavioral responses. Listening to calming or personally meaningful music may promote relaxation, reduce anxiety, improve mood, and decrease perceived stress. These effects may be particularly valuable during breastfeeding or breast milk expression, when maternal relaxation may facilitate the physiological processes associated with milk ejection. Music may therefore act indirectly on lactation by reducing psychological stress and promoting a more favorable physiological state for oxytocin release.

Several studies have investigated the effects of music therapy on breast milk production and maternal psychological outcomes. Varişoğlu and Güngör Satılmış conducted a randomized controlled study among mothers of premature newborns in the NICU and reported that music listening was associated with reduced anxiety and cortisol levels and supported breast milk production. These findings suggest that music may provide relaxation to mothers and potentially facilitate lactation through reduction of maternal stress. [1]

The characteristics of the music intervention may also influence its effectiveness. Factors such as type of music, duration, frequency, timing, and individual preference may determine the degree of relaxation experienced by the mother. Putri et al. examined the effectiveness of music therapy in relation to frequency, type, and duration and highlighted the importance of considering these characteristics when developing music-based interventions for improving breast milk production. [2] This suggests that a standardized intervention may not necessarily be appropriate for every mother and that individualized music selection may improve acceptability and therapeutic response.

Lullaby and culturally familiar music have also been investigated in mothers of premature infants. SefidHaji et al. examined the effect of lullaby music among mothers of premature infants admitted to the NICU and evaluated breast milk volume and milk composition. Such interventions are particularly relevant in the NICU because mothers may experience considerable emotional distress while being separated from their infants. Music may provide a familiar and emotionally supportive stimulus during breast milk expression and potentially improve maternal relaxation. [4]

Music interventions have also been examined during the immediate postpartum period. Chawanpaiboon et al. investigated the effect of music during cesarean delivery and the early postpartum period on breastfeeding outcomes. Their findings contribute to the growing evidence that music may be useful around the time of childbirth and during the early establishment of breastfeeding. [5] Early intervention

may be important because the immediate postpartum period is critical for initiation of breastfeeding and establishment of effective lactation.

In addition to music alone, relaxation-based interventions have been investigated as strategies to improve lactation and maternal mental health. The EXPRESS trial evaluated a lactation-specific relaxation and visualization intervention among mothers of very preterm infants. The intervention was designed to provide mothers with a structured relaxation approach during the period of breast milk expression and to assess both lactation and psychological outcomes. [3,6] These studies support the concept that psychological relaxation may be an important component of interventions aimed at improving breastfeeding outcomes.

The possible mechanism by which music therapy may influence milk ejection can therefore be understood through the interaction between psychological relaxation and neuroendocrine regulation. Music may reduce perceived stress and anxiety, decrease physiological arousal, and promote relaxation. Reduced stress may facilitate oxytocin release, which in turn supports contraction of the myoepithelial cells and milk ejection. Thus, music therapy may not directly increase milk production in all mothers but may improve the conditions required for effective milk ejection and milk expression.

However, the existing literature has several limitations. Studies differ considerably in participant characteristics, clinical settings, music selection, duration and frequency of intervention, and outcome measures. Some studies have focused on mothers of premature infants or mothers of hospitalized neonates rather than women with clinically diagnosed postpartum depression. Furthermore, studies have assessed different outcomes, including breast milk volume, milk composition, cortisol, anxiety, stress, breastfeeding rates, and maternal mental health. These differences make it difficult to determine the specific effect of music therapy on milk ejection in women with PPD.

Another important gap is the limited evidence directly examining the relationship between postpartum depression, music therapy, oxytocin release, and milk-ejection efficiency. Although several studies suggest that music and relaxation interventions may improve maternal psychological status and breast milk production, the specific physiological pathway linking music therapy with milk ejection requires further investigation. Objective measurements of milk volume, oxytocin levels, cortisol levels, breastfeeding duration, and validated measures of depression and anxiety may provide a clearer understanding of this relationship.

Therefore, there is a need to systematically evaluate the available evidence regarding the influence of music therapy on lactation and milk ejection in postpartum women experiencing depression. Understanding the potential role of music therapy may provide clinicians with an accessible complementary intervention that can be integrated into postpartum, maternity, and NICU care. Such an approach may simultaneously address maternal psychological well-being and breastfeeding-related outcomes.

The present systematic review therefore focuses on the influence of music therapy on milk ejection in women with postpartum depression. It aims to examine the existing literature regarding the effects of music-based interventions on breast milk production, milk-ejection efficiency, oxytocin-related mechanisms, breastfeeding outcomes, and maternal psychological responses. The review may also help

identify gaps in the existing evidence and provide direction for future research regarding the optimal type, frequency, duration, and individualized selection of music therapy for postpartum women.

AIM:

To determine the Influence of Music Therapy on Milk Ejection in Women with Postpartum Depression

OBJECTIVES:

To analyze, assess and investigate the existing literatures of music therapy approach on milk ejection in improving lactation outcomes by facilitating oxytocin release and alleviating stress in women experiencing postpartum depression

METHODOLOGY

A comprehensive literature search was conducted across databases including PubMed, Scopus, Google Scholar, and the Cochrane Library. Studies included in this review comprised randomized controlled trials, experimental studies, and case-control studies investigating the effects of music therapy on lactation in women diagnosed with PPD. Primary outcomes analyzed were oxytocin levels, milk ejection efficiency, breastfeeding duration, and maternal psychological responses. Data were extracted, assessed for quality, and synthesized to provide an overview of the relationship between music therapy and lactation.

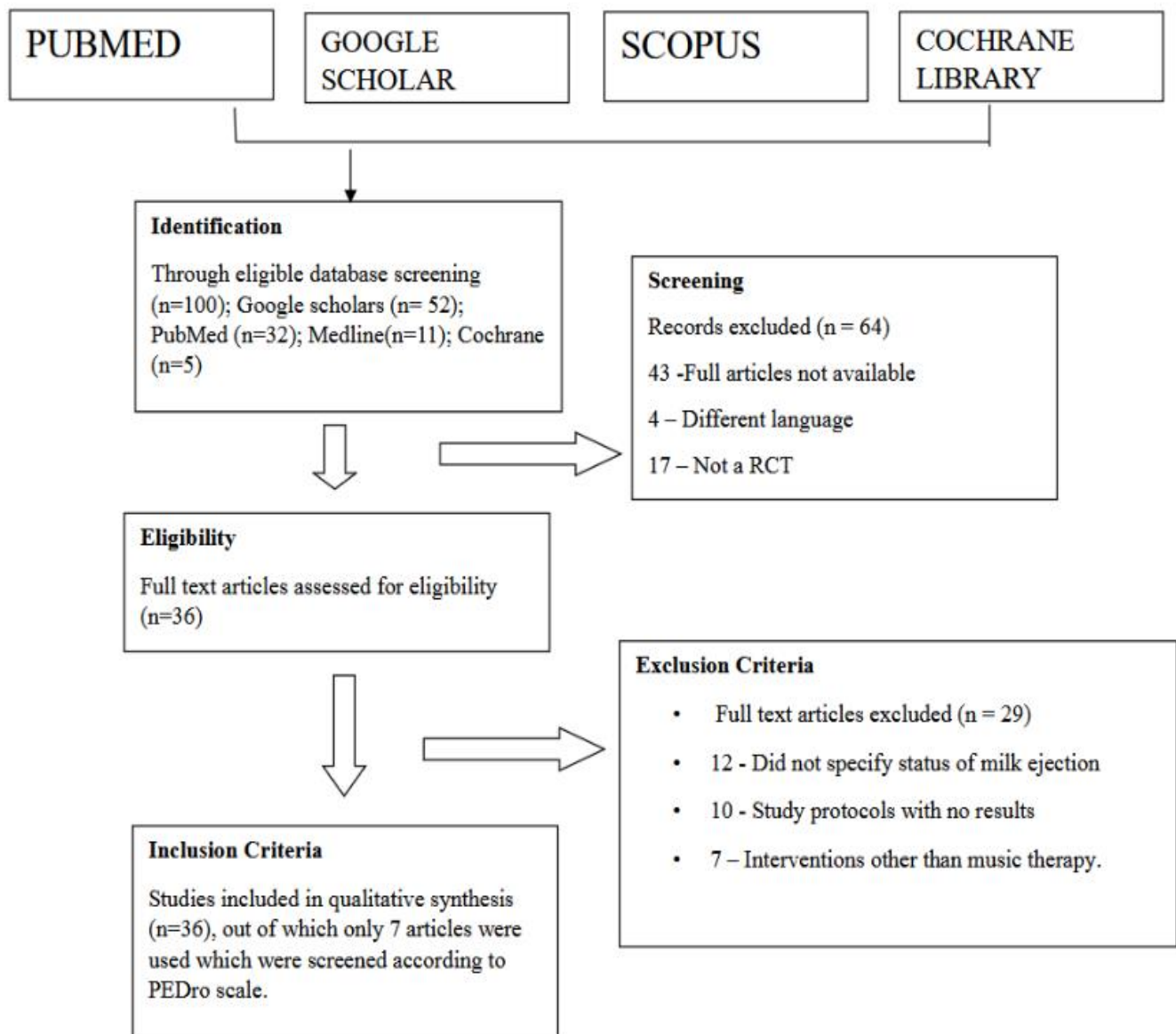
SELECTION CRITERIA.**Inclusion Criteria:**

- Studies involving postpartum women diagnosed with depression and focusing on the effects of music therapy on lactation, milk ejection, and oxytocin release.
- Randomized Controlled Trials, Observational studies, and Experimental studies published in peer-reviewed journals.

Exclusion Criteria:

- Studies with only Abstracts Studies Containing no Original Data Articles In Other Than English Language. Studies evaluating interventions other than music therapy.
- Articles not available in full text or published in non-peer-reviewed sources.
- Studies with insufficient data or lacking measurable outcomes related to milk ejection.

PROCEDURE:



REFERANCE	OBJECTIVE	TRAINING FREQUENCY	MUSIC DURATION	TYPE	RESULT
Impact of Music Therapy on Breast Milk Secretion in Mothers of Premature Newborns/Ak, et al/ 2015/A1)	Evaluation of the impact of music therapy on the amount of mother's milk secretion from premature newborns by reducing maternal stress.	two times a day for four days	30 MINUTES	Active (flute)	Music therapy is associated with a significant reduction in stress levels, as indicated by an increase in PSS scores and a decrease in salivary cortisol. Subjects who received music therapy experienced a considerable increase (p-value-0.33) in milk expression compared to mothers who did not.
Effect of Music on Immediately Postpartum Lactation By Term Mothers After Giving Birth/ Kittithanesua n et al. 2017/A2	The effect of listening to music on the response of lactation in the postpartum period immediately after vaginal delivery with term pregnancies.	3 times a day for four days	11 MINUTES	Passive (Traditional music with lyrics depicting a mother' s love for her child)	Breastfeeding mothers who listened to music immediately after delivery showed a significant increase in lactation after breastfeeding compared to the control group with increased lactation after breastfeeding (p<0.05)
The effectiveness of interventions using relaxation therapy to improve breastfeeding outcomes Mohd Shukri, et al. 2017/A3	direct effect of relaxation therapy on breastfeeding outcomes (volume and composition)	two times a day for 7 days	30 MINUTES	Passive (Breast feeding music from Turkey)	Relaxation therapy has been proven to increase milk production but cannot be generalized to all breastfeeding mothers based on

					social and economic class.
The effects of music intervention on breast milk production in breastfeeding mothers Mustafa Volkan Düzgün dan Zeynep Özer/2020/A4	the effect of music intervention on milk production in lactating mothers	3 times a day 30 minutes	3 Times a day 30 MINUTES	Passive (Breast feeding music from Turkey	Cochran's Q test results show that music has a negligible effect on increasing milk production (Hedge's $g = 0.39$). A systematic review and meta-analysis of these five trials indicated that music can effectively increase milk production. The types of music recommended are passive and active, both of which have the same effect, but the kind of music chosen by the participants is more effective in increasing milk production
The Effects of Listening to Music on Breast Milk Production by Mothers of Premature Newborns in the Neonatal Intensive Care Unit: A Randomized Controlled Study/Varisx oğ lu, Yeliz, et al/2020/A5	the effect of listening to music on milk production in Turkish mothers with premature newborns	3 Times a day 30 MINUTES	15 MINUTES	Passive (Breast feeding music from Turkey)	MG's status and total anxiety scores were statistically low ($p < 0.05$) between the MG and control groups in the amount of milk the breasts produced; however, the post-test cortisol level of the MG group was significantly lower than that of measurement

					(p<0.05) Listening to music in the NICU while breastfeeding can help reduce stress levels in premature newborn mothers and support milk production.
Comparing the effect of a lactation-specific relaxation and visualisation intervention versus standard care on lactation and mental health outcomes in mothers of very premature infants (the EXPRESS trial): study protocol for a multi-centre, unmasked, randomised, parallel-group trial Ilana Levene ¹	to determine if a self-directed relaxation and visualisation intervention for mothers of infants born between 23 weeks of gestation and 31 weeks and 6 days of gestation improves lactation and mental health outcomes	3 WEEKS	12-min-long modified audio	Relaxation soundtrack	Provision of specific relaxation and visualisation recording with instruction to listen frequently while expressing breastmilk
Impact of audio assisted relaxation technique on stress, anxiety and milk output among postpartum mothers of hospitalized neonates: A randomized controlled trial Suman Dabas	To assess the impact of relaxation technique on stress, anxiety and milk output among the postpartum mothers of hospitalized neonates in NICU.	every day practice for 10 days	30 MINUTES	audio assisted relaxation technique	Use of relaxation technique may have significant role in reducing maternal stress and anxiety and improving the milk output

DISCUSSION:

This systematic review provides an overview of the available evidence regarding the influence of music therapy and relaxation-based interventions on milk ejection, breast milk production, and maternal psychological well-being in postpartum women, particularly mothers of premature or hospitalized neonates. The findings from the included studies suggest that music-based interventions may have beneficial effects on lactation outcomes, mainly through reduction of maternal stress and anxiety and possible enhancement of oxytocin-mediated milk ejection.

Ak et al. (2015) investigated the impact of music therapy on breast milk secretion among mothers of premature newborns. Music therapy was provided twice daily for four days for 30 minutes using active flute music. The intervention was associated with reduced maternal stress and cortisol levels and an increase in milk expression compared with the control group. These findings suggest that reduction of maternal stress may contribute to improved lactation.

Similarly, Kittithanesuan et al. (2017) examined the effect of music listening immediately after delivery among mothers of term newborns. Mothers who listened to traditional music three times daily for four days demonstrated a significant increase in lactation after breastfeeding compared with the control group ($p < 0.05$). This supports the potential role of early postpartum music intervention in facilitating breastfeeding and milk ejection.

Mohd Shukri et al. (2017) evaluated relaxation therapy for improving breastfeeding outcomes. The intervention was provided twice daily for seven days for 30 minutes and demonstrated improvement in milk production. However, the authors highlighted that the findings may not be generalizable to all breastfeeding mothers because social and economic factors may influence breastfeeding outcomes. This indicates the importance of considering individual maternal characteristics when implementing relaxation-based interventions.

Düzgün and Özer (2020) investigated the effects of music intervention on breast milk production. Their findings suggested that both active and passive music interventions may have beneficial effects on milk production, although the overall effect was relatively small. The study also emphasized that music selected according to the mother's preference may be more effective, suggesting that individualized music selection could improve maternal relaxation and intervention adherence.

Varisoğlu et al. (2020), in a randomized controlled trial involving mothers of premature newborns in the NICU, found that music listening was associated with reduced anxiety and cortisol levels and supported breast milk production. The reduction in maternal stress may have contributed to improved milk expression. These findings are particularly relevant because mothers of premature infants frequently experience increased anxiety and emotional distress, which may interfere with breastfeeding and milk ejection.

The EXPRESS trial by Levene et al. investigated a lactation-specific relaxation and visualization intervention among mothers of very premature infants. The intervention used a short relaxation audio recording during breast milk expression and aimed to improve both lactation and maternal mental health outcomes. Although the intervention was designed as a structured relaxation approach rather than music

therapy alone, it supports the concept that reducing maternal psychological stress during milk expression may facilitate breastfeeding-related outcomes.

Dabas et al. also demonstrated that audio-assisted relaxation practiced daily for 10 days may reduce maternal stress and anxiety and improve milk output among mothers of hospitalized neonates. These findings further support the relationship between maternal psychological state and lactation. Relaxation interventions may create a calmer physiological state during milk expression, potentially supporting the neuroendocrine mechanisms involved in lactation.

The possible mechanism underlying these effects may involve the relationship between stress, the hypothalamic-pituitary-adrenal axis, and oxytocin release. Maternal stress and anxiety may interfere with the milk ejection reflex, while relaxation and positive emotional experiences may facilitate oxytocin release. Oxytocin causes contraction of the myoepithelial cells surrounding the mammary alveoli, resulting in milk ejection. Therefore, music therapy may indirectly support milk ejection by reducing stress and promoting relaxation rather than directly stimulating lactation.

Overall, the reviewed evidence suggests that music therapy may be particularly useful as a complementary intervention alongside conventional breastfeeding support. It is non-invasive, relatively inexpensive, easy to administer, and can be adapted according to maternal preferences. However, considerable variation was observed in the type of music, duration, frequency, intervention setting, and characteristics of participants across studies. In addition, many studies included mothers of premature or hospitalized infants rather than specifically women diagnosed with postpartum depression. Therefore, the direct effectiveness of music therapy on milk ejection in women with clinically diagnosed postpartum depression remains insufficiently established.

Future research should focus on well-designed randomized controlled trials involving postpartum women with confirmed postpartum depression, with standardized music therapy protocols and objective measures such as oxytocin levels, cortisol levels, breast milk volume, milk ejection efficiency, breastfeeding duration, and validated measures of depression and anxiety. Personalized music selection and intervention dosage should also be investigated to determine the most effective approach.

In summary, the findings indicate that music therapy and relaxation-based interventions have potential to reduce maternal stress and anxiety and may consequently support oxytocin-mediated milk ejection and breast milk production. Although the available evidence is encouraging, further high-quality research is required to establish the direct relationship between music therapy, postpartum depression, oxytocin release, and milk ejection.

CONCLUSION:

In conclusion, music therapy shows promise as a complementary intervention for improving lactation and reducing postpartum depression symptoms by stimulating oxytocin release and reducing stress.

Personalized approaches in therapy and music selection could enhance its benefits.

Music Therapy offers a non-invasive, cost-effective way to support both maternal well-being and lactation, leading to better health outcomes for mothers and infants.

Integrating Music therapy into Medical, Dental and office setups can improve focus, facilitate learning and maintain a calm focused state through Alpha Waves.

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