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A narrative literature review of the therapeutic effects of music upon childbearing women and neonates

Abstract

Therapeutic effects of music are well recognised within the literature, with benefits for a variety of health problems documented. This narrative review summarises benefits in terms of reducing stress, anxiety, labour pain and depression in childbearing women. For neonates, music has been shown to reduce number of days to discharge, reduce pain response behaviours, increase weight gain, improve Brazelton scores, improve parent/infant intimacy, improve oxygen saturation, increase formula intake, stabilize vital signs and increase parental reports of calmed infants. The main criticism of the studies reviewed is lack of categorisation of the particulars of the variables within the music that directly influenced outcome variables. A recommendation is made that a music package be developed and relationships with variables rigorously evaluated. The validated product may then be made available for use. Since evidence supports advantages from listening to music, it is suggested that maternity professionals use it in more creative ways.

Key words

Childbearing Women, Complementary Therapy, Maternal, Midwifery, Music, Neonates

Highlights

- (1) Therapeutic effects of music are well recognised within the literature.
- (2) People who listen to music that they enjoy have been shown to experience increased levels of natural serotonin (a monoamine neurotransmitter), which creates a more relaxed state.
- (3) Provisional evidence supports that there are therapeutic benefits from women and neonates listening to music.
- (4) It is recommended that midwives and neonatal nurses consider using music in more creative ways.
- (5) More research is recommended in this area.

A narrative literature review of the therapeutic effects of music upon childbearing women and neonates

1. Introduction

The therapeutic effects of music are well recognised within the literature, with benefits for a variety of health problems documented.^{1,2} With view to developing a study designed to measure the effects of music upon childbearing women's mental health, a structured narrative review of the literature was conducted to justify the aim of the proposed study.

People who listen to music that they enjoy have been shown to experience increased levels of natural serotonin (a monoamine neurotransmitter) that is used in the manufacture of some contemporary antidepressant medications.^{3,4} Serotonin creates a more relaxed physiological state, whereas stress can cause a fight/flight response. Listening to music has been shown to counteract the physiological stress reaction, with response release acetylcholine lowering heart rate, blood pressure and enhancing blood flow to the vital organs.⁶ Women who experience excessive stress are at risk of developing mental health problems, with vigilance to avoid, recognize and treat a main request of the Centre for Maternal and Child Enquires (CMACE) report.⁷ Since the majority of relaxants and antidepressants cross the placental barrier to effect the fetus, this justifies an exploration of alternative non-pharmaceutical methods of reducing stress in childbearing women.

At times it would benefit childbearing women to accomplish a relaxed state; for example, when blood pressure has breached normal range, when stressful interventions like External Cephalic Version (ECV) or amniocentesis are required, or simply to reduce stress caused throughout a busy day. To identify the evidence-based effects that music interventions can have upon maternal and neonatal

outcomes, the research question in this study asked; what are the therapeutic benefits of childbearing women and neonates listening to music?

2. Method

A narrative review of the literature was considered the appropriate method to answer the research question. This approach was chosen because the author wished to include both quantitative and qualitative methods, with implementation of a stringent hierarchy of evidence excluding valuable studies. The decision was to capture a broad variety of literature using an approach suggested by Baumeister and Leary,⁸ which sanctions inclusion of the full spectrum of research methods.⁹ Taking this approach, a narrative review of the literature was undertaken between December 2013 and March 2014, which involved searching several electronic databases:

- Cochrane Library
- JSTOR Music Collection
- NHS National Library of Health
- Science Direct
- Web of Knowledge

A combined free-text and thesaurus approach was adopted to identify relevant literature for inclusion. The following keywords were used:

- Anxiety
- Childbirth
- Health
- Pregnancy
- Stress reduction

The above search terms were combined with:

- Music
- Therapy

3. Evidence of effects music can have upon maternal and neonatal outcomes

Post gathering of the main body of literature, the papers were grouped in order of appropriateness. The main strengths and limitations of each paper were summarised. The initial review identified 58 papers, which on closer examination relative to the research question was reduced to 16. During reading and appraisal several categories emerged. These included the effects of music upon:

- Maternal stress and anxiety
- Maternal depression
- Maternal mood
- Labour pain
- Neonatal outcomes

What follows is the summarised findings from the papers scrutinized, followed by an overall discussion about the general rigour of the research methods used.

3.1. Effects of music upon maternal stress and anxiety

Two researchers studied the effects of music upon levels of stress and anxiety experienced by childbearing women.^{10,11} Ventura et al.¹⁰ played music to combat stress experienced by pregnant women awaiting amniocentesis. The music intervention contained a baseline which matched the human heartbeat (tempo=60-80 bpm), was middle-low pitched, low volume and held a rhythmic steady melody, as advocated by Schorr.¹² Childbearing women (n=154) were randomly assigned to 3 groups. Group (1) experienced the music intervention for 30 minutes, Group (2) read magazines, and Group (3) sat quietly in the waiting-room. Group (1) experienced the largest decrease in cortisol levels and state anxiety ($p < 0.001$). An insight acknowledged in the Ventura paper¹⁰ that holds relevance for further study design, is that conditions for relaxing in a clinic may not be reproducible in the home. In

addition, women taking relaxant medications may stray from an average response to calming interventions, and so this should be an exclusion criteria in further studies.

A further RCT by Liu et al.¹¹ measured the effects of music therapy on childbearing women's anxiety levels during labour. Taiwanese primigravidas (n=60) were randomly assigned to 2 groups. Group (1) (n=30) listened to the music intervention, and Group (2) (n=30) received routine care. Using Visual Analogue Scales (VAS), Group (1) experienced significantly lower anxiety during latent phase (2-4 centimetres cervical dilation), with no significant difference between groups observed during active phase (5-7 centimetres). One limit of the Liu et al.¹¹ study is that participant preference in music purchase was not explored, with this a consistent feature of most of the studies in this review.

3.2. Effects of music on maternal depression

The Scottish Intercollegiate Guidelines Network (SIGN) estimates that 100-150 per 1000 childbearing women experience Post Natal Depression (PND),¹³ with high levels of stress and anxiety during the antenatal period a precursor to developing antenatal depression.¹⁴

Maratos et al.³ conducted a Cochrane review that focused on 5 studies which implemented music as a variable. Four studies reported reduced symptoms of depression in the music therapy groups compared with those who received standard care. Upon questioning, participants viewed that the music therapy was an acceptable treatment for their depression, with improvements in mood also observed in neonates.¹⁵ Maratos et al.³ concluded that the studies reviewed were underpowered in terms of numbers of participants. Nonetheless, they showed short-term improvements in frame of mind that exceed that achieved by routine care alone. Based upon low participant drop-out rate, the music therapy was considered to be a

well-tolerated treatment. Maratos et al.³ concluded that overall quality ratings of the studies included was moderate to poor. They state that larger more rigorous studies are required which recruit sufficiently powered larger sample sizes and incorporate economic evaluation of the cost-effectiveness of treatment in comparison to standardised remedies for depression.

3.3. Effects of music upon maternal mood

Several authors have reported that singing enhances the mood of childbearing and postnatal women.^{16,17} For example, Carolan et al.¹⁶ explored the experiences of women who sang lullabies to their unborn and new born infants. During 4 group sessions with musicians, primiparous women (n=6, >32 weeks gestation) sang 3 lullabies to their infant at least once a day prior to and post birth. Three months post-partum, qualitative semi-structured interviews were conducted to evaluate participant experiences of the music intervention, with all 6 reporting that singing lullabies was enjoyable, emotion provoking, soothing and calming. Participants also recounted that the intervention increased their ability to express fears and anxiety. Ashby et al.¹⁷ testimony that positive mood arousal is affected by increased levels of dopamine produced in the ventral tegmental area of the brain, which enhances endorphin release into the bloodstream. Limitations of the Carolan et al.¹⁶ study was the extremely small sample size, with recruitment mainly from women of advanced maternal age and higher educational status, who are more likely to participate in health promoting activities.¹⁶ It is recommended that future studies stratify social background of the populations they sample.

3.4. Effects of music upon women's experiences of labour pain

Sixty percent of primigravidas and 40% of multiparas report experiencing acute labour pain.¹⁸ The gate control theory has been used to explain physiological

moderation of pain,¹⁸ with Melzack claiming that 'closing the gate' located in the dorsal horn of the spinal cord moderates pain experience through inhibiting neurone impulses.¹⁸ In alternative medical contexts, music has verified itself as a non-pharmaceutical modality that can reduce postoperative pain by up to 31% in patients who have received abdominal surgery,¹⁹ and are experiencing chronic pain.¹² Of interest to midwives is literature that has shown that childbearing women who listen to music report moderated labour pain.^{11,20-23}

Hanser et al.²¹ explored the effectiveness of music at decreasing childbearing women's (n=7) experiences of labour pain. The childbearing women participated in two music therapy sessions 4–8 weeks prior to their Expected Date of Delivery (EDD). Rhythmic breathing was taught to promote relaxation, with positive associations roused by the music intended to deflect attention from labour pain and anxiety provoking sounds within the delivery suite. The music intervention was played continuously for 10 contractions sandwiched between equal lengths of silence. All 7 participants experienced lowered pain responses during the music intervention compared with the silent periods. Postnatal questionnaires confirmed that all participants retrospectively viewed the music program positively. Hanser et al.²¹ recognised that a limitation was telling participants in advance the goal of their study. Also, the small sample size will have inevitably influenced statistical power and effect size.

Liu et al.¹¹ measured the effects of music therapy on labour pain using VAS. Group (1) participants (n=30) reported experiencing significantly lower pain during latent phase of labour (2-4 centimetres), with no significant difference compared with the control group during active phase (5-7 centimetres).

Again, Liu et al.¹¹ agreed that the Hawthorne effect resulting from participant awareness of the study goal may have influenced their scoring. In future studies

,although an ethical issue for debate, presenting a false hypothesis to participants would overcome this problem.

Phumdoung and Good²² measured the impact of music on sensations and distress from pain experienced during active phase of labour (5-7 centimetres) in Thai primiparous women (n=110). Participants were randomised into 2 groups. Group (1) listened to soft music without lyrics for 3 hours during early active phase of labour (n=55), and Group (2) received routine care (n=55). Using VAS, the music group reported significantly less pain and distress compared to the control ($p < 0.001$). One problem Phumdoung and Good²² reported was that the ceiling effect was reached on the VAS early on. Some primiparous women prematurely reported top scores, when clearly their pain worsened as labour progressed beyond this data collection point. This issue will inevitably influence validity of data collected using Likert scales and so should be considered in future studies.

Labrague et al.²³ measured the effects of listening to soothing music upon women's pain experiences during latent phase of labour (2-4 centimetres). Group (1) listened to the music intervention for 30 minutes (n=25), and Group (2) acted as the control (n=25). Using VAS at two time points, Group (1) participants reported reduced pain compared with the control group ($p < 0.05$). Again, a limitation of the Labrague et al.²³ study is that such small sample sizes will inevitably have constrained the effect size. Recommendations for future studies are to ensure a statistically powered number of participants are recruited.

Only one study contradicted the benefits of music at reducing women's pain experiences during labour²⁴. Kusolleartjariya²⁴ measured the effects of listening to music upon pain experienced by labouring women. Group (1) listened to Thai folk music (n=30), Group (2) Thai classical music (n=30), and Group (3) were the no-

music control (n=30). Utilising pain scales, no significant difference in intensity was found between the 3 groups.

The proposition that music therapy contributes towards improving women's experiences of labour pain has been demonstrated in (4)^{11,21,22,23} out of (5)²⁴ studies. The relevance for maternity care providers is that unrelieved labour pain can cause a stress reaction that increases cardiac output, raises blood pressure, respiratory rate, oxygen consumption and catecholamine levels, all of which can adversely effect mother and fetus.²⁵ Experiencing labour pain also has the potential to create traumatic memories,²⁶ protract length of labour,²⁷ and increase maternal request for Caesarean Section (CS).²⁸

3.5. Effects of music upon neonatal outcomes

Evidence has shown that exposing neonates to music produces several positive outcomes. Embryologists have shown that a rudimentary ear bud has developed by 3 weeks gestation and is functional by week 16, with the fetus capable of active listening by weeks 24/25.²⁹ Consequently, it is not surprising that 6 studies have shown that music can effect neonatal outcomes.^{30,31,32,34,35,36}

Arya et al.³¹ measured the effects of primigravidas listening to music during the antenatal period upon Brazelton Neonatal Behavioral Assessment Scale (BNBAS). Healthy childbearing women (n=329;<20 weeks gestation) were randomised into 2 groups. Group (1) listened to a pre-recorded music cassette for 1 hour immediately prior to sleep time (n=126), and Group (2) followed their usual bedtime routine (n=134). Both groups were assessed using the BNBAS on the second postnatal day. Neonates of mothers exposed to music during pregnancy performed significantly better on 5 of the 7 BNBAS clusters: (1) habituation, (2) orientation, (3) range of state, (4) regulation of state and autonomic stability, and (5)

motor performance. One observation of the Arya et al.³ study is that the women were recruited in the early half of pregnancy, and that the fetus was exposed to around 173 hours of music prior to birth. In contrast, other studies exposed the fetus to a few hours of music in advance of labour. Clearly, more requires to be known about the magnitude of effect from a variety of exposure times from a range of music styles.

Tabarro³² took a qualitative approach to explain the effects of music upon unborn infants and mothers (n=87) who listened to melodies from 5 months gestation. Cyclic melodies were continuously played during labour, with a 30 minute break every 2 hours. Post event, interviewees described that listening to the music reduced their levels of distress during labour. Beliefs were also expressed that the music intervention facilitated their infant to adjust in the first few months of life. The New Born Individualized Developmental Care and Assessment Programme (NIDCAP) promotes benefits from music therapy which include improved parent/infant intimacy, improved infant behaviour, and increased oxygen saturation, non-nutritive sucking and mean weight gain.³³ Tabarro³² reported that no participant asked for the music to be discontinued during labour. This is a salient point, since music can assist a non-verbal connection to be forged that can become part of the source of comfort and support provided by staff. In essence, a 'me-you' relationship may become assembled between the musical piece and retrospective viewing of the birth. When forged in memory the woman may recollect her 'birth' with a distinctive song, which is another area we highlight as worthy of further research.

Bo and Callaghan³⁴ compared TcPaO₂ levels, heart rate, and pain behaviour of neonates (n=27) who performed non-nutritive sucking whilst listening to music, compared with a no-intervention control. Whilst blood samples were removed in a heel prick test, both interventions significantly reduced neonates' heart rates, pain response behaviours and improved TcPaO₂ levels. One criticism of the Bo and

Callaghan³⁴ study and the majority of others is that minimal explanation is provided about how the music affected improvements. Future studies must assemble these explanations if they are to be taken seriously by professional care providers.

Caine³⁵ studied the effects of music on stress behaviours, weight gain, calorific intake, and length of stay of stable preterm/low birth weight neonates in an intensive care unit. Neonates in the experimental Group (1) (n=26), and the control Group (2) (n=26) were matched for sex, birth weight, and criticality of condition. Group (1) were exposed to 60 minutes of tape-recorded vocal music 3 times a day. Lullabies were played for 30 minutes alternated with children's music for a further 30 minutes. The music stimulation significantly: (1) reduced initial weight loss, (2) increased average daily weight gain, (3) increased formula/calorie intake, (4) reduced length of stay in the neonatal unit, and (5) reduced daily group mean stress behaviours. Even though this study is chronologically old, this does not mean findings lack merit for mention. On the contrary, a music intervention is a timeless event, unlike the issue of reviewing a drug or treatment intervention now dispatched from use.

Teckenberg-Jansson et al.³⁶ studied the influence of music on outcomes of preterm infants aged 24-36 weeks gestation at birth (n=61). Group (1) were exposed to music therapy combined with kangaroo care, and Group (2) experienced kangaroo care alone. Group (1) encountered reduced pulse, slowed respiration, increased transcutaneous oxygen saturation, and stabilised blood pressure. These results were accompanied by parental reports of calmed infants (51%) and self (63%). One limitation of the Teckenberg-Jansson et al.³⁶ study is the broad-time difference of 10 minutes to 2 hours between measurements of physiological parameters prior to and post the music intervention. Further shortcomings include lack of a control group,

randomization and blinding, which are factors ordinarily considered when designing experimental studies.

Standley et al.³⁰ substantiated the aforementioned findings in a meta-analysis which validated an overall large significant and consistent effect size that music therapy improved neonatal outcomes. Short-term effects included higher rates of oxygen saturation,¹⁵ stabilization of blood-pressure,³⁶ and moderated pain behaviours measured through observation of decreased arousal and facial grimaces of neonates during acutely painful procedures.³⁴ Long-term benefits included reduction in stress behaviours, decreased duration of hospitalisation, increased average daily weight gain, and increased nutritional intake.^{30,35} To gain more valid information about the effects of specified music interventions and how they influence detailed outcomes, further studies with larger participant pools and clearly specified variables are required. Such rigour would help identify specifics of procedures for music delivery that are effective in terms of length of exposure and relationships with prime gestational age and decibel levels. Also, follow-up of infants who have continued to listen to music at home would develop understanding of the longer-term effects.

4. Discussion

Despite broad differences in musical tastes, this narrative review has summarised some of the benefits of listening to music for both mothers and neonates (see *Tables 1 & 2*).

TABLE 1

TABLE 2

Yet, there are limitations in terms of research rigour of many of the studies cited. For example, a consistent feature of papers reviewed is poor clarity in terms of key data on which to base robust conclusions. For example, some of the quantitative

studies have missing means and standard deviations, which makes appraisal of effect sizes unattainable. Most studies did not detail variables of the precise music intervention involved, with specification of count, key, melody and instruments absent. In place of a specified music product are indeterminate statements about structure. For example, tunes that are rhythmically simple, steady in tempo, regular, repetitive and predictable, with fewer notes and contour changes.³⁰ Omitting details of the precise music variables used inhibit opportunity for replication of the study in other contexts. It is therefore requested that future authors of papers publish details of how to access the music sheets and particularise the details of composition and instruments used. Creating a website where the pre-recorded music may be downloaded is just one possible solution. Further, researchers require to report relevant environmental factors. For example:

- What were the sound levels?
- What length of time was the music played for?
- At what distance was the music played from the participant?
- How was the music delivered to the participant (e.g., headphones)?

With this detailed information, a specified piece of music may then be tested in a variety of contexts with an assortment of patient groups.³

Nonetheless, this narrative review has declared clear benefits for women and neonates from being exposed to music. Clearly, there is considerable scope for defining adequately powered, hypothesis-driven and methodological robust research to quantify specifics of music variables involved in terms of type, level and extent of exposure in relation to specified outcomes. Increased participant numbers and providing reliable and valid tools for measuring outcomes, such as pain, anxiety, stress and depression, will create more robust evidence.

Clinical relevance of music studies to maternal and neonatal health

The music studies reviewed in this paper signal the reciprocal and inextricable relationship between music and its broader social, physiological and psychological contexts. The identified links between health, mental and physical well-being are complex and multi-layered, and are undoubtedly a vital component of why music has been implicated as a therapeutic agent in countless cases of medical research. The studies reviewed have shown that music is about more than just notes and acoustic prescribing's written on sheets of paper. Music has immutable capacity to influence how childbearing women and neonates feel and has capacity to improve their physical well-being. Yet, only over the past two decades have researchers begun to explore and acknowledge the positive effects that music can have upon health, mental development and physical well-being of childbearing women and neonates. There is countless work yet to be done that explores these relationships. Further research questions require to be answered. For example, what are the thoughts of midwives, obstetricians and paediatricians of the empirical observations made? What are the mechanisms that derive from the observed effects of music on maternal and neonatal well-being, and how can they be used to build robust theoretical frameworks to underpin practice? Recommendation's for future research is a timely response to the eruption of interest in the relationships between music, health, and maternal/neonatal well-being.

Relevance for Midwives

At present, music is undervalued as a therapy within the maternity services. Research in this area is in its infancy in terms of providing robust evidence to underpin practice. Nevertheless, the studies reviewed should rouse readers' attention to the potential worth of using music to soothe childbearing women and

neonates and create improved outcomes. Music interventions are ethical to deliver, are cost-effective, involve minimal effort to implement, and can be continued at home post discharge. There is also potential to reduce request for analgesics that cross the placental barrier to influence fetal behaviour. Midwives may implement music as part of their daily routine or at scheduled times throughout the day. When calming of women and infants is achieved, time is freed up to perform alternative tasks. Also, shorter inpatient times within the neonatal unit may reduce infection rates through limiting exposure to source. A further benefit is that this hazard free method of minimizing discomfort may enable women to recollect enhanced birth experiences. Results of this review are intended to arouse interest in exposing women and neonates to uplifting music. Inspiring interest in conducting further rigorous research could conceivably result in music therapy becoming a productive part of standardized care provision.

5. Conclusion

The results of this narrative review have provided promising results about the effectiveness of music interventions at reducing stress, anxiety, labour pain and depression in childbearing women. For neonates, music interventions have been shown to reduce number of days to discharge, have lessened pain response behaviours, increased weight gain, improved Brazelton scores, increased parent/infant intimacy, recovered oxygen saturation, increased formula intake, stabilized vital signs and increased parental reports of calmed infants. In such respects, music has shown to be an effective non-pharmacological complementary therapy, which is straightforward to dispense, cost-effective, harmless, and can be enjoyed by childbearing women, neonates and staff. Music interventions may be used to complement routine care, with personal taste just one consideration. In future

research, personal preference for style of music may be achieved through participants self-selecting their own intervention group. It is also recommended that a piece of music be composed that consists of features tested in a variety of maternal and neonatal contexts. The product produced may become Intellectual Property of the grant provider, who may then decide how they wish to make their music product available to women, clinicians and researchers.

6. Implications for practice

Provisional evidence supports that there are therapeutic benefits from women and neonates listening to music. Consequently, it is suggested that midwives and neonatal nurses consider using music in more creative ways within maternity and neonatal units.

Ethical approval

Published data were used in preparation of this manuscript, hence no ethical approval was required.

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Author contribution

CJHM conceived the idea, conducted literature search, reviewed the studies for quality and performed analysis.

Conflict of interest statement

None declared.

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Table 1: Summary of reported effects of listening to music upon maternal and neonatal outcomes					
Researchers	Date	Method	Total no. of participants	p value	Findings
					Effects of music upon maternal stress and anxiety
Ventura et al.	2011	RCT	n=154	0.001	Women awaiting amniocentesis. Music group had largest decrease in cortisol levels and state anxiety post music intervention compared with those who read magazines and waited.
Liu et al.	2010	RCT	n=60	0.001	Women in labour. Music group demonstrated lower anxiety during latent phase (2-4 cm), with no difference between groups observed during active phase (5-7 cm).
					Effects of music on maternal depression
Maratos et al.	2008	Systematic review	5 studies	na	4 of 5 studies reported reduced depression in music therapy groups compared with standard care group.
					Effects of music on maternal mood
Carolan et al.	2011	Qualitative semi-structured interviews	n=6	na	Participants who sang lullabies to their unborn and new born infants reported the experience as enjoyable, emotion provoking, soothing and calming. It also increased their ability to express fears and anxiety.
					Effects of music on women's experiences of labour pain
Hanser et al.	1983	Experiment	n=7	absent	Participants demonstrated fewer pain responses during 'music periods' compared with 'silent periods'.
Liu et al.	2010	RCT	n=60	0.001	Women in labour. The music group demonstrated less pain during latent phase (2-4 cms) compared with the control group.
Phumdoung & Good	2003	RCT	n=110	0.001	Women in labour. The music group experienced significantly less sensation and distress compared with the control.
Labrague et al.	2013	Quasi-experimental	n=50	0.05	Women in labour. Music therapy group reported statistically significant reduced pain levels compared with the non-music group.
Kusolleartjariya	1997	Quasi-experimental	absent	absent	Women in labour. No difference in pain intensity found between 3 groups.
					Effects of music upon neonatal outcomes
Standley	2002	Meta-analysis	10 studies n=780	0.0000	Overall large, significant, consistent effect size. Homogeneity of findings suggests that music has clinically important benefits for premature infants in terms of increasing O2 saturation, stabilizing BP, moderating pain behaviours, shortening hospital stay, increasing daily weight gain, and increasing sucking.
Arya et al.	2011	RCT	n=329	0.001	Healthy neonates. Infants of mothers exposed to music during pregnancy performed significantly better on 5 of the 7 BNBAS clusters: (1) habituation, (2) orientation, (3) range of state, (4) regulation of state and qualitative autonomic stability, and (5) motor performance.
Tabarro	2010	Qualitative	n=27	na	Post event participants described how music played during labour minimized distress and helped baby adjust in first months of life.
Bo & Callaghan	2000	Experimental	n=27	0.0001	Neonates having blood samples removed had significantly reduced heart rate, improved TcPaO ₂ levels and reduced pain behaviours.
Caine	1991	RCT	n=52	0.001	Neonates in an ITU. The music intervention group experienced significantly increased daily weight gain, increased caloric intake, reduced length of stay and reduced stress behaviours.
Teckenberg-Jansson et al.	2010	Experimental	n=113	0.05	In pre-term neonates music therapy reduced pulse, slowed respirations, increased O2 saturation and stabilized BP. Parents reported calming of infants (51%) and self (63%).

Table 2: Summary of reported effects of listening to music upon maternal and neonatal outcomes

Reduces maternal stress and anxiety^{10,11}

Reduces maternal depression³

Enhances maternal/fetal relationship³³

Calms mother³⁶

Improves maternal mood^{16,17}

Reduces experiences of labour pain^{11,20,21,22,23}

Neonatal outcomes:

- Reduced number of days to discharge^{30,35}
- Reduced pain response behaviours³⁴
- Increased weight gain^{30,33,35}
- Improved Brazelton scores³¹
- Enhanced parent/infant intimacy
- Improved oxygen saturation^{33,34,36}
- Increased formula intake^{30,33,35}
- Stabilized blood pressure³⁶
- Stabilized heart rate^{34,36}
- Stabilized respirations³⁶
- Increased maternal reports of calmed infants^{32,35,36}