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Maternal singing of lullabies during pregnancy and after birth: Effects on mother–infant bonding and on newborns' behaviour. Concurrent Cohort Study

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ABSTRACT

Background: Mother–infant bonding is of great importance for the development and the well-being of the baby. The aim of this Concurrent Cohort Study was to investigate the effects of mothers singing lullabies on bonding, newborns' behaviour and maternal stress.

Methods: Eighty-three (singing cohort) and 85 (concurrent cohort) women were recruited at antenatal classes at 24 weeks g.a. and followed up to 3 months after birth. The Prenatal Attachment Inventory (PAI) and the Mother-to-Infant Bonding Scale (MIBS) were used to assess maternal-foetal attachment and postnatal bonding.

Findings: No significant influence was found on Prenatal Attachment; by contrast, Postnatal Bonding was significantly greater (i.e. lower MIBS) in the singing group 3 months after birth (mean 1.28 vs 1.96; $p = 0.001$). In the same singing group, the incidence of neonatal crying episodes in the first month was significantly lower (18.5% vs 28.2; $p < 0.0001$) as were the infantile colic (64.7% vs 38.3%; $p = 0.003$) and perceived maternal stress (29.6% vs 36.5%; $p < 0.05$). Infantile colic was reduced in the singing group, even in the second month after birth (22.8% vs 36.5; $p = 0.002$). At the same time, a reduction was observed in the neonatal nightly awakening (1.5% vs 4.7; $p < 0.0001$).

Conclusions: Mothers singing lullabies could improve maternal-infant bonding. It could also have positive effects on neonatal behaviour and maternal stress.

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Statement of significance

Problem or issue

Mother–infant bonding is of great importance for the development and well-being of the newborn

What is already known

The sound experience during the prenatal period is so incisive that after birth a newborn is able to discriminate between maternal and other female voices and demonstrates a clear preference for the former. An interesting form

of acoustic communication between the mother and child is represented by maternal singing, which is an expression of maternal love and is generally recognised as being beneficial for both mother and newborn.

What this paper adds

Maternal singing during pregnancy and after birth could both improve maternal infant interaction and contribute to preventing neonatal colic.

1. Introduction

According to the Theory of Attachment, mother–infant bonding is of utmost importance for the development and well-being of the

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baby.¹ From conception to birth, all human beings establish a relationship with their mother that allows them to interact with her. The mother–infant relationship starts during pregnancy when the mother perceives foetal movements, and from then on a special dialogue develops between mother and baby. This bonding is further strengthened at the moment of childbirth.^{2–5} After pregnancy, the relationship between mother and baby has a special channel of communication: the maternal voice. The auditory foetal system already reaches full maturity between the 24th and 28th weeks' gestation. From this moment the foetus is able to react to auditory stimuli. Kisilevsky et al.⁶ investigated foetal responses to music played with a headset placed on the maternal abdomen and found an increase in foetal motor activity and in foetal heart rate in the foetus from 28 weeks. Among all the acoustic signals perceived during pregnancy, the maternal voice is the predominant one and the main source of sensory stimulation.⁷

From the 28th to the 36th week, the phenomenon of "habituation" occurs: the foetus is able to preserve the sound memory of the vibro-acoustic stimuli to which it is repeatedly exposed.^{7,8} This is one of the most important higher brain functions involving learning and ability to retrieve information.^{7,8} Some authors have suggested that the newborn recognises and responds positively to the maternal voice as a result of prenatal exposure, and is soothed when exposed to the same stimulus in the early postnatal period.^{9,10} The sound experience during the prenatal period is so incisive that after birth a newborn is able to discriminate between maternal and other female voices and demonstrates a clear preference for the former.^{7,10–13}

Evidence of the beneficial effects of exposure to music during pregnancy for both, mother and baby, has been quoted in the literature.^{14–18} The adequate vibro-acoustic stimulation by exposure to music can produce changes in foetal and neonatal behaviour and has a direct influence on the emotions and neurotransmitter system.¹⁴ During pregnancy, symptoms of stress, anxiety and depressive mood are common and there is a clear association between a high level of stress and a range of poorer maternal and infant outcomes.^{16,17} It has been proven that pregnant women benefit from music therapy in terms of reduction of stress, anxiety and depression.¹⁸ An interesting form of acoustic communication between the mother and child is represented by maternal singing in pregnancy which is an important precursor for the relationship. Even after birth, maternal singing to the infant is an expression of maternal love and is generally recognised as being beneficial for both mother and newborn.^{19–21} Lullabies are differentiated from other types of songs due to their repetitiveness, soothing quality, softness, simplicity and slow tempo.¹² Infant-directed play songs and lullabies are part of traditions and cultures all around the world. However, in contemporary society, the maternal singing tradition in Italian culture is changing due to increased modernisation and the tendency of women to go back to work soon after the birth of their baby.

1.1. Aim

This study aims to explore the potential of maternal singing of lullabies during pregnancy and after birth in developing and strengthening the relationship between the mother and baby. The choice of lullabies, as opposed to other kinds of music, is a result of their communicative value and their importance as one of the symbols of mother–infant relationship in all the cultures around the world.^{12,22}

The main aim is to assess the effects of mothers singing lullabies on both prenatal attachment and postnatal mother–infant bonding by means of established and validated questionnaires. In addition, the foetus and newborn behaviour are also investigated together with the mother's feelings and perceived stress.

2. Methods

2.1. Participants

The study was approved by the Hospital Ethics Committee on November 17, 2011 (approval Number 1497-2011). Recruitment took place from December 2011 to August 2013, during the first session of antenatal classes at the San Gerardo Hospital, a metropolitan maternity hospital in Monza (Italy). The recruited women attending the antenatal classes were aged 18 years or more, had adequate knowledge of the Italian language, had uncomplicated singleton pregnancies and gave their informed consent to participate in the study.

The enrolled women were divided into a cohort invited to sing lullabies during pregnancy (singing cohort) and a control cohort of non-singing women (concurrent cohort). Antenatal classes were organized in 14 weekly sessions, starting at 24 weeks of gestational age (g.a.) with the participation of at least 30 women in each group. The groups were progressively numbered from 1 to 6. Odd numbers were assigned to the singing cohort group, and even numbers were assigned to the concurrent cohort group to mimic randomization. All the groups were conducted by the same midwife. Women were monitored from 24 weeks g.a. to 3 months after giving birth.

A required sample size of 156 (N = 78 for both the singing cohort and the concurrent cohort), was calculated to detect a minimum difference of 0.45 standard deviations between the expected values of the mother–infant-bonding score (a continuous summary measure calculated from the MIBS questionnaire) with a 5%-significance level and 80%-power. The sample size was increased to about 180 participants to take into account a drop-out rate of 7.6% due to premature birth revealed by the Italian official statistics,²³ the presence of drop out during follow-up, and the standard size of the antenatal classes (at least 30 women).

2.2. Measures and data collection

Demographic and obstetric data were collected at 24 weeks g.a. and 48 h after birth. On this occasion, the neonatal data were also collected. The Prenatal Attachment Inventory (PAI) questionnaire^{24,25} was used to assess the mother's attachment to the foetus at baseline (about 24 weeks g.a.) and at 36 weeks g.a.

This validated questionnaire^{24,25} consists of 21 items that describe the mother's feelings and thoughts towards the baby during pregnancy. For each item, the woman is asked to rate her feelings by setting an intensity rate on a 4-level scale ranging from 1 (weaker feelings) to 4 (stronger feelings). A final summary score is calculated by summing up the 21 single scores. It ranges from a minimum of 21 (very low prenatal attachment) to a maximum of 84 (very strong prenatal attachment). Mother to infant bonding was assessed by the Mother-To-Infant Bonding Scale (MIBS) questionnaire,^{26,27} administered 48 h after birth, and three months later. The MIBS questionnaire^{26,27} is a structured multidimensional and validated self-report scale. It consists of 8 items focused on key adjectives which describe possible main emotions the mother could feel for her newborn in the first weeks after birth.^{26,27} For each item the woman is asked to rate her perception of the emotion by setting an intensity rate on a 4-level scale ranging from 0 to 3. A final summary score is calculated by summing up the 8 single scores, with a total score ranging from a minimum of 0 (very strong bonding) to a maximum of 24 (very weak bonding).

The singing frequency was collected for the singing cohort by asking how many times per week the mother used to sing. The frequency was then categorized into 1–3 times/week; 4–5 times/week; 6–7 times/week; >7, times/week, as previously reported.²¹ The reaction of the foetus and the mother's feelings while singing

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