The First International Conference

Psychology and Music – Interdisciplinary Encounters
Pre-conference Program October 21–23, 2019
Conference Program October 24–26, 2019

Main Organizer
Faculty of Music, University of Arts in Belgrade

Co-organizers
Institute of Psychology, Faculty of Philosophy, University of Belgrade
Psychology of Music Section, Serbian Psychological Society

Proceedings of the First International Conference
Psychology and Music – Interdisciplinary Encounters

Editors
Blanka Bogunović and Sanela Nikolić

Publisher
Faculty of Music, University of Arts in Belgrade, Kralja Milana 50, Belgrade

For Publisher
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Cover Design
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Dušan Ćasić

THE FIRST INTERNATIONAL CONFERENCE

Psychology and Music – Interdisciplinary Encounters

PROCEEDINGS

Editors
Blanka Bogunović and Sanela Nikolić
Faculty of Music, University of Arts in Belgrade

UNIVERSITY OF ARTS IN BELGRADE
FACULTY OF MUSIC

Belgrade, 2020

Lullabies and Preterm Infants: A Contribution for the Study of Infant Directed Singing in the NICU

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Abstract

The practice of singing to babies has been observed around the world, in all cultures and historical periods. In cases of prematurity, benefits of maternal singing have been reported for both the baby and maternal anxiety levels. Therefore, several authors have expressed concerns about the possible decrease in singing practice for the infant and, consequently, the loss of transmission of children's oral repertoire. In this study, our purpose was to understand what and how do mothers sing to their babies, in the specific case of hospitalized preterm infants in a Portuguese NICU. We used a mixt method in a study case where 36 mothers sang without words to their hospitalized preterm infants during Kangaroo Care. We parametrized the repertoire and analyzed its characteristics, namely the melodic contours, range pitch, melodic intervals, rhythm, tempo and form. The participants also responded to a questionnaire regarding the habits of singing to their babies. Older and more educated mothers sang more pre-existent melodies and younger mothers tended to improvise. This study showed that the former mothers tend to sing adult songs and children's mediated songs to their hospitalized babies more than traditional Portuguese play songs or lullabies suggesting that mothers are not familiar with the Portuguese repertoire, as shown in other studies. It is possible that the sociological changes Portuguese families, as well as the development of automatic reproduction devices that replace a mother's voice, led to this fact. The latter mothers' improvised singing was highly repetitive and mostly by whole tones. These characteristics, may be related to an attempt to please and calm the baby, were also common to a comfortable chant for a female voice without practice.

Introduction

Singing for babies is an extremely common practice, observed in all cultures and historical periods (Abrantes, 2001; Malloch & Trevarthen, 2009). The way mothers communicate vocally with their babies, either through speech or singing, has specific characteristics (Fernald & Simon, 1984; Trehub et al., 1997) that render these intonations are identifiable by infants and adults. It has been observed that children prefer the infant-directed versions of songs to adult-directed ones (Trainor, 1996). The practice of singing to the baby is so common that it generates a repertoire of songs "for children". These songs emerge in a variety of contexts and during specific activities as lulling, playing, teaching children about everyday practicalities, etc. In this sense, we observe two very distinct styles of infant-directed repertoire used in different contexts and that communicate different messages: *Lullabies* and *Playsongs* (Rock, Trainor, & Addison, 1999; Trainor, 1996; Trehub & Trainor, 1998). While playsongs stimulate the infant and, according to A. Creighton, "engage the infant in play" (Creighton, 2011: 43), lullabies calm and relax the baby and are referred to as simple, repetitive, with a soft texture and slow tempo (Bargiel, 2004; Creghton, 2011; Trainor, 1996; Trehub & Schellenberg, 1995; Trehub et al., 1997). These characteristics are identical in many different cultures (Trehub, Unyk, & Trainor, 1993a) and these songs can be identified by adults from different cultures and musical systems, even when the lyrics were filtered out (Trehub, Unyk, & Trainor, 1993b). Trehub points that there are mostly mothers who sing for infants (74%) followed by fathers (14%) and siblings (8%) (Trehub et al., 1997). Another study affirms that lullabies are used mainly for younger children (Silva, 2016) and that parents sing more to their firstborn and less to the next children (Bonnár, 2014). Through lullabies and

play songs, mothers convey positive emotions and, according to Andrea Cevasco (2008): "results seem to indicate that these emotional nuances regulated her infant's state, either arousing or soothing according to specific circumstances" (p. 38).

In cases of prematurity, the benefits of maternal singing for both the baby and the mother's anxiety levels have been considered (Adén, 2014; Arnon et al., 2014). Especially in the NICU context, this seems to be a fundamental interaction activity in the mother/baby relationship (Cevasco, 2008). Pre-term infants in Neonatal Intermediate and Intensive Care Units are exposed to high levels of distress, noise either from medical equipment or professionals and families. That has been observed to cause behavioral changes and harmful variations in infant's sleep patterns. According to Merenstein and Gardner (2006) "sleep disruption may interfere with growth and development by alternating neuronal maturation, cortex development, and growth hormone secretion" (pp. 269–270). Then, to prevent these stressful occurrences for premature infants they are frequently administered sedatives (Garunkstiene, Buinauskiene, Uloziene, & Markuniene, 2014). It has been observed that music therapy interventions are an alternative to pharmacological sedation that improves the infant's sleep patterns (Loewy, Hallan, Psych, Friedman, & Martinez, 2005). Schwartz (2004) referred that lullabies would be the most appropriate repertoire to sing to the babies in order to tranquilize them during these procedures.

While the beneficial effects of singing for infants are reported, the decline of this practice and consequently the loss of transmission of children's oral repertoire has been a concern on the part of many authors today. This has been related to the introduction of women into the workplace and popularization of automatic audio reproduction devices such as CD players and more recently digital audio platforms (e.g., iTunes, Spotify or Youtube) as well as musical toys (Baker & Mackinlay, 2006; Custodero, Britto, & Brooks-Gunn, 2003). These authors argue that the preferences of parents in contemporary urban homes are also fueled by the booming of

the commercial music market that promotes products as not only suitable for babies but as creators of small geniuses (Baker & Mackinlay, 2006: 148).

Aims

Since lullabies seem to be more common in infants' early months and fragile states, and the practice of lullaby may show improvements in the sleep patterns of premature babies, we studied the repertoire sung by mothers of hospitalized infants between 32 and 37 weeks postgestational age, in the context of the Neonatal Intermediate Care Unit of the Maternity Dr. Alfredo da Costa in Lisbon, Portugal. Our aim was to understand what and how these mothers sing, studying the repertoire of lullabies and play songs as a specific behavior of mother/infant interaction. We expect mothers to use mostly a children's repertoire as they are addressing to their babies. We expect that, given this infant's condition of prematurity and fragility, mothers choose to sing lullabies over to play songs. On the other hand, we also expect that the repertoire reflects the tendency pointed by several authors of a repertoire less associated with the traditional repertoire of oral transmission and more directed to mediated music.

Method

After approval by the Ethical Committee of the Central Lisbon Hospital Center (267/2015), recruitment was performed at the Intermediate Neonatal Care Unit of the hospital Maternidade Dr. Alfredo da Costa (Lisbon, Portugal), between June 2016 and April 2017. We recollected a sample of fifty mothers of preterm infants to participate in this study. The participants signed an informed consent form after being informed about the aims and procedures of the study.

Exclusion criteria. Participants were excluded from the study based on the following criteria: a) age (younger than 19 years old); b) language (not understanding and speaking Portuguese fluently); c) auditory deficit (in infant or mother); d) gestation without medical supervision; e) previous psychiatric pathology

or serious negative emotional states and f) addictive behaviors. Another exclusion criterion was based on the baby's state ate the observation moment. We excluded dyads were the babies had: a) post-menstrual age lesser than 32 weeks or higher than 37 weeks; b) instability of the vital parameters; c) support of Continuous Positive Airway Pressure (CIPAP); d) intraventricular hemorrhages; e) congenital or neurological anomalies of auditory cortex; f) nasogastric tube and g) supporting breathing. Dyads were also excluded if skin-to-skin kangaroo care had not been practiced at least once. For clinical and circumstantial reasons, ten dyads couldn't participate in the study. Among the 40 observed dyads, 4 were excluded due to perturbations during the recording procedure, and 36 dyads were selected for the study.

Sample characteristics. Mothers' mean age was 34 years (SD = 5.63, min = 21, max = 48), the majority with Portuguese nationality (n = 26, 72.2%), with a high number of education years (M = 15.33, SD = 3.69, min = 6, max = 24). Most participants were married (n = 23, 63.9%; single = 19.4%; common law marriage = 16.7%) and primiparous (n = 22, 61.1%). The clinical variables regarding the mother indicate that the clear majority had no spontaneous abortions (n = 23, 63.88%), no voluntary abortions (n = 30, 83.33%) and no abortions for medical reasons (n = 23, 63.88%) prior to this study. Also, we observed 26 pregnancy with one fetus (72.2%), 7 cases with two fetuses (19.4%) and three cases with three fetuses (8.3%). Most of these pregnancies had been planned and desired according to the mother (n = 31, 86.1%). 24 cases of caesareans (66.7%) spontaneously triggered labor in 19 cases (55.9%) and induced in 15 cases (44.1%). Regarding the infants, the mean gestational age at birth was 30 weeks and 4 days (M = 212.78, SD = 17.11, min = 178, max = 241) and 34 weeks and 1 day of post-menstrual age at observation (M = 239.27, SD = 9.28, min = 224, max = 259). Mean chronological age was 26.5 days (M = 26.5%, SD = 19.99%, min = 4, max = 81), mean weight at birth was 1265.47 g (SD = 308.20, min = 590, max = 2017) and mean weight at observation was 1538.05 g (SD = 237.72, min = 1060, max = 2185). Twenty of the infants are male (55.56%) and 16 (44.44%) female.

Instruments. We recollected data based on a Sociodemographic and Clinical Questionnaire designed for this investigation with items about age, education, citizenship, marital status, occupational status, social and economic status, number of previous children, obstetrical data (spontaneous abortions, voluntary abortions, interruptions by medical advice, number of fetuses at the last pregnancy) and pediatric data (gestational age at birth, birth weight, delivery type, Apgar, age at observation, weight at the observation).

The participants also responded to a questionnaire about their Sound-Music Experience Before and After Birth that included items about maternal behavior of sound-music and vocal nature as well as about maternal perceptions related to the baby's responses to the sound-music environment. Answers were recorded on Likert scales varying from 0 (I completely disagree) to 5 (I completely agree).

Equipment and procedure. Observations took place in the Intermediate Neonatal Care Unit. Mothers were asked to sit in a chair, and to position the baby according to the Kangaroo Supported Diagonal Flexion Positioning (KSD-FP) (suggested for Buil et al., 2016). The mother was provided with a large scarf for holding the baby in skin-to-skin contact, and an additional strap was provided to support the baby's neck in such a way as to enable the mother to maintain visual contact. One camera (Panasonic 4K HC-VX870) was placed and oriented toward the dyad. The camera was connected to an external microphone placed near the mother. The 15-minute interaction was recorded and analyzed.

Design. During the 15 minutes of the research protocol, the participants were in Kangaroo Supported Diagonal Flexion Positioning, and the infants' state at the moment of observation corresponded to a state of quiet alertness or drowsiness according to the Brazelton & Nugent's scale (2011: 49–51). During the first 3 minutes, mothers were asked to remain silent

(baseline period) and proceed to sing or speak to the baby in the next 3 minutes. They proceeded with a silent period (3 minutes) and were asked to either speak or to sing to their babies once again, alternating with the previous speaking or singing condition. In the end, a final 3-min-period of silence was requested (offset period). For the speaking condition, mothers were asked to speak to their babies as they usually did, with no pre-established script. For the singing condition, mothers were asked to hum for their babies without words. In group 1, mothers began with the singing condition, and in group 2, mothers began with the speaking condition. For each dyad, one video recording (MP4) and its corresponding audio record (WAV) were coded. As for this study, we were interested in studying the infant-directed singing. As so, we only consider the singing excerpt.

Results

Regarding the questioning about the singing practices, we can conclude that the percentage of mothers who claim to sing for the baby in the incubator is slightly lower than the percentage of mothers who claim to sing during Kangaroo Care. The percentage of mothers who claim to speak to their baby in the incubator is higher than the percentage of mothers who claim to speak to their baby during Kangaroo Care. In fact, the overwhelming majority of mothers agree that they talk to the baby when it is in the incubator, while only about 60% of mothers say they sing in the same condition (see Fig. 1).

When asked to sing to their babies, 26 mothers sang melodies or variations we considered pre-existent or variations of pre-existing melodies, 2 of these mothers also sang melodies from
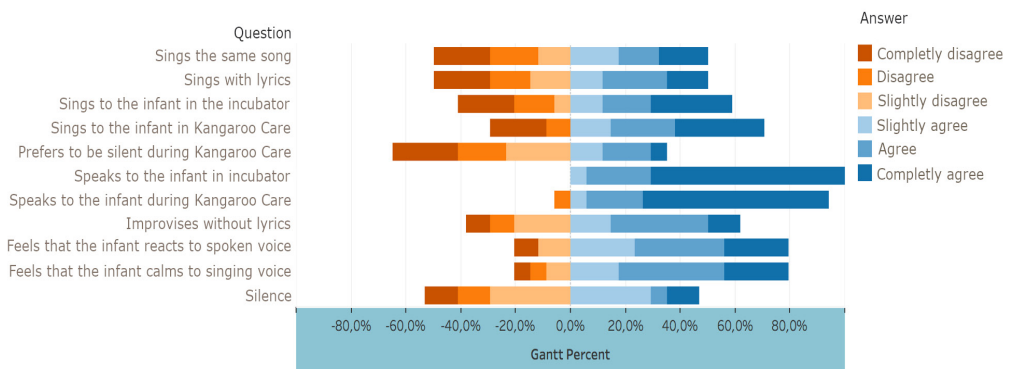

Figure 1. Data about the infant directed singing practices during the first weeks after the birth.

Analysis method. ELAN software (EU-DICO Linguistic Annotator) version 4.9.4 was used for coding each audio sample. All maternal vocalizations and pauses were coded and quantified in terms of frequency (number of vocalizations per minute) and duration (in ms). The repertoire sung by the mothers was transcribed using a spectrum analysis program (Anthem-Score). We identified the repertoire sung by mothers as improvised or non-improvised and made a qualitative musical analysis. We analyzed the factors a) range; b) intervals; c) repetitions; d) texture and e) measure.

three different songs and 1 sang two melodies. The remaining 10 participants improvised. Regarding the recognized pre-existent repertoire, 78.3% were children's songs, from which 38.9% were play songs and 61.1% lullabies. These play songs were mainly from an international oral tradition repertoire such as "Frére Jaques", "Twinkle, twinkle little star", "Happy Birthday" or "The wheels on the bus". Regarding the lullabies, it was mostly eared "Rock-a-bye Baby" and Johannes Brahms's "Wiegenlied: Guten Abend, gute Nacht" ["Lullaby: Good evening, good night"] Op. 49, No. 4 (c.a. 1868). Only two

mothers sang Portuguese lullabies. 27.8 % of the mothers did not follow the tendency of singing children's songs. In these cases, we eared mainly popular contemporary Portuguese songs and, in two cases, mothers sang melodies of religious songs.

In addition, we identified 10 mothers who performed an improvised singing, that is, mothers who did not sing pre-existing melodies. After a preliminary analysis of these improvisations, we concluded that, in general, the mothers sang more descending intervals, although the difference was not significant. In addition, they perform more ascending and descending intervals than unison (sing the same note), being a more melodic and less recited chant. Concerning the intervals, conjunct motion (the presence of major and minor second intervals) was more significant. Also significant is the absence of intervals greater than five halftones, making the range of these interpretations extremely short. Structurally these improvisations were very repetitive, usually featuring one or two very short melodic cells repeated throughout the interpretation. We also concluded that younger mothers and mothers with fewer education years improvised more, thus mothers with older babies sang more pre-existing songs.

Discussion

Based on the questionnaires, we observed a tendency for mothers to prefer to use the spoken word rather than singing, but the discrepancy between speaking and singing is more noticeable during distal contact (while the infant is in the incubator) than during the proximal contact of Kangaroo Care. Most mothers say that they prefer not to be silent during Kangaroo Care. Still, several mothers say they prefer to be in silence when they are with their babies. Regarding this last variable, it was not clear whether mothers understand silence as the absence of vocal interaction or the absence of characteristic noise from the Neonatal Intermediate Care Unit, such as medical equipment.

Although we have no data prior to this study on baby singing practices in Portugal, studies on time spent by mothers with their infants suggest

that it has been decreasing. The coverage rate of early childhood social responses (childcare and daycare) in Portugal has been growing between 2008 and 2015, and in 2018 the average number of weekly hours that Portuguese children under the age of 3 spend in educational institutions or early childhood care (39.1h) is among the highest in EU 28 countries, where a weekly average is 27.4h. It is possible that having less time with their children, mothers also spend less time singing to them and consequently less time learning, remembering, or practicing repertoire. (Castro, 2003; Esteve-Faubel, Esteve-Faubel, Cavia-Naya, & Benlloch, 2014; Grasina, 2017; Torres, 2018)

The data recollected in this study clearly shows that mothers prefer to sing pre-existent melodies rather than improvise. This may be related to the insecurity of mothers in using their own voice to sing and create melodies. Concerning the improvised chant, the participants perform a melodic and cantabile singing, mostly by conjunct motion, extremely repetitive, and within a short-range. On the one hand, these characteristics are common to children's songs and especially to lullabies (Abrantes, 2001) and may relate to an attempt to resemble the characteristics of this repertoire. On the other hand, it may relate to the use of a comfortable vocal register for a female voice without practice.

The repetitive structure is also an element often associated with children's songs and a recurring process in cases of improvisation and an aid to memory, which makes the repetitive musical structures common in several other improvised or oral tradition repertoires. According to Helena Rodrigues (2005), "the repetition strategy is recurrent in the interactions that the adult establishes with the child" (p. 67).

Regarding the pre-existing repertoire, we clearly see the use of children's songs, which becomes understandable since the participants are singing directly to a child. However, mothers prefer lullabies to play songs. Not only these musical genders are characteristically diverse and serve very different purposes (Bargiel, 2004; Trainor, 1996; Trehub & Schellenberg, 1995; Trehub et al., 1997), but babies also respond differently to these songs. According to

Creghton, De L'Etoile (2006) "states that infants are sophisticated listeners capable of detecting changes in musical stimuli and decoding their mother's singing accordingly" (2011: 44). Therefore, the infant plays an extremely important role in the choice of the repertoire and its performance which, according to the author, is dictated by the child's age, current state and response, thus acting as the conductor of maternal singing. The premature infants in a fragile state may have led to the choice of lullaby repertoire. Similarly, recourse to the religious repertoire may also relate to seeking emotional support and protection for the child in a time of weakness. Choosing religious chants is also an example of how maternal singing can already serve the purpose of enculturation and insertion in a certain community.

On the other hand, the repertoire chosen in the case of play songs and lullabies was mostly a highly mediated children's repertoire (such as *Twinkle twinkle little star* or *Brahm's Lullaby*), which can be heard on several children's CD, musical toys and educational games, series and movies, acquiring the status of a canon for babies and children. Even the case of the two interpretations of Portuguese lullabies eared shows one traditional song and one song composed in the 60's also extremely widespread on television and adapted by several mothers.

Given the scarce examples of traditional children's repertoire, we can conclude that this is not the first resort mothers use when singing to their babies, giving grounds to the concern of some scholars about the loss of this repertoire. Nevertheless, in Portugal are reports of resorting to the most diverse repertoires while singing for infants: in Gil Vicente's *Auto da Sibila Cassandra* ("Act of the Sibyl Cassandra") a wet nurse lists the songs neither related to children's songs repertoire that she can sing for the infants.

Conclusion

This study showed that these mothers tend to sing more adult songs and children's mediated songs to their hospitalized babies than traditional Portuguese play songs or lullabies. It is possible that the sociological changes of a family in Portugal, as well as the development of automatic reproduction devices that replace a mother's voice, led to this fact. The characteristics in the improvised repertoire, which may be related to an attempt to please and calm the baby, were also common to a comfortable chant for a female voice without practice.

Through the analysis of the repertoire sung by the participants, we verify the popularity of certain lullabies and play songs and observe that the repertoire sung to babies revolves more in mediatized music than in the oral passage of traditional melodies which, according to Rodrigues (2005), "also mirrors a different social attitude of women towards motherhood" (p. 70). The study of these practices may offer a historical record of the social functions of motherhood and paternity. Furthermore, we find that these practices, even in conditions such as prematurity and neonatality, serve several functions, including the provision of care, bonding between mother and infant, and socializing the child. It also serves a purpose of enculturation by presenting the baby with a repository of songs that are part of the mother's culture and, by which, introduces the child to a cultural, musical and in some cases, religious reality. These practices then provide what Doja (2014) refers to as "joyous transitions from the protected world of intimate songs to the wider world of interpersonal games and social relations, as well as particular rituals of a social community's culture" (p. 140).

As previously referred, this study was limited by the short number of participants since it was a pilot study, thus not being possible to obtain a statistically relevant collection of data. The sample was recollected in a very specific environment, and it is not possible to generalize the results to a different community, such as mothers of term infants or mothers of older children. In the future, it would be interesting to extend this research to different communities and to focus, for example, on the paternal figure and mostly in the infant's emotional and physiological response to these practices.

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