MUSIC THERAPY IN THE NEONATAL INTENSIVE CARE UNIT

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Infants in the neonatal intensive care unit (NICU) face many challenges to their health and survival. The combination of stress, pain, isolation from parents, aversive stimuli and multiple caregivers in the NICU can intensify their challenges. To address from a music therapy perspective some of the negative effects of NICU on premature infants, I conducted a pilot study at MCP Hahnemann Hospital in Philadelphia, Pennsylvania using live singing. Findings suggest that music therapy can play a valuable and unique role in the developmental care of infants in the NICU.

Background

**Stimulation:** A primary task of the neonate is to process, store and organize multiple stimuli. This task is extremely difficult for premature infants whose sensory systems are not fully developed. There has been considerable controversy about the stimulation of premature infants in the NICU. Some believe that premature infants in isolettes are deprived of adequate stimulation necessary for growth, and that this contributes to learning disabilities and other developmental challenges later in life. Others have rejected this theory of sensory deprivation on the grounds that constant activity and medical procedures are inherent to the NICU environment (High & Gorski, 1985; Lynam, 1995; Linn, Horowitz, Buddin, Leake & Fox, 1985). In addition to ambient noise, sudden noises from ventilators, monitor alarms, telephones, water faucets and cabinet doors can be highly arousing to infants and lead to hypoxemia, blood pressure instability, apnea, bradycardia, and altered cerebral blood flow (Lynam, 1995). As well, sleep states necessary for growth are interrupted (Schwartz, 2000).

Today, it is generally accepted that a neonate’s growth and development needs a careful and purposeful amount of stimulation. In utero, the fetus is surrounded by natural sounds of the mother’s placental blood flow, heartbeat and digestion and the movements of her body. As well, external sounds of speech and music are transmitted through mother’s abdomen, uterus and amniotic fluid. This uterine environment may influence later intelligence and personality as a considerable neuro-synaptic maturation takes place during the third trimester of pregnancy (Schwartz, 2000). Premature infants do not benefit from this natural in-utero stimulation, and one challenge for the NICU may be to provide an environment that is as optimally stimulating and conducive to growth as that of the womb. Therapists are now being employed in NICUs around the world to assist infants to self regulate and raise their tolerance thresholds for stimulation (Shoemark, 1998; Nocker-Ribaupierre, 1998).

**Stimulation and Music:** The use of live singing with infants in the NICU offers many possibilities. Interaction with the infant can be modified instantly by varying tempo, pitch and range of voice in response to cues given by the baby. Music, lullabies in particular, is inherently predictable. Lullabies have regular, slow, even phrases and smooth melodic lines that are easily sung and provide a form of stimulation to which infants can easily orient and respond.

**Attachment:** Attachment can be defined as the process by which people develop positive emotional bonds with others (Newman & Newman, 1998). The initial attachment is usually with one or both parents, and the strength and nature of this emotional tie shapes relationships that develop later in life. Bowlby (1988) views the formation of attachment in terms of a behaviour system that is regulated by the infant’s signals and the adult’s responses. However, neonates in the NICU, especially those in isolettes, spend considerable time without normal, social, caregiving interaction, and their limited interaction with caregivers is often uncomfortable. As well, the psychological distress experienced by both parent and infant may negatively affect the infant’s physical well being. It is therefore essential that parent and infant are provided with opportunities for positive interactions whenever possible.

**Music and Attachment:** Singing offers a natural way to communicate the emotional state of the singer and can help to regulate infant states (Trainor, 1996). Singing also has the potential to benefit infants who are limited in their capacity to interact with caregivers as a result of illness or fragility. Research has shown a difference in the way that people sing when an infant is present than when not present. Emotions such as love and acceptance may be inherent in the way that caregivers sing to infants, and the communication of these messages through singing may contribute to overall feelings of well being in both caregiver and infant.

Specific elements of singing cannot be replicated in other ways, for example voice tone and volume, expression and regular breathing during phrases, emotional content, and reception vibrations caused by the transmission of sound. As well, a physical experience of warmth and security is transmitted to the infant by the singing caregiver. A formidable task for the infant in the NICU is to provide feedback to caregivers. The stressed neonate may not be able to provide the cues necessary to elicit an adaptive response from caregivers, and music therapy may offer a way to interpret the range of unique sound cues of the infant and enhance the vocal relationship the baby can have with parents and caregivers.
Pilot Study

The purpose of this study was to establish whether live, infant-directed singing can be used as a non-invasive, natural form of infant regulation that has an effect on the physiological responses of premature infants, in particular heart rate, oxygen saturation levels and respiration rate.

The subjects were 10 infants born prematurely (less than 37 weeks gestation). Subjects were sung to and held (Singing & Holding phase) simultaneously, then held only (Holding Alone phase) for approximately 15 minutes during each phase. Heart rate, oxygen saturation levels and respiration rate were recorded for each minute before, during, between and after both interventions. Results of the Singing & Holding phase were compared with the Holding Alone phase.

Music Therapy Techniques Used: Infants were observed closely throughout all phases of the study so as to allow slight modifications to accommodate the individual needs of each infant. If an infant gave a disengagement cue, such as grimacing, yawning, or turning away (Als, Lester, Tronick & Brazelton, 1982) I altered my singing style. Some examples include slowing the tempo, lowering the volume, elongating the vowels and/or increasing space between each phrase.

Similarly, when an approach behaviour was observed, such as cooing, grasping, vocalizing or sucking, I modified my singing style subtly. I rarely increased tempo and/or volume so as to avoid overstimulation. Instead, I created brief spaces in the musical phrase to encourage the infant to respond on his/her own to the musical question without creating tension. As soon as an approach cue was observed, I ended the musical phrase and smiled. Smiling while singing changes the quality of the voice and the sound of the sung vowel.

I also varied my holding style slightly with each infant. All were cradled in my left arm with their heads close my heart. Some infants appeared to prefer being held higher up closer to my face where they could experience vibration of my diaphragm as well as increased volume and intensity of the singing. All singing and holding was in a rocking chair that provided steady rocking and offered additional vestibular stimulation to the infant.

The behavioural cues observed were very subtle. At no time did any infant become agitated to the point of crying and their disengagement cues never persisted for more than one minute. If an infant had become agitated or appeared uncomfortable for an extended period of time, the intervention would have been terminated immediately.

Results and Discussion

Findings indicated a statistically significant increase in infant heart rate during the Singing & Holding phase as compared to the Holding Alone phase. There was no statistically significant change in the oxygen saturation levels or respiratory rate of infants during any phase of data collection. The increase in heart rate was not unexpected given the infants’ behavioural responses during singing. Eight out of the ten infants in the study showed noticeable changes in sleep-awake states that correlate with behavioural characteristics of the “quiet alert” state (Als et al., 1982) considered as the optimal time for caregiver-infant interaction. Signs that the infant is in this state include a wide gaze and the appearance that the infant is focussing on and processing the stimuli being presented. Six of the infants opened their eyes and appeared to look directly at me for a portion of the Singing & Holding phase and two vocalized. All demonstrated “approach behaviours” (Als et al., 1982) that indicate an infant is organized and able to accept stimuli and/or information, for example tongue extensions, grasping, hand holding, vocalizations and mouthing. Very few “avoidance behaviours” (Als et al., 1982) such as grimacing, yawning or turning away, were observed during the Singing & Holding phase.

The results can also be discussed in terms of orienting and defensive reflexes (Sokolov, 1963). According to Sokolov, a defensive reflex occurs when a stimulus is too intense. An orienting reflex occurs when a stimulus falls below a level necessary for a defensive response. Orienting responses enhance and strengthen the effects of the stimulation. The challenge of organizing environmental stimuli is especially difficult for premature infants in the NICU. The infants in this study demonstrated that they were able to tolerate the stimulation of singing without compromising their physiological stability in that physiological signs of distress such as oxygen desaturation did not accompany their increased heart rate.

Krafchuk, Tronick & Clifton (1983) propose a paradoxical theory of reactivity for the preterm infant based on two suppositions. The first is that preterm infants have a high threshold for sensory input that has a protective function of inhibiting reactivity. This can be linked to the concept of a stimulus barrier (Spitz, 1963) that limits the amount of sensory input taken in. The second is that premature infants have a low tolerance for stimulation that does pass through the stimulus barrier. This can quickly lead to overstimulation and disorganization. The implication of these two assumptions is that there is a limited range of stimulation to which an infant can respond in an organized way. Given that the infants in the present study did not show any observable signs of distress, and most appeared alert and responsive for at least part of the Singing & Holding phase, infant-directed singing may have provided an optimal level of stimulation. The relationship that develops in the course of singing to infants and the ability to vary responses subtly to their behavioural cues may provide a “quality of interaction” not present in other forms of stimulation.

In addition to demonstrated benefits for infants, the study indicates a role with parents. When approached about the study, parents were very curious about the value of singing. Several said that they didn’t know any lullabies and were embarrassed by the quality of their voice. Without being asked, some confided that they were fearful of taking their baby home because they felt that they lacked the skills to care adequately for their baby. In these cases I spent time with the parents while they held their infants. If asked, I taught the parents some lullabies, or sang familiar songs with them to their baby. Often nearby parents began singing to their infant. In this way, music therapists can facilitate the development of attachment between infants and their parents in the NICU and provide important support as models and teachers.
Conclusion

The sensitivity shown by infants in the study to infant-directed singing suggests that music therapy can play a role in the developmental care of infants in the NICU. Specialized skill and training enable music therapists to provide individualized programs sensitive to the subtle responses of premature infants. Those concerned with the developmental care and psychological well being of parents and infants in the NICU should be encouraged to further explore the benefits of a music therapy program in the NICU.

References


