Optimizing Treatment for Preterm Infants Through Music Therapy: 
A Critical Review of Literature

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Optimizing Treatment for Preterm Infants Through Music Therapy: A Critical Review of the Literature

Capstone Thesis

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Music Therapy

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Abstract

This capstone thesis explores music therapy treatment for preterm infants in the neonatal intensive care unit. The first section outlines developmental considerations and interventions for preterm infants which include minimizing stress, prioritizing sleep, developing feeding behaviors, and promoting strategies for self-regulation of the infant. Both standard care and music therapy interventions are included in this discussion. The second section includes considerations and interventions for attachment and social development. These include skin-to-skin contact between infant and caregiver, the importance of emotional closeness in the infant-caregiver relationship, and supporting parents as they interact with their child in the hospital environment. The third section makes two claims: (a) secure attachments with caregivers facilitate healthy social functioning later in life and (b) music therapy can help create these attachments. Communicative musicality and creative music therapy are two methods that can be incorporated into existing models of NICU care to help create and strengthen bonds between preterm infants and their caregivers. The purpose of this capstone thesis is to improve treatment outcomes for preterm infants through music therapy and to provide rationale for the development of NICU-MT programs to support this population.

Keywords: preterm infants, communicative musicality, creative music therapy, attachment
Optimizing Treatment for Pre–Term Infants Through Music Therapy: A Critical Review of the Literature

An infant that is born prematurely has complex medical needs and is at a significant risk for developmental challenges. Typical development is interrupted by premature birth and the infant’s stay in the neonatal intensive care unit (NICU). The growth that would take place in the womb is now happening in the external environment, a place that is much louder and brighter than the infant is ready to handle (Silva et al., 2018; Park, 2020). Overstimulation is a stressful experience for a preterm infant which limits opportunities for the brain and body to develop (Silva et al., 2018; Park, 2020). Complications that occur because of preterm birth and atypical development can impact the future health of the infant.

Music therapy has been integrated into the NICU over the past twenty years to address these medical and developmental needs (Standley & Guiterrez, 2020). This type of music therapy requires board–certified music therapists to complete a training program to ensure proper care of preterm infants (Standley, 2014). The program outlines a developmental approach that is responsive to the needs of preterm infants in three stages: the survival/pacification stage, the cautious stimulation phase, and the interactive/discharge phase. Each stage is organized by the preterm infant’s gestational age, measured in weeks, which corresponds to how old the infant would be if they were still in the womb.

Martin (2018) provides a detailed look at the impact of established music therapy interventions in the NICU. In recent years, several researchers have focused on the transition of passive music listening to interactive music–making in the music therapy treatment of pre–term
infants (Ettenberger & Ardila, 2018; Haslbeck, 2014; Malloch et al., 2012). Some of these interventions promote the development of *communicative musicality* (Haslbeck, 2014; Malloch et al., 2012; McLean, 2016; Shoemark, 2016) to decrease isolation of pre–term infants, increase responsivity to interactions with the music therapist and their parents and develop self–regulation skills (Haslbeck, 2014; Malloch et al., 2012). Songwriting is another active–music making method that may be used to engage pre–terms infants and their parents in the creation of a strong bond (Ettenberger & Ardila, 2018). These kinds of music therapy interventions will be explored for inclusion in the existing music therapy model for pre–terms infants in the NICU.

This critical review of the literature is organized into three parts. The first part provides an overview of the needs of preterm infants, the standard care they receive in the NICU, and the influence of music therapy combined with standard care. The second section describes considerations and interventions for creating secure parent–infant attachments. The third part outlines an expansion of a current developmental model of music therapy to include methods that emphasize creativity and active music–making to support self–regulation and healthy attachments between infants and their parents.

“Though NICU–MT has strong evidence and research base showing benefits for premature infants, it is not yet a standard of medical care in the U.S.” (Standley, 2014, Overview section, para. 3). Incorporating music therapy in the NICU provides preterm infants and their parents with a holistic approach to treatment. Medical needs such as feeding (Standley, 2012) and stress reduction (Loewy et al., 2020) can be addressed in music therapy. Parent–infant bonding (Ettenberger & Ardila, 2018) and self–regulation (Haslbeck, 2014; Malloch et al., 2012)
represent goals that are not medically based but still provide the infant and their parents with opportunities for further development. My hope is that this project will present a well-researched perspective on how treatment can be optimized for preterm infants.

**Literature Review**

Premature birth may be considered an interruption that impacts the development of the infant. The Newborn Individualized Developmental Care and Assessment Program (NIDCAP) seeks to establish a “relationship–based developmentally supportive environment for preterm infants and their families” (Als, 2009, p. 138). This program incorporates a strengths-based, family-centered approach to determine best practices for each infant receiving care in a NICU. Several researchers cite the NICU environment as a factor that can negatively influence development of preterm infants (Loewy et al., 2013; Park, 2020; Silva et al., 2018). Park (2020) states the NICU can be an overstimulating environment for preterm infants because of the lighting, sounds, and medical procedures. Overstimulation leads to toxic stress which inhibits development (pp. 24–25). Weight gain is another critical goal and preterm infants must be taught how to feed (Standley, 2012). To be discharged from the NICU, a preterm infant must manage the suck/swallow/breathe ability during feedings, demonstrate established sleep and wake cycles, and respond to environmental stimuli (Standley, 2014).

**Developmental Considerations and Interventions**

The NIDCAP was created by Heidliese Als in the early 1980s. Als (2009) provides a description of the process. It begins with a trained staff member observing the infant for 20 minutes before an interaction with the parent or another staff member. This interaction may be
a routine medical procedure, diaper change, or feeding. The observation continues for the length of the interaction and for 20 minutes after the interaction. Stress and self-regulation behaviors of the infant are recorded on a form during this observation period. An individualized program of care is then determined based on the behaviors exhibited by the infant. This may involve environmental adjustments such as lower noise levels, lowering the lights around the infant when possible, or positioning the infant a certain way when during diaper changes, feedings, or when taking vital signs.

Als (2009) notes that co-regulation is the central concept in the NIDCAP model (p. 142). Co-regulation is grounded in the idea that forming secure attachments with caregivers positively impacts neurodevelopment. “The developmental NIDCAP framework sees infants, parents, and professional caregivers engaged in continuous co-regulation with one another, and in turn with their physical and social environments” (p. 145) Essentially, the belief is that humans have evolved to learn from other humans within the context of their environment. In practice, NIDCAP involves the parents of the infant as active participants in their child’s care. Specifically, NIDCAP encourages and teaches parents to observe their child’s behaviors and respond accordingly, prioritize consistent sleep, connect through touch, and promote non-nutritive sucking (NIDCAP Federation International, 2020). Recent research supports these findings as well (Park, 2020; Silva et al., 2018; Standley, 2012; Welch et al., 2015).

**The NICU Environment, Minimizing Stress, and Promoting Sleep**

Silva et al. (2018) provide a review of the literature regarding approaches to developmental care aimed at minimizing stress for preterm infants in the NICU. The researchers
note that the NICU environment is inherently stressful due to the medical procedures that preterm infants require (p 117). Specifically, Silva et al. state, “Indicators of stress during the neonatal period should be identified and managed by environmental strategies that support biobehavioral self–regulation of the neonates to minimize the negative impacts of stress on development” (p. 118). Several strategies to modify the NICU environment and decrease infant stress are described.

Silva et al. (2018) highlight massage therapy, skin to skin contact between parent and infant, therapeutic touch, sound interventions, and modifications of the NICU environment (p. 118–119). The goals of these approaches include increasing amount of time spent sleeping, decreasing alert states and crying, and regulating heart rate and breathing. Massage therapy, skin to skin contact, and therapeutic touch resulted in more time spent asleep, regulated heart rates, and decreased periods of agitation and crying. Two separate sound interventions, not specifically defined as music therapy, include playing recorded maternal sounds and live harp music. The infants had lower heart rate in response to the maternal sounds (p. 123). Regular breathing patterns and decreased cortisol levels were found in response to the live harp music (p. 123). Environmental modifications included placing goggles and ear muffs on the infants to reduce the amount of sensory input, though this method proved not to be effective as it resulted in increased heart rates in preterm infants (p. 122). The external factors, light and sound, may need to be adjusted in the NICU itself to have a positive effect. The developmental approaches described in the review note the importance of increasing amount of time spent sleeping, decreasing alert states and crying, and regulating heart rate and breathing.
As previously mentioned, NIDCAP promotes the importance of sleep for preterm infants. Park (2020) describes the two different sleep states and the impact each state has on infant brain development. An infant in active sleep has their eyes closed with rapid eye movement (REM), an irregular breathing pattern, and random motor movements. Neural connections are created in the sensory processing areas of the brain during active sleep. Quiet sleep is defined by closed eyes with no movement, a regular breathing pattern, and no motor movements. During quiet sleep, the brain processes information from the waking state, growth hormones are secreted, and the body can heal. Increasing the amount of time spent sleeping is critical for the development of preterm infants.

**Self-Regulation**

Lien (2020) recognizes the general importance of stabilizing cardiac and respiratory systems of preterm infants to ensure that oxygen can be supplied to different areas of the body for proper development (p. 260). She specifically discusses neurocritical care, an approach that supports preterm infant brain development. In the NICU, neurocritical care involves monitoring the steady delivery of blood and oxygen to the brain using a noninvasive device called cerebral near-infrared spectroscopy (p. 262). Lien also notes the importance of feeding for supplying the brain with necessary nutrients and increased weight gain (p. 264).

Music therapy interventions can influence both oxygen saturation and feeding behaviors. Loewy et al. (2013) studied the effects of three live music therapy interventions on preterm infant heart rates, sucking behaviors, sleep patterns, and caloric intake. Live singing of a parent-selected lullaby showed to increase the amount of time that preterm infants spent in
active sleep and increased caloric intake over a 2-week period. Entrained breathing sounds were created by following the infants’ breathing patterns using an ocean drum, an instrument that mimics sounds of the womb. This intervention resulted in increased oxygen saturation and prompted the infants into a quiet-alert state. Entrained heartbeat sounds were created using an instrument called a gato box, which lowered the infants’ heart rates and influenced intermittent sucking behavior. Intermittent sucking allows infants the opportunity to pause to breathe while feeding to avoid choking. This study shows that entrained sounds and live singing, when implemented by a music therapist, can positively influence a preterm infant’s ability to self-regulate. These areas of self-regulation are necessary for premature infants to be discharged from the NICU (Standley, 2014).

**Developing Feeding Behaviors**

Weight gain is another important goal for preterm infants. An infant typically must weigh at least 4.5 pounds to be considered for discharge from the NICU (Standley, 2014). As previously mentioned, an infant’s ability to manage the suck/swallow/breathe ability is critical for growth and development. According to Standley (2012), “the suck-swallow-breathe coordinated response necessary for nipple feeding is not neurologically possible until 34 gestational weeks” (p. 380). Infants born prior to 34 gestational weeks are fed by a tube connected to the stomach and therefore must learn how to use their mouths to feed before discharge (p. 380). First attempts at oral feeding can be stressful for a preterm infant and result in increases in heart rate and episodes of respiratory distress (p. 380). Opportunities to
encourage non-nutritive sucking, such as using a pacifier, can help infants when it is appropriate to transition to oral feeding (p. 379).

Standley (2012) discusses the use of contingent music to encourage non-nutritive sucking behavior in preterm infants. Contingent music for non-nutritive sucking is a process by which a pacifier activates a lullaby to be played as the infant sucks. Essentially, the lullaby serves as reinforcement for proper sucking behaviors. The pacifier activated lullaby (PAL) device only plays music when the infant sucks on the pacifier with the amount of strength and pressure needed to transition to oral feeding (p. 380). Contingent music for non-nutritive sucking has proven to be most effective when implemented before feeding sessions to improve oral feeding ability (p. 381).

**Increasing Stimulation Tolerance**

Music therapy may be used to increase stimulation tolerance beginning when infants reach 30–32 weeks gestational age (Martin, 2018; Gooding, 2010; Standley, 2014). Music and multimodal stimulation (MMS) is a developmental method created by Jayne Standley in 1998 (Gooding, 2010; Whipple, 2005). To begin MMS, an infant is picked up from the incubator or crib and held. Auditory stimulation in the form of quiet lullaby humming is introduced first followed by tactile stimulation with moderate pressure. A slow and steady rocking motion to increase tolerance to vestibular stimulation is added then followed by a repetition of the tactile stimulation procedure. Eye contact is made throughout the session to increase tolerance to visual stimuli.
Whipple (2005) notes that each form of stimulation (auditory, tactile, vestibular, visual) is considered cumulative and introduced in intervals of about 30 seconds to allow the infant to maintain homeostasis. Signs of overstimulation are monitored throughout the intervention and stimulation may be withdrawn for 15 seconds, allowing the infant to reach homeostasis again (p. 101). Each MMS session lasts for about 15–30 minutes and does not exceed 60 minutes.

Minimizing stress and overstimulation (Loewy et al., 2013; Park, 2020; Silva et al., 2018) and facilitating conditions for sleep (Lien, 2020; Park, 2020) are primary considerations to create an environment where preterm infants can thrive. Creating opportunities for self-regulation (Loewy et al., 2013), teaching independent oral feeding (Standley, 2012), and increasing stimulation tolerance (Martin, 2018; Gooding, 2010; Standley, 2014; Whipple, 2005) through music therapy can help preterm infants develop further and meet discharge requirements. Parental attachment and social development are two additional areas for consideration in the care of preterm infants.

**Considerations and Interventions for Attachment and Social Development**

Als (2009) recognizes the influence of co-regulation on improved neurodevelopment, social, and behavioral outcomes for preterm infants (p. 142). She states, “infants are now recognized as complex, responsive, and active in eliciting social and sensory stimulation, while they attempt to regulate their own thresholds of reaction and response” (p. 136). This perspective supports the idea that infants engage with adults and seek out opportunities for stimulation to grow and develop.
Yoldas et al. (2020) hypothesized that neurodevelopmental outcomes for premature infants would be influenced by parents’ experiences of postnatal depression, attachment style, and perceived social support. Ninety-six preterm infants were included in the study. Parents were asked to fill out the Edinburgh Postnatal Depression Scale (EPDS), Adult Attachment Style Scale (AASS), and the Multidimensional Scale of Perceived Social Support (MSPSS) when their child reached a corrected age of 3 months. Infant development was measured using the Bayley Scales of Infant and Toddler Development III at a corrected age of 6 months and 18 months.

Yoldas et al. (2020) note, “In depressed parents, responsive parental behavior is reduced, the quality of the parent–child relationship is disturbed and child development is affected adversely” (p. 2). Specifically, the researchers found that postnatal depression (PND) was more often reported by mothers. Infant cognitive development was negatively impacted when the father also experienced PND. This may be because depressed parents tend to be less responsive. Infant language development was negatively impacted in families where the mother exhibited an anxious/ambivalent attachment style. PND and anxious/ambivalent attachment styles were thought to be caused by a lack of bonding opportunities while the infant received treatment in the NICU. The researchers state that social support may be a protective factor in decreasing parental PND and strengthening attachments between parent and child, though more research is needed to confirm these findings. Ultimately, the researchers conclude, “Efforts to improve the developmental outcomes of premature infants should include parental well-being” (p. 9). Developmental interventions and music therapy methods to support families and infant development are described in the following sections.


**Delivery Room Skin-to-Skin Contact**

Hucklenbruch–Rother et al. (2020) studied the effects of mother–infant skin-to-skin contact in the delivery room on long-term expression of stress response genes in preterm infants (p. 1). The researchers first hypothesized that 1 hour of delivery room skin-to-skin contact (DR–SSC) between mothers and their preterm infants would influence stress response genes compared to infants who only received 5 minutes of visual contact (VC) with their mother following birth (p. 2). A second hypothesis included that the changes that occurred in the stress response genes would show changes within the HPA axis, the part of the brain that responds to stress, and that this would influence mother–infant interactions at 6 months corrected age (p. 2).

Eighty-seven infants were randomized into either the DR–SSC group (44 infants) or the VC group (43 infants) and 77 of these infants (39 DR–SSC and 38 VC) participated in the follow-up at 6 months (Hucklenbruch–Rother, 2020, p. 3). Blood samples were taken of infants in each group prior to discharge from the hospital. According to the analysis, three of the six stress response genes that were studied were lower in the DR–SSC group compared to the VC group (p. 4). Videos of the mothers and infants were taken at 6 months and analyzed. It was found that infants from the DR–SSC group were more responsive to their mothers than the infants in the VC group (p. 5) Hucklenbruch–Rother et al. (2020) therefore concluded that 1 hour of DR–SSC influences both the expression of stress response genes and improved mother–infant interactions at 6 months. The researchers cite the lack of healthy term infants as control
subjects and the uncertainties surrounding correlation of stress response genes to structural changes in the brain to observed interactions as limitations of the study (p. 6).

To summarize, the DR–SSC infants received an hour of physical touch immediately after birth were found to have fewer stress response genes and improved interactions with their mothers at 6 months (Hucklenbruch–Rother, 2020). The research conducted by Hucklenbruch–Rother et al. (2020) shows that there may be a link between physical touch, self–regulation, and attachment. It may be beneficial for future research to include the other parent or caregivers to understand the impact of multiple attachments on the infant’s development.

**Family Nurture Intervention**

Welch et al. (2015) hypothesized the Family Nurture Intervention (FNI) would improve the social behaviors, attention, and brain development of preterm infants at a corrected age (CA) of 18 months. FNI is “designed to overcome the maladaptive conditioning effects of maternal separation and the NICU environment on the premature infant… by facilitating an emotional connection and by establishing an adaptive classical homeostatic conditioning routine referred to as the *Calming Cycle*” (p.1203). FNI sessions involved a Nurture Specialist working with mothers on how to interact with their child while in the NICU. Components of FNI include a scent cloth exchange, speaking to their child about their feelings, and maintaining eye contact and physical contact throughout each session (p. 1204). Essentially, each part of the session involves connecting through four of the five senses. The scent cloth exchange involves two cloths: one that the mother has kept under her shirt and the other that has been under the infant’s head which are switched during the session so that mother and child feel connected
through that sense of smell. FNI sessions include skin-to-skin and non-skin-to-skin holding when the infant is stable enough. The goal of these interactions is to establish the calming cycle between mother and infant.

Welch et al. (2015) randomly assigned infants to receive FNI or standard care (SC) during their stay in the NICU. One hundred and fifty infants with a gestational age (GA) of 26 to 34 weeks were included in the study; 72 were placed in the SC group and 78 were placed in the FNI group (p. 1203). Infants with major congenital defects or very low birth weight were excluded from the study. Mothers who were either under the age of 18, did not speak fluent English, had current or prior substance use or mental illness, or did not have another adult at home were excluded from the study. No fathers or other caregivers were included. The reasons for the inclusion and exclusion criteria are not noted in the study.

Welch et al. (2015) found that the infants in the FNI group, those who had the opportunity to develop a calming cycle and emotional connection with their mothers through structured interactions, showed better scores on the assessments of social-relatedness, attention, and brain development than infants in the SC group at a CA of 18 months (pp. 1205–1208). Based on these findings, Welch et al. concluded that “establishing a calming cycle routine with emotional connection between mothers and premature infants in the NICU improves neurodevelopmental and socioemotional functioning in toddlers” (p. 1208). The researchers do note, however, that the inclusion criteria for this study and the smaller sample size at the follow-up may make it difficult to generalize the results (p. 1208). Replications of this study with diverse populations and larger sample sizes would be beneficial to the field.
Experiences of Emotional Closeness

Thomsen et al. (2020) conducted a review of the literature regarding parents’ experiences of emotional closeness to their preterm infants in the NICU (p. 1). The purpose of the review was to identify situations that allowed parents to have a sense of emotional closeness to their child (p. 2). Three main themes emerged from the literature: “embodied connections” (p. 4), “inner-knowing” (p. 9), and “evolving parental role” (p. 10). Embodied connections were defined as physical situations that influenced emotional closeness (p. 4); these included opportunities for physical contact and feeding. Inner-knowing was defined as a cognitive process that allowed the parents to be updated on the health status of their child and understanding the differences in reactivity of preterm infants compared to term infants (pp. 9–10). The evolving parental role theme was defined as actions that made parents feel like the primary caregivers of their child and included observing the effect that feeding and holding had on their child’s health, advocating for their child’s needs, and being acknowledged as a parent by the NICU staff (p. 10).

Thomsen et al. (2020) noted that findings may not be generalizable across all settings as the data included came from high income to upper-middle income countries and ethnicity was not always reported in the literature. Including diverse perspectives of parental emotional closeness may lead to more experiences and situations than those studied so far. Thomsen et al. provide an important perspective on the parents’ side of attachment and bonding in the first few weeks of their child’s life. Implications for practice include implementing a family-centered
approach within the NICU environment to allow for situations where parents can feel emotionally close to their infant (p. 12). Emotional closeness is critical for the attachment between parents and infant.

**Music Therapy Models: Family–Centered, Creative, and Relationship–Based**

**Combining NICU–MT with Developmental Care**

Standley (2014) created a model of NICU music therapy with three stages: survival/pacification, cautious stimulation, and interactive/discharge. Each stage is based on the infant's age in gestational weeks and includes music therapy interventions that are developmentally appropriate.

**Survival/Pacification Stage.** The goal of music therapy treatment during the survival/pacification stage (23–30 gestational weeks) is to prioritize the infant's survival and assist in keeping the infant calm (Standley, 2014, NICU Clinical Treatment section, para. 2). Standley (2014) notes, “The medical community advocates the following during the survival pacification stage: no touching, no interacting, and no disturbance of sleep” (NICU Clinical Treatment section, para. 2). Music therapy interventions in this stage involve quietly singing or humming lullabies to create a calming environment for the infant that covers the noise of the NICU to promote sleep.

**Cautious Stimulation Phase.** The cautious stimulation phase (30–34 gestational weeks) introduces the infant to a minimal amount of stimulation (Standley, 2014, NICU Clinical Treatment section, para 3). During this phase, receptive music therapy (music listening) may be combined with kangaroo care which is skin-to-skin contact between the infant and a primary
caregiver. Music and multimodal stimulation (MMS) can begin based on the infant’s tolerance of initial stimulation and appears ready to integrate auditory, visual, tactile, and vestibular stimulation.

**Interactive/Discharge Phase.** The interactive/discharge phase (34–40 gestational weeks) centers on developing social behaviors and preparing the infant to be discharged from the NICU (Standley, 2014, NICU Clinical Treatment section, para. 4). The infant must be able to establish sleep/wake cycles, coordinate the suck/swallow/breathe ability during feedings, and tolerate and respond to stimuli. Receptive music therapy may be used to help transition the infant between alert and sleep states. Contingent music therapy using the pacifier–activated lullaby (PAL) can be used to develop feeding behaviors. Music and multimodal stimulation (MMS) can help infants tolerate stimuli. This is also the phase when family-oriented music therapy interventions are most effective to begin developing social behaviors and creating secure attachments with caregivers.

*Creating Secure Attachments in Music Therapy*

Several music therapy theories and methods exist to allow opportunities for infants and parents to create secure attachments to facilitate healthy infant development. Standley and Gutierrez (2020) and Ettenberger et al. (2017) advocate for family-centered models of music therapy in the NICU. Malloch et al. (2012), McLean (2016), and Shoemark (2016) highlight the potential of communicative musicality to influence familial intimacy, social development, and neurodevelopment. Haslbeck (2014) and Haslbeck et al. (2020) discuss a creative music therapy (CMT) approach to enhance co-regulation between parents and infants and influence
neurodevelopment, respectively. Ettenberger and Ardila (2018) also take a CMT approach by using songwriting in the NICU. The key concept found in each of these methods is the use of live music therapy.

**Family–Centered Music Therapy.** Standley and Gutierrez (2020) describe several family-centered music therapy interventions that can be used to facilitate parental well-being and infant development. NICU music therapists (NICU-MTs) can create lullabies with mothers of preterm infants. These lullabies are sung by the mother and recorded so that they may be played for the infant when the mother cannot be in the hospital. NICU-MTs may also teach parents how to bond with and soothe their child using infant-directed singing. This is significant because “the ability to self-regulate when upset is a skill that develops early in life and is influenced by interactions of co-regulation between caretakers and infants” (p. 44). Music therapy can also be a place to help parents process their experiences in the NICU and reduce stress. Parental well-being influences healthy infant development.

Ettenberger et al. (2017) focus on ways of supporting parents and their infants in the NICU through music therapy. Parents may experience stress in a variety of ways when their child is born premature. Worries about the child’s survival, health outcomes, and longer periods of separation can impact how parents interact with their infant. According to Ettenberger et al. (2017), “lower responsiveness, increased stress or depressive symptoms are again associated with insecure attachment patterns” (p. 208). Engaging in live music therapy offers parents an opportunity to create a relationship with their baby. Additionally, “Experiencing positive moments during a period of increased stress could also counterbalance some of the emotional
disturbances that parents normally go through in the NICU, and thus act as a reinforcing factor for coping and trauma prevention” (p. 208).

Ettenberger et al. (2017) hypothesized that live music therapy during kangaroo care would positively impact the physiological function of preterm infants, help parents manage stress, and improve the relationship between parents and their infant. Kangaroo care is a skin-to-skin contact intervention that involves placing the infant on the parent’s bare chest. Thirty-three mothers, 17 fathers, and 36 infants born between 28 to 34 weeks, including three pairs of twins, were selected to participate in the music therapy (MT) group based on medical stability and having already started kangaroo care. These infants also received standard care. The control group received only standard care. Most of the MT sessions involved the music therapist and parent(s) singing songs that were familiar and meaningful to the family. The songs were modified to be appropriate for the infant’s developmental stage. This meant changing the meter, tempo, and simplifying the harmonic structure as needed. Some MT sessions were receptive which meant the music therapist improvised music on guitar to create a calming environment.

Ettenberger et al. (2017) found that the infants in the MT group gained more weight per day, left the hospital almost 2 days earlier, and fewer hospitalizations after 4 months compared to the control group. The researchers note, however, that length of stay and subsequent hospitalizations were not statistically significant. They also report difficulty in measuring heart rate and oxygen saturation during the music therapy interventions because of how the infants were repositioned during kangaroo care. The researchers interviewed parents to get their
perspective on whether or not music therapy helped them to manage stress and connect with
their child. Parents stated feeling relaxed during MT sessions. More specifically, mothers noted
being able to forget about their worries during MT sessions whereas fathers mentioned being
able to forget they were in a hospital. Parents in the MT group also reported they felt more
connected with their child during the sessions and that participating in music therapy helped
them learn how to interact and soothe their baby. These responses are significant, as the
researchers state:

During MT, parents had many opportunities to get to know their babies’ preferences and
frequently noticed their gestures or changes in behaviours. Being sensitive to the
neonates’ behavioural cues and detecting their readiness for stimulation or their need
for relaxation is very important for the baby’s development. In return, the positive
behavioural feedback that parents receive from their babies after an adequate
stimulation can evoke feelings of love, joy or confidence that motivate parents in the
often difficult path of bonding in the NICU. (p. 227)

Music therapy allowed parents the opportunity to relax, bond with their baby, and learn how to
calm their child.

**Communicative Musicality in the NICU.** Mclean (2016) and Shoemark (2016) discuss the
concept of fostering familial intimacy through communicative musicality, a theory originally
developed by Colwyn Trevarthen and Stephen Malloch in 2009. Shoemark (2016) defines
musicality as “the innate musical part of each person” (p. 1). This musicality may be observed in
infant-directed speech, a phenomenon that occurs when parents speak to their baby. Shoemark
states, “The melody of our voices tells them if we are inviting them to play with us (voice goes up like a question), soothing them (voice goes down), or just helping them to be okay (voice stays flat)” (p. 2). Infants pick up on these musical cues, attune, and respond to their parents using sound, facial expressions, and gestures. McLean (2016) observed these interactions and noted that “Musical moments were perceived by these parents as physically intimate and exclusive and involving a rich emotional exchange with their baby that supported a sense of human connection” (p. 8). Communicative musicality allows for the development of the parent–child relationship by creating space for emotional connection.

Malloch et al. (2012) examined the effect of a music therapy intervention based on the communicative musicality theory on the social and neurological development of late–preterm and full–term infants. In the communicative musicality model, the researchers state, “The shared sense of time is expressed by both the sensitive caregiver and infant through mutually contingent gestures, expression, and timing, which in turn enhance the infant’s ability to modulate feeling states” (Malloch et al., 2012, p. 387). Twenty hospitalized infants, born full–term, were randomized into two groups: 10 in the NICU–music therapy (NICU–MT) group and 10 in the NICU–no music therapy (NICU–noMT) group. Nineteen healthy infants comprised a second control group that did not receive music therapy. According to Malloch et al. (2012),

The MT protocol was presented by the same qualified and experienced music therapist throughout (the second author). Guided by the stable parameters of lullabies and playsongs, the therapist consciously manipulated melody, register, dynamics, tempo,
timbre, attack, and silence to provide the infant with contingent interaction and a balance between stimulation and support in the moment. (p. 390)

Sessions occurred three times a week. The length of the sessions varied based on the infant’s tolerance and the average length was 52 minutes.

Malloch et al. (2012) reported that infants in the NICU-MT group cried less, were less irritable and dysregulated, and seemed overall more positive to interactions with adults following the music therapy session (p. 395). The researchers note, however, that the small number of participants, the short length of observation time, and the number of MT interventions used in each session present limitations of this study. Replication with larger sample sizes would be helpful to confirm the findings. While the infants in this study were not born premature, they were critically ill and receiving care in the NICU environment. A long-term version of this study with the preterm infant population is necessary to clarify the findings related to premature birth.

Creative Music Therapy. Ettenberger and Ardila (2018) state, “The construction of positive emotional bonds between parents and their newborn is the basis for a nurturing parent–infant relationship and essential for the baby’s long-term development” (p. 42). The researchers hypothesized that songwriting in music therapy would influence bonding and maternal anxiety, depression, and overall mental well-being. The songs were created over the course of four to six music therapy sessions and centered on welcoming the baby. Parents were encouraged to think about what they wanted to tell their child and could include messages from other family members. Fifteen mother–infant dyads participated in the study. The mothers were
asked to complete three questionnaires before the first music therapy session, during the process of music therapy, and after the final session. The questionnaires included the Mother–to–Infant Bonding Scale (MIBS), the Short Warwick–Edinburgh Mental Well–Being Scale (SWEMWBS), and the Hospital Anxiety and Depression Scale (HADS). Mothers also participated in semi–structured interviews after the final music therapy session.

Ettenberger and Ardila (2018) found that songwriting in music therapy positively impacted mother–infant bonding and levels of anxiety and depression among mothers. Mental well–being was found to be unaffected by the intervention. The interviews yielded three themes: bonding, maternal well–being, and empowerment. The researchers report

The mothers stated that they felt more connected to their babies during music therapy and that their babies understood what they wanted to express to them through their song... That mothers could relax during music therapy was the most frequently mentioned statement... Most mothers identified that music therapy was beneficial for their baby and helped them in their stimulation or relaxation, for soothing them when they were crying or for helping them in transitioning more easily to sleep. (p. 46)

Feeling connected, being able to relax, and feeling empowered by taking an active role in the care of their infants allowed mothers to benefit from songwriting in music therapy. Further replication of this study with a larger sample size would be helpful in confirming the effectiveness of songwriting for preterm infants.

Haslbeck (2014) conducted and then analyzed video footage of creative music therapy (CMT) sessions with 18 preterm infants and their parents. The music therapy sessions
prioritized improvisation through communicative musicality. The first step involves assessing
the infant’s state by observing their breathing pattern, their facial expression, and any
movements. The music therapist and parents then responded to the infant’s sounds and
behaviors with infant-directed humming with the goal of physiological entrainment with the
infant. This approach, therefore, is unique to each infant. “As a result, infants were capable of
achieving self-regulatory balance, orienting and engaging in subtle relatedness” (p. 44).
Haslbeck emphasizes the role that creativity played in facilitating moments of responsiveness,
communicative musicality, and empowerment of both the parents and the infant. She
concludes:

CMT may not only act as a treatment approach by reducing acute stress and
empowering premature infants and their parents during hospitalization, it may also be
seen as a preventative therapeutic approach, by promoting the quality of parent–infant
interactions from the very beginning, thereby decreasing the risk of long–lasting
problems in the parent–infant attachment process, socio–emotional difficulties in the
infant, and even infant abuse. (p. 55)

CMT seems to be successful as a preventative measure because parents can be shown how to
interact with their child with the support of the music therapist. While in the hospital, CMT can
help reduce parent and infant stress and reduce the effects of parental separation.

Haslbeck et al. (2020) hypothesized that CMT could also be used as a
neurodevelopmental intervention. They note that “socio–emotional and auditory deprivation
and the stressful environment in the neonatal intensive care unit (NICU) may negatively impact
brain maturation” (p. 1). CMT, however, may enhance brain development by providing individualized stimulation. Eighty-two infants were randomized into two groups: the CMT group received CMT and standard care and the control group received standard care only. CMT sessions took place two to three times per week and lasted about 20 minutes each with each infant receiving a total of eight sessions. Some sessions involved the parents during kangaroo care and others were conducted with the infant alone.

Haslbeck et al. (2020) report that CMT sessions appeared to facilitate increased connectivity between areas of the brain associated with movement, planning, and word production. They state, “In general, increased connectivity in the prefrontal cortex is associated with higher-order cognitive functions that are often impaired in preterm infants such as inhibition, working memory, cognitive flexibility, and planning” (p. 9). Therefore, CMT may be used to enhance parent–infant attachment and neurodevelopment. The researchers conclude that CMT “has beneficial effects on functional brain activity and connectivity in networks underlying higher-order cognitive, socio-emotional, and motor functions in preterm infants” (p. 11). The researchers state that a long-term study is necessary to confirm the results and investigate whether this connectivity impacts future development.

Family-centered music therapy, communicative musicality, and creative music therapy are approaches to NICU-MT that prioritize connection, attachment, creativity, and communication. These goals may be met through infant-directed humming or singing and songwriting during music therapy sessions. Parental well-being is the focus of family-centered care. Managing parent stress can be considered a protective factor in that parents are more
emotionally available to create secure attachments with their child, which in turn is a protective factor for enhanced neurodevelopment.

**Discussion**

The purpose of this capstone thesis was to provide evidence for the use of music therapy to optimize treatment for preterm infants. The approach for completing this review was based on combining a developmental perspective of NICU care with newer research to put forth updated treatment recommendations for preterm infants. Music therapy has been shown to influence neurodevelopment (Gooding, 2010; Haslbeck et al., 2020; Standley, 2014; Standley & Gutierrez, 2020), self-regulation (Loewy et al., 2013; Whipple, 2005), and parent–infant bonding (Ettenberger & Ardila, 2018; Ettenberger et al., 2017; Haslbeck, 2014; Malloch et al., 2012; McLean, 2016; Shoemark, 2016). Family–centered models of music therapy are similar to established standard care procedures in the NICU such as NIDCAP (AIs, 2009) and Family Nurture Intervention (Welch et al., 2015). Music therapy programs, then, may be incorporated into the NICU to provide more support for preterm infants and their families.

The research on family–centered music therapy models, communicative musicality, and creative music therapy included in this review can be incorporated into Standley’s developmental model of music therapy. Infants in the interactive/discharge phase of the model are developmentally ready to engage in such interventions. As previously mentioned, the ability to respond to stimulation, reciprocate social interaction, and create secure attachments with caregivers are part of the goals for discharge from the NICU (Standley, 2014). NICU music therapists can teach parents how to interact with their child creatively through infant–directed
humming or singing. This has been shown to increase feelings of connection and empowerment among parents of preterm infants (Malloch et al. (2012); McLean (2016); Shoemark (2016); Haslbeck, 2014). Parental well-being may be improved by engaging in the process of writing a song for their baby (Ettenberger & Ardila, 2018). A family-centered approach to music therapy in the NICU that includes creative, active music making interventions such as communicative musicality and songwriting can enhance neurodevelopment and the preterm infant’s ability to self-regulate and form attachments with caregivers.

Limitations of this review include a bias towards the importance of attachment theory and a narrow perspective of how to include recent research into a developmental model of music therapy. Secure parent-child attachment is likely not the only protective factor concerning healthy development for preterm infants. Similarly, Standley’s developmental model is not be the only model of NICU music therapy that can incorporate family-centered practices, communicative musicality, and creative music therapy. Future areas of research may look at other theories of development and other models of NICU music therapy.

Despite these limitations, this literature review presents evidence and treatment recommendations as rationale to create NICU music therapy programs. This is a newer area of medical music therapy and therefore not many NICUs offer music therapy services in the United States at this time. Music therapy as standard care in the NICU can optimize treatment for preterm infants.
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