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Running head: MUSIC THERAPY WITH PREMATURE INFANTS

Music Therapy with Premature Infants and their Parents in the NICU Setting

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Abstract

Music therapy research with premature (or pre-term) infants in the Neonatal Intensive Care Unit (NICU) setting began over 25 years ago, and has expanded to include music therapy with premature infants, music therapy with parents of premature infants, and music therapy with both premature infants and parents combined. This literature review demonstrates the importance of continued research in this field to improve physiological, psychological, social, and behavioral health outcomes for premature infants and their parents. Current music therapy research has established the success of certain music therapy interventions, such as the Pacifier Activated Lullaby (PAL), Rhythm, Breath, Lullaby (RBL), Auditive Stimulation, and Multimodal Stimulation. These interventions, along with many others discussed in this literature review, indicate how music therapy can improve premature infant health concerns such as: decreased oxygen saturation, increased heart rate, challenges with oral feeding, hyperarousal, pain management, sleep difficulties, inconsolable crying, and difficulty establishing secure attachment with parents and/or caregivers. Music therapy in the NICU is underutilized within hospitals in the United States, and this literature review describes the many benefits to both premature infants and their parents, and why Neonatal Intensive Care Unit-Music Therapy (NICU-MT) should be a standard of hospital care across the United States.

Keywords: music therapy, premature infants, NICU, parents, health, interventions, family-centered care, literature review

This Capstone Thesis discusses the use of music therapy with premature (or pre-term) infants and their parents in a Neonatal Intensive Care Unit (NICU) setting. Music therapy with this population can be complicated due to the various health concerns with these infants, and special training is required for music therapists (Standley, 2014). Music therapy interventions in the NICU, such as Jayne Standley's Pacifier Activated Lullaby (PAL), can decrease the length of time a preterm infant stays in the hospital (Standley, 2012). While a decreased length of stay (LOS) is beneficial for the infant, the decreased LOS also economically benefits the hospitals. NICU facilities are incredibly expensive to operate, and every infant that has a decreased LOS reduces the cost for the hospital (Standley & Swedberg, 2011). Music therapists, and music therapy interventions, can play an important role in decreased LOS, which indicates that music therapists in the NICU are also an economic benefit to hospitals (Standley, 2014).

Research in Neonatal Intensive Care Unit-Music Therapy (NICU-MT) began over 25 years ago, and has now amassed a strong body of evidence based research that demonstrates the effectiveness of music therapy with this population (Standley, 2014). One of the goals of music therapy research in this field is to increase the "medical acceptance of music therapy as integral to NICU care and outcome" (Standley, 2014, Need for Conceptual Continuity, para. 1). Existing music therapy research has been shown to improve feeding in premature infants, improve sleep, decrease stress, reduce pain, decrease crying, improve the parent-child bond, increase growth, and decrease length of stay in the hospital (Allen, 2013). Much of the existing research is focused on improving physiological aspects of the preterm infant's health, such as breath rate, heart rate, and ability to sleep. More recently, researchers are exploring music therapy with parents of preterm infants and their babies in a family-centered model (Haslbeck, 2014; McLean, 2016; Shoemark & Dearn, 2008; Shoemark, Hanson-Abromeit, & Stewart, 2015). This

demonstrates the effectiveness of music therapy to improve social and/or emotional goals, and physiological outcomes as well. This literature review will describe the numerous benefits to using music therapy in the NICU, both for infants and their parents, in addition to some of the interventions utilized by music therapists in this setting such as live music, pre-recorded music, auditive stimulation, creative music therapy, and the PAL. Multiple researchers agreed that live music therapy is more beneficial than pre-recorded music, but when a music therapist is not available, recordings can also make a significant difference to the infant (Garunkstiene, Buinauskiene, Uloziene & Markuniene, 2014; Standley, 2014).

For the purposes of this literature review, I divided music therapy in the NICU setting into three subcategories: music therapy with pre-term infants, music therapy with the parents of pre-term infants, and music therapy with pre-term infants and parents together.

Music therapy with pre-term infants is primarily focused on the infant's physiological health, while also including pain management and decreased time spent crying. Standley and Swedberg (2011) researched music therapy interventions such as the PAL and multimodal stimulation and how they impacted LOS, heart rate, breath rate, oxygenation, and ability to feed orally. Loewy, Stewart, Dassler, Telsey, and Homel (2013) researched Lowey's Rhythm, Breath, Lullaby (RBL) intervention, and its effects on calming the infant, which increased time spent in homeostasis, and decreased hyperarousal/stress. Shoemark et al. (2015) and Chou, Wang, Chen, and Pai (2003) wrote about music therapy and pain management, and using music therapy during painful procedures, respectively. Music therapy was shown to have a significant impact on pain management in pre-term infants with fewer side effects, when compared to pharmacological methods (Shoemark et al., 2015). Keith, Russell, and Weaver (2009) researched music therapy and inconsolable crying. When the infant spends less time crying, they increased the amount and

quality of sleep, increased eating, and decreased hyperarousal and stress (Keith et al., 2009). This allowed them to regulate their sleep/wake schedule faster and gain more weight, which allowed them to leave the NICU sooner (Keith et al., 2009).

The second category in this literature review focuses on music therapy with parents and pre-term infants. There is overlap between this section and the following, because using music therapy to support parents often involves improving their relationship with and understanding the needs of their pre-term infant. Haslbeck (2014) researched Creative Music Therapy (CMT) and its impact on parent-infant attachment. Strengthening the attachment between parent and infant can have a discernable positive impact on the infant's future social and emotional health (Haslbeck, 2014). Strengthening attachment also helped the parents feel more secure in their abilities as parents, which helped relieve and manage some of the fear that accompanied parenting a medically fragile pre-term infant (Haslbeck, 2014; McLean, 2016). Auditive Stimulation is another technique utilized in NICU music therapy, created by Monika Nöcker-Ribaupierre (2010). She researched how to use the mother's voice to strengthen the bond between mother and pre-term infant. The pre-term infant is more familiar with their mother's voice than any other sound, which means the mother is uniquely suited to help their child feel safe while in the NICU (Nöcker-Ribaupierre, 2010). Auditive Stimulation also helped the mother (and/or father) deal with the trauma of an early and unexpected birth (Nöcker-Ribaupierre, 2010).

The last category in this literature review is music therapy with parents of pre-term infants. Research with parents focused on increasing healthy attachment between parent and infant, managing the stress and trauma of an early birth, increasing parental self-esteem, and teaching parents new ways to interact with their medically fragile infant (Haslbeck, 2014;

McLean, 2016; Shoemark & Dearn, 2008; Shoemark et al., 2015). McLean (2016) wrote about the inherent musicality in all human connection, which makes music therapy ideal for building healthy and strong connections between pre-term infants and their parents.

Music therapy with pre-term infants is worthy of further research because an elongated stay in a NICU can have long lasting effects on the development of a child (Nöcker-Ribaupierre, 2010; Standley & Swedberg, 2011). Many studies have shown the emotional, physical, and relationship-building benefits to music therapy with pre-term infants (Haslbeck, 2012; Lowey, 2014; Nöcker-Ribaupierre, 2012; Shoemark & Dearn, 2008; Standley, 2012). Continued research in this area of music therapy will expand on how music therapy can support and benefit pre-term infants and their parents in significant and long-lasting ways. NICU-MT research can also help further clarify the qualifications required for music therapists to work with this population. It is important for music therapy, as a profession, to continue demonstrating how music therapy is relevant and effective within the medical community. Standley (2014) wrote about the importance of unifying the standards that music therapists must meet in order to receive certification in NICU-MT. This population is medically fragile therefore clear standards of practice are needed to determine who is qualified to work in the NICU setting. Standley (2014) commented on the biopsychosocial model of NICU music therapy currently used in Europe and Australia, and that the United States may benefit from following those guidelines (Need for Conceptual Continuity, para. 3). According to researchers, the future of NICU-MT in the United States will involve unifying the standards of care and training for NICU music therapists. Additionally, research will continue to demonstrate the importance of NICU-MT, which will potentially lead to NICU-MT as a standard of care in most hospitals across the United States and the world. Music therapy research continues to expand the scope of music and healing, and this

critical review of literature is intended to add to the body of research in the field of NICU-MT. This literature review intends to examine the current research on how music therapy impacts healing in premature infants and their parents in the NICU setting.

Issues Facing Premature Infants

Infants born prematurely face a multitude of health issues, largely determined by their gestational age at birth (Nöcker-Ribaupierre, 2012). An infant born before 37 gestational weeks (GW) is considered premature (Keith et al., 2009; & Nöcker-Ribaupierre, 2012), and the earlier an infant is born within the gestational period, the more likely the child will have to spend time in a NICU. In 2006, 12% of births in the United States were premature, and the average length of stay in a NICU was 90 days (Standley & Swedberg, 2011). Research has shown that staying in the NICU itself can have adverse effects on the premature infant's health due to the increased stress the infant experiences (Keith et al., 2009; & Nöcker-Ribaupierre, 2012). Shoemark et al. (2015) described the long-term side effects of prolonged exposure to stress:

Current research suggests that the impact of prolonged or excessive stress has the potential to result in a dysregulated response to future stressors, as well maladaptive changes in the hippocampus, prefrontal cortex and amygdala-areas which are important for learning, decision making and emotion regulation. (p. 2)

The womb protects the fetus from overstimulation and other dangers from the outside world, and when an infant is born prematurely, their bodies are not prepared to handle the onslaught of experiences. Nöcker-Ribaupierre (2012) wrote: "A premature birth forces the infant's immature sensorial and cortical systems to develop with interference. Unprotected, the infant is extremely vulnerable to all kinds of environmental stressors, which may have a harmful impact on his development" (p. 73). These infants are particularly sensitive to noise and light,

and they react with measurable stress responses such as: reduced oxygen saturation, increased rates of apnea and bradycardia, fluctuation in blood pressure, increased agitation, and crying and sleep disruption (Nöcker-Ribaupierre, 2012). Premature infants can sustain damage to their cochlea if they are exposed to sustained noise above 45dB (Loewy, 2014) and the ambient noise level in a NICU can reach up to 90dB. The isolette, or incubator, reduces noise by 10% (compared to a 45% noise reduction inside the womb), which means that the infant is not protected from dangerous levels of noise (Nöcker-Ribaupierre, 2012). Additionally, the American Academy of Pediatrics has found that monitor alarms, telephones, and the sound created by closing the incubator portholes reach levels between 100dB and 114dB (Loewy, 2014; Nöcker-Ribaupierre, 2012). In the short term, exposure to too much noise in the NICU disrupts the infant's sleep, and can lead to sleep deprivation. Exposure to such noise can also affect heart rate, blood pressure, respiratory rate, and oxygen saturation (Allen, 2013; Nöcker-Ribaupierre, 2012). Sustained exposure to dangerous noise levels can lead to hearing loss, and speech and language problems into childhood and beyond (Nöcker-Ribaupierre, 2012).

Despite the dangers of the NICU environment, some infant stress is unavoidable due to necessary life saving treatments, such as mechanical assistance with breathing and eating. One of the most common difficulties for a premature infant is respiratory distress syndrome (RDS) caused by underdeveloped lungs, which may require mechanical ventilation (Chou et al., 2003). One procedure that requires mechanical ventilation is endotracheal suctioning (which prevents airway obstruction). This procedure is stressful and painful for the infant, and can induce negative physiological responses (Chou et al., 2003). Another common challenge for premature infants is oral feeding, which may require tube feeding until the infant has developed enough to be able to nipple (breast or bottle) feed. Tube feeding can be uncomfortable for the infant so their

abdominal muscles often tense up during a feeding, which forces the formula back up the tube and prolongs the duration of the feeding (Standley, 2012).

Premature infants also face a 50% greater likelihood of having a developmental disability such as cerebral palsy, hyperactivity, and specific learning disabilities; and over 20% of premature infants have major disabilities (Standley & Swedberg, 2011). Since there are more and more infants surviving with increasingly complicated diagnoses, the goal of medicine in a NICU has changed. Nöcker-Ribaupierre (2010) wrote: “The goal of neonatal care has shifted from mere survival to the prevention of major disabilities. Accompanying studies have shown that structural and electro-physiological differences and their corollary psychological findings continue into childhood and adolescence” (p. 32). The medical issues that infants experience due to premature birth, in addition to the stress they are under during their stay in a NICU, often have long lasting effects into childhood and adulthood. This is due to their still developing nervous system, which means: “these infants have decreased self-protective and self-regulatory abilities” (Nöcker-Ribaupierre, 2012, p. 67). According to Stewart (2009a), a premature infant may face acute states of hyperarousal between 60-100 times as part of routine care. Without a mature nervous system to process the multiple instances of hyperarousal “the preterm infant is vulnerable to long-term globalized impact, due to the crucial stage of brain development coinciding with the timing of a NICU admission” (Stewart, 2009a, p. 30). Additionally, Allen (2013) wrote:

It has been found that preterm infants in the NICU are touched, positioned, examined, and manipulated more than 8-12 times over a 4-hour period to assess and evaluate their clinical status. Each of these stimuli can be viewed as a stressor by the immature system of a preterm infant, which can lead to impaired oxygenation, blood flow, heart rate, and behavioral responses. (p. 349)

Music therapy can decrease the amount of time an infant spends in a state of hyperarousal, and can ameliorate many of the negative experiences and side effects of being in the NICU.

Music Therapy Interventions with Premature Infants

Jayne Standley and the Pacifier Activated Lullaby (PAL)

Jayne Standley is one of the foremost music therapists conducting research on music therapy use in a NICU. She invented a device called the Pacifier Activated Lullaby (PAL), which is designed to help infants learn how to feed from a nipple (bottle or breast) using music as a positive reinforcement. The PAL consists of a pacifier that is connected to a device that will play music when the infant sucks on the pacifier with a predetermined strength. If the infant sucks the pacifier hard enough to meet the preset strength, music will play for 10 seconds (originally from a cassette tape player). After 10 seconds, the device resets and is ready for the infant to suck and activate the music again. The PAL decreased the amount of time it took for an infant to learn how to nipple feed, which allowed them to switch away from tube feeding earlier than infants who did not use the PAL (Standley, 2012).

Infants born before 34 GW are neurologically unable to coordinate the suck-swallow-breath response required for nipple feeding (Standley, 2012). This response ensures that a child does not try to breathe and swallow simultaneously. Without this ability, a premature infant is highly likely to aspirate their food, which is why so many premature infants require tube feeding (Nöcker-Ribaupierre, 2012). A pacifier by itself is instrumental in teaching premature infants how to suck and develop non-nutritive sucking (NNS). NNS is the first rhythmic behavior that the fetus engages in, and it appears in the third trimester of pregnancy. Standley (2012) wrote of the importance of this behavior: “NNS activates the vagal nerve causing the release of the gastrointestinal hormones that stimulate gastro-intestinal activity, growth, and production of

insulin. Insulin enhances the infant's energy economy" (p. 380). Essentially, when an infant sucks on a pacifier, hormones are released that help with digestion and energy production even though they are not actually ingesting food. Increased presence of these hormones impacted gastro-intestinal activity (Standley, 2012). Pacifiers also increased oxygenation, lowered activity levels and conserved energy, increased weight gain, increased time spent in a safe alert state (as opposed to hyperarousal), and promoted a faster return to quiet sleep (Standley, 2012). If the infant sucked on a pacifier during tube feeding, they consumed more formula, were less stressed during the feeding, and returned to homeostasis faster. When used consistently, NNS via a pacifier during tube feeding shortened the length of hospital stay by 6.3 days on average with premature infants beginning to bottle feed 2.9 days sooner (Standley, 2012). Given all of the benefits to NNS, the PAL is a meaningful music therapy intervention because it increases the success of a pacifier. Standley's (2012) study demonstrated that infants would suck for a longer amount of time with the PAL because they wanted to hear the music. Music can provide positive reinforcement for these infants developing new skills.

Music and Multimodal Stimulation (MMS)

This intervention was designed for infants who are at least 32 GW and medically stable. MMS consists of a sung lullaby to initially calm the infant, and then systematically adds tactile (massage), visual, and vestibular (rocking) stimulation (Nöcker-Ribaupierre, 2012; & Standley & Swedberg, 2011). MMS was designed to increase the infant's tolerance to multiple stimulations, and increase the infant's capacity for homeostasis (Nöcker-Ribaupierre, 2012). Standley & Swedberg (2011) stated that infants could usually learn to tolerate all three levels of stimulation in three days with one 15-30 minute treatment per day. MMS is conducted as live music therapy, with each stimulation added after about 30 seconds. Parents can also be trained to implement this

intervention (Nöcker-Ribaupierre, 2012). This provides parents a new way to act as caregiver to their infant; and allows the infant to experience music therapy even when a music therapist is not available. If a parent is trained to implement MMS, it may also have a positive impact on their parental self-esteem.

Joanne Loewy and the Rhythm, Breath, Lullaby (RBL) Intervention

Joanne Loewy created a three-part intervention called Rhythm, Breath, Lullaby (RBL) where each part can be utilized together or separately. This intervention relies on the skills of a music therapist to interact and entrain with different aspects of the infant's behavior. The Rhythm portion of the intervention refers to when a music therapist uses a gato box (slit drum) to simulate the sound of a heartbeat from inside the womb; the Breath intervention consists of a music therapist using an ocean drum to simulate the "fluid sounds of the womb" (Loewy et al., 2013, p. 906); and the Lullaby intervention is the use of a personal song chosen by the parents (a song of kin) that the music therapist sings live to the infant in order to calm them (Loewy et al., 2013). These three interventions can help an infant entrain their breathing and/or heart rate to the musical instruments. The gato box impacted infant's heart rate, and sucking and feeding behavior. Loewy et al. (2013) wrote: "It is likely that the infant's impetus and sustenance of a sucking pattern were enhanced with rhythm. The rhythm was entrained to the observed sucking meter of the infant during feeding times" (p. 909). The ocean drum has an impact on the quiet-alert state and increased oxygen saturation during and after the intervention, as well as over time (Loewy et al., 2013). The lullaby strongly impacted the infant's vital signs, particularly activity level. Loewy et al. indicated: "live vocal contact can sustain quiet-alert state. This is surmised from the fact that the HR decreased but the activity level increased" (p. 909). Loewy et al. conducted research that demonstrated how each part of the Rhythm, Breath, Lullaby

intervention, utilizing live music therapy, impacted the infant's physiological symptoms and induced a calm state in the infant.

One significant aspect of Loewy's intervention is that it consists of live music, and relies upon the relationship between the music therapist and the infant. Additionally, the parents and/or caregivers are often actively involved with this kind of intervention because they choose a song of kin for the therapist to sing. Some researchers argue that live music interventions are more successful and safer for the infant because the music therapist can adjust the music according to the infant's response in the moment (Haslbeck, 2012). This helps ensure the infant does not become over stimulated, and ensures the music remains at a safe decibel level. The inclusion of the parent in the therapeutic intervention is significant because it allows the music therapist to work therapeutically with both the premature infant and the parents and/or caregivers at the same time. Loewy's RBL intervention fostered emotional connection between the parents and/or caregivers and the infant, and can teach the parents and/or caregivers how to implement some of the interventions themselves (Loewy et al., 2013).

Music Listening during Painful Procedures

Many of the medical procedures that infants must undergo require pharmacological sedation, but there is evidence that music had success as a safe alternative to pharmacology, or at least reduced the dosage required (Shoemark et al., 2015). Music did not have the potential side effects that pharmacological sedation can have, such as nausea and vomiting, respiratory depression and cardiac arrhythmias (Shoemark et al., 2015). Considering that many of the necessary procedures in a NICU are painful, it is vitally important to explore non-pharmacological options of pain management.

Chou et al. (2003) conducted a study with premature infants in Taiwan on the effectiveness of music listening during a specific stressful procedure called endotracheal suctioning. Endotracheal suctioning is used to clear the airways of infants relying on mechanical ventilation to breathe. This procedure is routine and necessary for infants that are intubated, but the procedure has the potential to cause serious side effects such as low oxygen saturation, dysrhythmias, cerebral blood flow fluctuations, and laryngospasm (Chou et al., 2003). Music can increase tolerance to pain and can induce calm in the infant, which could make a procedure like endotracheal suctioning more tolerable. This study used the music “Transitions”, a piece of music created by Dr. Fred J. Schwartz that is a combination of actual womb sounds with synthesized female vocals (what a fetus may hear if the mother sings) (Chou et al., 2003). The results showed that oxygen saturation improved significantly during the intervention, and the recovery time for oxygen saturation was faster when the music was played (Chou et al., 2003). This study is noteworthy because it described a music therapy intervention that could be utilized by nurses with proper training. This means infants could have access to this intervention, even when a music therapist was not available in the moment.

Music Listening and Inconsolable Crying

Many of the measures discussed so far to determine hyperarousal and stress in a premature infant were physiological. Crying can also indicate stress, and music therapy can decrease the amount of time a premature infant spends crying. This is critical because when an infant is crying, they cannot eat, sleep, or suck on a pacifier. Inconsolable crying caused the infant to burn calories which were needed for weight gain, which then slowed the infant’s ability to gain enough weight to leave the NICU (Keith et al., 2009). Additionally, Keith et al. (2009) demonstrated that excessive crying could also impair the parent/caregiver-infant relationship by

increasing the stress levels of the parents and/or caregivers. Music listening, in the form of lullabies sung by a woman, has been shown to decrease the number and length of crying episodes. On days when music was played, crying episodes occurred about four times in a 24-hour period, and the mean duration of crying episodes was 5.53 minutes (Keith et al., 2009). On days when there was no music intervention, crying episodes occurred about seven times in a 24-hour period, and the mean duration of crying episodes was 23.14 minutes (Keith et al., 2009). This drastic difference could have a lasting impact on the health of the infant. According to Keith et al.: “These periods of inconsolability increase stress for the infant, which may negatively impact weight gain and delay neurological development” (p. 201). Furthermore, Standley (2012) stated: “During this period of neurologic growth, brain cells develop only during homeostasis” (p. 382), and music therapy can help the infant return to a state of calm that allows for more neurologic growth. Shoemark et al. (2015) also discussed the use of music in helping these infants sleep: “Music can be useful in helping the infant transition effectively between physiological states—for instance from quiet wakefulness to sleep” (p. 2). It is vital that infants spend as much time in homeostasis as possible in order for increased neurologic growth, and a decreased LOS in the NICU (Standley, 2012).

Music Therapy Interventions for Both Premature Infant and Parent

Auditive Stimulation

Auditive Stimulation is a type of re-creative music therapy described by music therapist Monika Nöcker-Ribaupierre. Auditive Stimulation is designed to: “Reestablish the interrupted mother-infant bonding process, providing a basis for its development, and preventing later relationship conflicts” (Nöcker-Ribaupierre, 2010, p. 30). This intervention consisted of the music therapist helping the mother create a recording of her voice, either singing or speaking, for

the duration of approximately 30 minutes. Once the recording was made, the music therapist sat with the mother while the infant heard the recording for the first time (Nöcker-Ribaupierre, 2010). Auditive Stimulation was based in psychotherapeutic crisis intervention to help the mother deal with the trauma of a premature birth. Once a premature infant is born, the mother is no longer the primary caregiver, and that loss is profound. Recording her voice was something only the mother could provide, so it gave the mother a way to help her child while the infant was still in the care of clinical staff (Nöcker-Ribaupierre, 2010). The mother's voice is one of the earliest sounds that a fetus can recognize, and it is one of the only sounds a premature infant would find familiar in the NICU. Nöcker-Ribaupierre (2010) stated: "The mother's voice is of unique importance during prenatal and early postnatal life. It is a sound, melody, rhythm and emotional carrier-representing the mother as a whole being" (p. 33). This ability to sooth and calm their child goes a long way in helping the mother process her trauma.

This intervention is significant because it benefits both the infant and the mother. Many music therapy interventions do not address the needs of the mother and/or caregiver, but Auditive Stimulation works with both infant and mother. Multiple recordings can be made over time, and the music therapist continues to check in with the mother for continued psychotherapeutic work. Additionally, the father (or additional caregiver) can be included in later recordings to support the relationship between the father and/or caregiver and the infant, and provide emotional support for both parents and/or caregivers (Nöcker-Ribaupierre, 2012).

Preventative Approach to Traumatic Experience by Resourcing the Nervous System (PATTERNS): A Model to Evaluate Trauma

PATTERNS is a treatment model used to evaluate trauma in both the parents and/or caregivers and the infant. This treatment is based on "the use of trauma renegotiation and music

therapy principles to develop, restore, or otherwise engage absent and/or latent human resiliency” (Stewart, 2009a, p. 31). There are many opportunities for premature infants to experience trauma in a NICU, both physically and emotionally. The infant must endure stressful and sometimes painful medical procedures while being separated from their familiar environment (the womb) and their caretaker (mother and/or parents) (Stewart, 2009a).

PATTERNS is a complex model involving the infant, parents and/or caregivers, staff, and the NICU environment. Each of these areas impacts the infant, and the relationships between all the areas influence the health and development of the infant (Stewart, 2009a). There are six phases to the application of PATTERNS in a NICU: (a) stabilization; (b) self-regulation; (c) integration of experience/resolution of traumatic memories; deconditioning; (d) establishment of secure social connections: repair and/or development of effective attachment and reciprocity; (e) accumulation of restorative emotional experience; (f) future planning: development of self-care plans and goals (Stewart, 2009a). Fundamentally, this treatment model was designed to increase and enhance stabilization, integration, and relational development for the infant, as well as to improve interactions between staff, parents, and infants (Nöcker-Ribaupierre, 2012).

Additionally, this method focused on the mood, attitude, and training of staff and caregivers so the infant received care that was attuned and regulated (Nöcker-Ribaupierre, 2012). Music therapy interventions applied to the infant “during acute moments of distress are intended to reduce the intensity of arousal and to help expand the infant’s *window of tolerance* (Ogden, Minton, & Pain, 2005), thus engaging regulatory patterns and supporting the development of resiliency” (Stewart, 2009a, p. 35).

PATTERNS focuses on interdisciplinary collaboration in implementing music therapy interventions. This means working with nurses to figure out the optimal times for music therapy

treatment and encouraging staff to reduce auditory and visual stimulation as needed and whenever possible (Stewart, 2009b). Stewart (2009b) emphasized the importance in matching the music therapy intervention to the appropriate gestational age of the infant, and making sure to not overwhelm and over stimulate the infant. Stewart (2009b) referenced earlier music therapy literature in creating these considerations:

- Slow tempo;
- Simplicity: minimal number of instruments and harmonics;
- Quiet and stable dynamics: decibel levels not greater than 60-65dB (A-weighted scale);
- Repetition and consistency;
- Rocking meters;
- One octave tonal range maximum, beginning with middle C;
- Unidirectional melodic contours, with limited changes in pitch direction;
- Emphasis on descending tones to engage relaxation response. (p. 127)

This trauma-centered approach has the potential to connect the many people involved in the premature infant's care, and allow for music therapy to support all the areas in the infant's orbit.

Family-Centered Music Therapy and Building Healthy Attachment

This category of music therapy interventions for the NICU setting is focused on parents and/or caregivers in a family-centered approach. Shoemark et al. (2015) explained:

One strong advantage of using music in the NICU concerns its potential for a family-based approach to care, which can promote mutual regulation of the parent-infant dyad, thus building attachment and empowering parents to be involved in the care of their child. (p. 2)

According to Shoemark et al. (2015), when the infant's caregivers received appropriate emotional support, they were able to support the emotional and physical growth of their premature child. Additionally, parents were uniquely suited to make music with their infants because their voices were more familiar. Infants can recognize and orient to their mother's voice, and research showed that hearing the mother's voice can increase oxygen saturation levels and induce quiet alert states (Shoemark et al., 2015). Furthermore, hearing the maternal voice in the NICU allowed for communication, and emotional and physiological regulation in the infant when physical closeness is often not available (Shoemark et al., 2015).

When conducting music therapy with the parents of infants in the NICU it is also important to understand their cultural background. Shoemark et al. (2015) suggested: "Integrating parents' cultural systems within the context of infant-directed singing may encourage parent attunement to their infant's cues and support attachment through responsiveness particularly if it is modified with consideration for the infants neurological functioning" (p. 3). Recognizing, respecting, and utilizing culturally appropriate music will help build the connection between the music therapist and the parents as well. McLean (2016) wrote:

The complexity of music as a social and intimate process shared between humans demands the exploration of individual circumstances and cultural values, attitudes and beliefs if we are to more deeply understand how we can best foster intimacy through music ("Grounding Communicative Musicality," para. 2).

All of these factors demonstrate the importance of live music therapy with licensed music therapists: "Thus the individualized application of music requires a relationship between music therapist, infant and family, which differentiates it from other music-based approaches where music may be a more standardized stimulus" (Shoemark et al., 2015, p. 2).

McLean (2016) also researched how music, musical, and musicality is critical in developing healthy attachment between parent and infant:

This understanding of musical is grounded in Malloch & Trevarthen's (2010b) inclusive view of musicality being an innate capacity of all humans to communicate and connect that moves away from the more conventional view of musicality as something only held by trained or naturally talented musicians (*Intimacy Through Early Musical Beginnings*, para. 5).

If all humans can innately use music to connect and communicate, then it broadens the number of people and populations music therapy can serve. Even parents that do not consider themselves particularly musical can make music with their infant, and therefore actively aid in their growth and development. McLean observed 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" (Conclusion, para. 2).

Ettenberger, Cárdenas, Parker, and Odell-Miller (2017) conducted a study in Colombia that measured music therapy outcomes for the infant, while also researching the emotional stability of the parent and/or caregiver. This family-centered music therapy intervention consisted of a song of kin sung by the music therapist to the infant during kangaroo care (when the infant is held by the parent; skin to skin contact) (Ettenberger et al., 2017). Recently, more research has been focused on the experience of parents with infants in the NICU. It is absolutely crucial that music therapy address the needs of the parents as well as the infant because the emotional stability of the parents is regarded as vital to the growth and health of a premature infant. Ettenberger et al. stressed the importance of working with the parents:

Families with a preterm infant show more risk towards increased stress, depression and anxiety after birth compared to families with full-term infants...helping parents in establishing a nurturing relationship with their preterm baby is an important feature of family-centered care in the NICU and might play a crucial role in the infant's development later on in life. (p. 208)

Shoemark et al. (2015) also focused on the emotional status of the parents: "Problems of attachment are common, with parents enduring significant experiences of trauma putting at risk their own sensitivity to their baby, and often developing an overall hypervigilance about their baby's medical status" (p. 2).

The Ettenberger et al. (2017) study showed that infants who received music therapy increased their weight gain and had shorter hospital stays when compared to the control group. Both mothers and fathers in the music therapy treatment group showed improvements in their anxiety as compared to the control group, and both parents reported feeling more connected and bonded to their child in the music therapy intervention group. The qualitative analysis showed that parents who experienced music therapy with their child reported feeling more relaxed, calm, and happy. It provided a distraction from the NICU and hospital environment and fostered their relationship with their child (Ettenberger et al., 2017).

This study was unique in that it used both qualitative and quantitative analysis to determine the effect of music therapy on the parents of infants in the NICU. More music therapy research is needed in this area because often the emotional aspect of the infant-parent experience in the NICU is overshadowed by the medical and physical health of the infant.

Creative Music Therapy

Creative Music Therapy (CMT) with premature infants is another form of family-based music therapy created by Friederike Barbra Haslbeck. CMT grew out of the realization that: “Premature infants need individualized nurturing interactions with their caregivers to support healthy development, particularly when the infants have to spend months in a hospital and may suffer from medically necessary isolation” (Haslbeck, 2014, p. 36). Haslbeck (2014) described this kind of music therapy as an “interactive, resource-and needs- oriented music therapy approach” (p. 38) grounded in two theoretical perspectives: Nordoff-Robbins music therapy and CMT with comatose patients. In CMT, the premature infant was carefully assessed for “their breathing pattern, the most fundamental rhythm of a human being, together with their facial expressions and gesticulations” (Haslbeck, 2014, p. 38). According to Haslbeck (2014), the infant should not be overwhelmed or over-stimulated. The music therapist was able to respond in the moment to the infant’s breathing rhythms, gestures and facial expressions, which allowed the infants to “achieve self-regulatory balance, orienting and engaging in subtle relatedness” (Haslbeck, 2014, p. 44). In terms of the parent’s perspective, Haslbeck (2014) wrote: “They focused on their infant, and adapted and became *attuned* to their infant’s behaviour, both communicatively and musicality. They reported that CMT helped them to *relax* and intensify their *attachment* to their infant” (p. 48). CMT may also work as a preventative therapeutic approach in that it builds strong parent-infant attachment from the beginning, which decreases the risk of long-lasting social emotional issues in the infant (Haslbeck, 2014).

Music Therapy for Parents

There are many researchers interested in using music therapy with parents, both with and without their infant. There is a growing awareness in the field of NICU music therapy that parents’ needs must be considered, both in how they deal emotionally with a traumatic birth

experience, and then also with the reality of a medically fragile infant (Haslbeck, 2012; Haslbeck, 2014; McLean, 2016; Shoemark, 2016; Shoemark & Dearn, 2008). Shoemark and Dearn (2008) described working with families: “Being a music therapist for families is not always about making music, but about being an attuned and empathetic partner with a uniquely positive presence” (p. 12). Developing a strong therapeutic relationship with the parents can make a significant difference. Music therapists can help them manage their emotions, while also providing new resources for them to utilize in interacting and caring for their infant. Shoemark and Dearn explained: “Uncertainty about their baby’s prognosis may be compounded by a lack of knowledge and control regarding medical treatment, their on-going fatigue, and relentless fear and grief” (p. 3-4). Music can support the learning curve that comes with caring and understanding a medically fragile premature infant. Shoemark and Dearn wrote: “A lack of understanding of the different behaviours displayed by premature infants can cause withdrawal, rejection or resentment of infants which can have consequences for the long term attachment relationship so important to the infant’s development” (p. 5). Additionally, music therapists working with parents can help parents to “build experiences which the parents might not be able to build on their own” (Shoemark & Dearn, 2008, p. 10).

Parents can also benefit from the presence of the music therapist because it allows them to take a break from attending to their child and get the opportunity to restore their energy. The music therapist can work with the infant when the parent is not available in order to provide another caring presence with different priorities than other medical staff (Shoemark & Dearn, 2008). Music therapists can also provide support to the parents by recording music for each individual infant that can sustain and provide comfort when services are not available (Shoemark & Dearn, 2008). It can be difficult for the parents to notice when their child is making progress

or difficult for them to notice the joy in their infant because the medical issues are forefront in their minds (Shoemark & Dearn, 2008). The music therapist can provide a different perspective:

While the medical and nursing teams take primary responsibility for treating the medical issues, the music therapist can stimulate the parents' sense of the infant as a whole child...Parents have the opportunity to enjoy their baby as a baby instead, or making him/her 'better' (Shoemark & Dearn, 2008, p. 16).

Helping parents share joy in their child is essential for building healthy attachment between the parents and their infant (Shoemark & Dearn, 2008). Music therapy with parents of premature infants can make a large impact on the wellbeing of the parents, which can then impact their relationship with their infant (McLean, 2016).

Discussion

This literature review examined the current research in NICU-MT, and how it related to the health of premature infants and their parents. While many premature infants have complex medical issues at birth, multiple studies have demonstrated how music therapy can positively impact the health and wellbeing of pre-term infants (Nöcker-Ribaupierre, 2012; Standley, 2014). Standley (2014) wrote: "Over 50 research studies in refereed medical and music therapy journals provide multiple types of evidence-based NICU-MT methodology and document multiple benefits for premature infants ("Overview", para. 2). These benefits include improved sleep quantity and quality, decreased stress, improvement in oral feeding, decreased pain during painful procedures, and decreased LOS (Allen, 2013; Keith et al., 2009; Standley, 2012).

Additionally, there is growing research into how music therapy can positively benefit the parents of premature infants, especially in the areas of trauma, attachment, and self-esteem (Haslbeck, 2014; Nöcker-Ribaupierre, 2012; Shoemark et al., 2015; Stewart, 2009a). Nurses,

NICU parent groups, and “many allied health professionals embrace the benefits” (Standley, 2014, “Overview”, para. 2) of NICU music therapy.

Current music therapy research has clearly demonstrated the benefit to including music therapy in NICU treatment, yet it is still not considered essential and standard medical treatment in hospitals across the U.S (Standley, 2014). To this end, continued research in the field of NICU-MT would be beneficial, particularly in regards to the economic benefit to hospitals. Standley and Swedberg (2011) discussed the economics of premature birth for the hospitals: “The average length of NICU stay is approx. 90 days. Costs are astronomical, with over 2 billion dollars spent each year” (p. 36). Additionally, according to length of stay research from 10 years ago, premature infants accounted for over half of all hospital delivery charges, even though they accounted for less than 7% of all births (Standley and Swedberg, 2011). Today, infants are surviving with more and more complicated diagnoses, and at earlier stages of gestation than before (Nöcker-Ribaupierre, 2010). It would be beneficial to research the cost of caring for premature infants today, and how music therapy can impact that cost in 2018. Music therapy was economically beneficial when Standley and Swedberg (2011) published their article, which suggests continued economic benefit into the present.

NICU-MT research also serves to strengthen music therapy’s place in the medical field as a legitimate and necessary aspect of medical treatment. All of the expressive arts therapies have struggled with finding legitimacy in the eyes of other professions, and NICU-MT evidence-based research has helped legitimize music therapy in the NICU medical community (Standley, 2014). This literature review demonstrated how both qualitative and quantitative research in NICU-MT provides significant insight into understanding how music therapy impacts infants and their parents; but evidence-based quantitative research remains the gold standard for medical research.

In order for NICU-MT to strengthen and solidify its critical role in NICU treatment, music therapy must continue utilizing evidenced-based research.

This literature review described (1) music therapy interventions for pre-term infants, (2) music therapy interventions with both pre-term infants and their parents, and (3) music therapy with parents of pre-term infants to provide a critical analysis of a variety of music therapy interventions used in a NICU setting. More research is needed to increase understanding of how music impacts health and wellbeing, and how to continue using music therapy to improve health outcomes for premature infants. This literature review provided an in-depth examination of current research and the correlating studies that show how vital music is to the growth and healing of pre-term infants and their parents.

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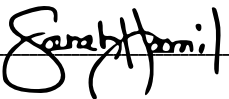
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