

Mother-infant musical interaction and emotional communication: A literature review

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Abstract

Early experiences of emotional communication contribute to mother-infant attachment and impact upon an infant's neurological, social and emotional development. Understanding emotional communication is paramount to encourage, support and promote healthy mother-infant relationships and infant health. Across various fields of research there is extensive literature on mother-infant interactions, attachment, emotional regulation and infant health with varying degrees of relevancy to music therapy. This paper aims to integrate theories and concepts pertinent to music therapy in order to provide a cross-disciplinary theoretical framework for any therapist interested in early mother-infant relationships intervention. Gaps in the literature and potential areas for future research are also discussed.

Keywords: mother-infant, attachment, emotional communication, music

Introduction

For therapists to intervene and encourage the development of positive mother-infant relationships, it is necessary to have a sound understanding of what emotional communication is and how it relates to attachment. This article will provide a comprehensive cross-disciplinary review of literature and focus on how music 'fits in' to the current understanding of emotional communication and attachment.

Emotional communication

What is emotional communication?

Siegel (1999a, 1999b) and Schore (2001, 2003) describe the modulation of emotional states as *emotional communication*. It involves sharing and amplifying positive emotions, soothing distress or negative emotional states, and taking joy in the child. Emotional communication contributes to the infant's developing ability to control, modulate and self-regulate emotional responses (Cozolino, 2010; Schore, 2001, 2003; Weinfield, Sroufe, Egeland, & Carlson, 2008). Infants need to learn to rely on themselves for emotional

regulation (Lenz & von Moreau, 2004), however, they are “ill equipped to regulate their own emotions, so as they experience such emotions as distress, anger and fear, they turn to their caregivers for assistance” (Weinfield, et al., 2008, p. 84). It is through the consistency and repetition of the parent¹-infant interaction that infants learn to regulate their emotions (Beebe, Lachmann, & Jaffee, 1997; Cozolino, 2010; Lenz & von Moreau, 2004).

Importantly, the same interactions that regulate the infant’s emotions co-create the emotional or affectional bond between parent and child, known as *attachment* (Bowlby, 1969; Cassidy, 2008). This enduring relationship is primarily formed throughout the first year of the infant’s life and is developed and reflected through patterns of parent-child interaction (Beebe, et al., 2010; Campbell & Taylor, 1980; Cassidy, 2008; Schore, 2001, 2003; Woodhouse, 2010). The emotional availability, appropriateness, sensitivity and consistency of a parent’s response to infant cues and signals determine the style or quality of attachment that is developed (Bowlby, 1969; Egeland & Erickson, 1999). Parents who are emotionally available and provide quick, sensitive and appropriate responses to the infant facilitate a *secure* or high quality type of attachment, whereas parents who are emotionally unavailable, imperceptive and who provide inconsistent, insensitive, rare, intrusive or inadequate responses facilitate *insecure* types of attachment (Boris, Aoki, & Zeanah, 1999; Cozolino, 2010; Siegel, 1999a; Steele, Steele, & Croft, 2008).

Furthermore, the same interactions that regulate the infant’s emotions and develop attachment are also constantly shaping the neural connections and structure of the brain and thus impact upon the child’s future development (Cozolino, 2010; Gardner & Goldson, 2002; Schore, 2001, 2003; Siegel, 1999b). Empirical studies have shown, for example, that children with a secure attachment in the early years of life exhibit greater understanding of emotions, greater ability to recognise and judge emotions, more competent social problem-solving skills and are less lonely than insecurely attached children (Meins, Fernyhough, Russell, & Clark-Carter, 1998; Pip-Siegel, Brown, Easterbrooks, & Harmon, 1995; Raikes & Thompson, 2008; Steele, et al., 2008; Steele, Steele, Croft, & Fonagy, 1999; Thompson, 2008).

Schore (2001) explains, “Early interpersonal events positively or negatively impact the structural organisation of the brain and its expanding adaptive functional capacities” (p. 12). When a secure parent-infant dyad is interacting the parent is continuously regulating the baby’s shifting arousal levels and emotional states. Such exposure to regulatory capacities expands the infant’s adaptive ability to evaluate on a moment-to-moment basis stressful changes in the external social environment. Furthermore, because the maturation of the brain systems that mediate this coping capacity occurs in human infancy, the development of the ability to adaptively cope with stress is

¹ In this paper the term ‘parent’ denotes any primary caregiver e.g. mother, father or adoptive parent.

directly and significantly influenced by the early parent-infant interaction. In other words attachment and child development are linked; the same emotionally communicative interactions that develop parent-child attachment also influence the development of the infant's brain and regulatory systems and thus, the overall future development of the child (Cozolino, 2010; Gardner & Goldson, 2002; Schore, 2001, 2003; Siegel, 1999b). Considering this, there is significant value in developing a greater understanding of emotional communication and encouraging emotionally available, sensitive and consistent parent-infant interactions during the first year of the infant's life.

Forms of emotional communication

Positive forms of emotional communication require the parent to align him/herself to the infant's current emotional state, a process known as *attunement*. Once both partners are aligned, the parent and infant simultaneously adjust their social attention, stimulation and accelerating arousal to each other's responses (Schore, 2001, 2003; Siegel, 1999a). These adaptive and flexible 'adjustments' are known as *synchronous* or *reciprocal* interpersonal interactions (Reyna & Pickler, 2009). When the parent is attuned to the infant he/she will maintain the child's arousal within a moderate range; high enough to stimulate the child up from low arousal states but not too intense as to cause distress and avoidance. Maintaining reciprocity therefore allows for sustained lengths of positive emotional communication. Thus, attunement and synchrony/reciprocity are essential components in establishing and sustaining emotional communication.

There are several forms of emotional communication, one of which is the recognition and response to infant cues or signals known as *collaborative communication* (Gardner & Goldson, 2002; Wallin, 2007). For example, if a baby cries to communicate hunger, the parent responds appropriately by feeding the child. When the infant's hunger is satisfied the infant associates the parent with need satisfaction, comfort and trust. According to Gardner and Goldson (2002) "the infant develops a sense of mastery over his or her world and a sense that it is okay to have needs and to have them met" (p. 221). The appropriate response to the child's needs therefore, is necessary to the development of trust in self and in others. Alternatively, if the parent does not meet the infant's needs, the infant will associate the parent with need dissatisfaction and mistrust, and consequently develop low self-concept, low self-esteem and a sense of helplessness (Cozolino, 2010; Gardner & Goldson, 2002; Wallin, 2007). Importantly, when the parent is attuned or connected to the child's feeling states, collaborative communication creates a shared interpersonal experience that allows each person to 'feel felt' by the other, providing a wealth of interpersonal closeness (Siegel, 2001). In these ways, emotional communication contributes to the development of attachment and child development.

Another form of emotional communication is the use of shared and mutually pleasurable motion-generated experiences, also known as *kinaesthetic bonding* (Hatch & Maietta, 1991). The kinaesthetic bond begins during pregnancy when the mother and the baby are sensing each other's movements and adjusting to each other accordingly. The shared motion-generated sensory experience creates a mutual reality for mother and her baby through motion (Hatch & Maietta, 1991). After birth, however, kinaesthetic bonding requires a mother to be attuned to her infant and skilled in using space, timing and effort to match her movements to her baby. The infant also needs to synchronise to the mother's movements so that the interaction becomes mutual (Hatch & Maietta, 1991). It is through motion-generated synchronisation that a mother may express her attunement to her child, practise emotional communication and bond with her child in the early months of the infant's life.

Emotional communication may be understood, described and examined within several parental and child dimensions known as *emotional availability* (Biringen, 2000, 2009). The concept of emotional availability grew from the research of earlier theorists who highlighted the key characteristics of emotional communication as follows: (1) maternal sensitivity or attunement to the child to perceive and respond to cues and signals (Ainsworth, Blehad, Waters & Wall, 1978; Bowlby, 1969), (2) a supportive maternal presence or a secure base from which the child can explore and practice autonomy (Mahler, Pine, & Bergman, 1975, cited in Biringen, 2000) and (3) responsiveness of both parent and child to the negative and positive emotions of one another (Emde, 1980). By considering and integrating these perspectives, the following emotional availability dimensions were developed (Biringen, 2000):

- *Parental sensitivity* – behavioural style of the parent and the degree of pleasure with the infant
- *Parental structuring* – the appropriate degree of structuring by taking care to follow the child's lead
- *Parental non-intrusiveness* – the ability to be available to the child without being intrusive to him/her; emotional presence
- *Parental non-hostility* – the degree of covert and overt forms of hostility e.g. background discontent, impatience and anger.
- *Child responsiveness to parent* – the child's eagerness or willingness to engage with the parent and pleasure in interaction
- *Child involvement with parent* – the degree to which the child attends to and engages the parent in play.

Infants who experience emotionally available relationships with their parent will be better able to regulate their own emotions (Easterbrooks, Chaudhuri, & Gestsdottir, 2005), for example, children who have emotionally

available relationships with their parents are less aggressive and less likely to be the target of aggression from other children, will have better peer relationships, will be more attentive at school and relate better to their teachers (Biringen, 2009).

Consistent links between emotional availability and attachment have also been found (Biringen, et al., 2000; Biringen, et al., 2005; Biringen, Matheny, Bretherton, Renouf, & Sherman, 2000; Easterbrooks & Biringen, 2000; Easterbrooks, et al., 2005; Swanson, Beckwith, & Howard, 2000). For example mothers of secure infants are more sensitive and structure an infant's play more optimally than mothers of insecure infants (Ziv, Aviezer, Gini, Sagi, & Koren-Karie, 2000). This demonstrates that emotional availability is a valid construct for reflecting the style and quality of attachment relationships as well as describing the emotional communication between parent and child.

Music and emotional communication

Infant-directed vocalisations

Infants are essentially musical beings (Trehub, 2001; Trevarthen & Malloch, 2002). According to Trehub (2001) "... infants do not begin life with a blank musical slate. Instead, they are predisposed to attend to the melodic contour and rhythmic patterning of sound sequences, whether music or speech" (p. 11).

An infant's musical predisposition is particularly evident in their preference of vocal stimuli (Gardner & Goldson, 2002). Research has shown that infants prefer high-pitched voices (female) over low-pitched voices (male) and higher pitched singing over lower-pitched singing (Gardner & Goldson, 2002; Trainor & Zacharias, 1998). Children and adults modify their speech instinctively when interacting with infants to appeal to their preference for higher frequencies by using a 'music-like' speech that contains expanded, larger pitched contours, higher pitch and rhythmic patterning (Rock, Trainor, & Addison, 1999; Shoemark, 2007). This type of speech is known as *infant-directed speech*, *motherese* or *baby talk* (Gardner & Goldson, 2002; Shoemark, 2007).

Infants also prefer infant-directed singing over infant-directed speech and have exhibited more sustained attention to an audiovisual presentation of maternal singing than to an audiovisual presentation of maternal speech (Nakata & Trehub, 2004). Another study showed that mothers' infant-directed singing modulated the infants' arousal levels (de l'Etoile, 2006b; Shenfield, Trehub, & Nakata, 2003). Additionally infants prefer voices that are familiar and have shown a consistent preference for their mother's voice over other female voices and sounds (DeCasper & Fifer, 1980; Standley & Madsen, 1990). Together, these results demonstrate that the mother's voice is

within an engaging frequency range, is a preferred auditory stimulus for infants and may be used to sustain infant attention and modulate the infant's arousal level (Walworth, 2009).

Infant-directed vocalisations contain emotional communicative messages conveyed through a combination of pitch, touch, facial expressions, gestures and vocal tone (Aitken & Trevarthen, 2001; de l'Etoile, 2006a; Dissanayake, 2000; Milligan, Atkinson, Trehub, Benoit, & Poulton, 2003; Stern, Jaffee, Beebe, & Bennett, 1975; Trainor, 1996; Trainor & Heinmiller, 1998; Trehub, Hill, & Kamenetsky, 1997; Weinberg & Tronick, 1994). Research findings have demonstrated that mother and infant are mutually engaged in reciprocal interpersonal interaction as early as when the baby is two months old, by looking at and listening to each other, responding sympathetically to one another's intricate rhythmic patterns, multimodal signals, vocal imitations and facial and gestural expressions (Aitken & Trevarthen, 2001; Malloch & Trevarthen, 2009; Stern, et al., 1975; Weinberg & Tronick, 1994). Studies have confirmed that infants are responsive, in that their emotional expressions are well organised and systematically related to the environmental elements (Malloch & Trevarthen, 2009; Weinberg & Tronick, 1994). Additionally, nine-week old infants have expressed distress at mistimed or 'unmutually sympathetic' maternal expressions, no matter how positive, joyful or playful they were, further demonstrating that infants are sensitive to, responsive to and consciously appreciate the emotionally communicative intentions of infant-directed vocalisations (Aitken & Trevarthen, 2001; Beebe, et al., 1997; Nadel, Carchon, Kervella, Marcelli, & Réserbat-Plantey, 1999).

Dissanayake (2000) suggests that the combination of sound, gestures and facial expressions is a multi-modal form of emotional communication which progresses according to the baby's developing needs and abilities. In the first three months of the baby's life, mothers will touch, hold, cuddle, rock and pat babies while looking at their faces, smiling and performing repetitive infant-directed vocalisations. The baby gradually produces vocalisations, eye contact, touches, smiles and nods. From about two and half months onward the mother adjusts her sounds, movements and gestures to suit the baby's changing needs and growing abilities by gradually moving from the more gentle cooing to more animated play. Her vocalisations and facial expressions become more exaggerated, formed more slowly, held for longer, given more dynamic intensity and variety and punctuated with musical pauses and sound silences. The baby responds by producing larger smiles, more active movements and a larger range of sounds and the mother in turn responds with greater exaggeration of mood, movement and tempo.

H. Papoušek (1996; 2000) believes that mothers intuitively modify their vocalisations to construct an emotionally communicative code consisting of universal characteristics including smooth, continuously gliding pitch contours, simple unidirectional, bidirectional or bell-shaped contours,

one-syllable utterances and prolonged vowel sounds (H. Papoušek, 1996). Endless variations of these vocalisations are created which tends to affect infant arousal and attention in three ways (1) build-up of arousal and tension; (2) release of arousal and tension, and (3) playful elaboration of a high level of arousal (M. Papoušek, 1996).

Trevarthen and Malloch (2000, 2002; Malloch and Trevarthen 2009), believe that mother-child vocalisations stem from the desire to engage in emotionally communicative interactions and are a reflection of the innate abilities within all humans that expresses emotional communication known as *communicative musicality*. Communicative musicality between mother and child is expressed through an exchange of spontaneous and improvised vocal narratives created from the parameters of pulse, pitch, timbre, volume and gesture. By being attuned to the infant's state of arousal and attention and attentively listening to the infant's vocalisation the mother may respond sympathetically by imitating the pitch contour or repeating the vocalisation with variation, usually through exaggeration or by answering with a contrasting pitch contour. When the mother and infant respond and adjust to each other, they engage in reciprocal musical or vocal narratives sustaining a "co-ordinated relationship through time" (Trevarthen & Malloch, 2000, p. 6). Trevarthen & Malloch (2000) describe this interaction as 'dancing' in emotional communication.

Considering that infant-directed singing sustains infant attention for longer than infant-directed speech (Nakata & Trehub, 2004), as well as the 'dance' of communicative musicality, forms of infant-directed singing, including the more structured infant-directed songs, may be considered as more effective than infant-directed speech in promoting sustained and pleasurable emotional communication and in this way contribute to the development of mother-infant attachment.

Playsongs and Lullabies

Playsongs and *lullabies* are two types of songs that are known to facilitate emotional communication. These songs are viewed as "musical analogues of soothing and playful 'baby talk' or 'motherese' (i.e. infant-directed speech)" (Trehub, et al., 1997, p. 385).

Each form serves an emotional regulatory purpose: playsongs arouse and engage the infant in play whereas lullabies soothe and relax the infant (Bargiel, 2004; Trainor, 1996; Trehub, et al., 1997; Trehub & Schellenberg, 1995). They also have distinctive musical and expressive features. According to Rock (1999), Trainor (1996) and Trehub and Schellenberg (1995), playsongs are playful, sung with a 'smiling tone,' capture the lyrics by exaggerating the rhythm and rhythmic groupings and impart feelings of joy. In contrast, lullabies are soothing, sung with a breathy tone, capture a sense of flow or 'smoothness' and convey affection and tenderness. The rhythmic

character of a lullaby is not determined by the text, but rather the accompanying rocking or swaying movements. Also, the lyrics of lullabies characteristically urge infants to sleep, whereas playsongs are games and vehicles of enculturation; they encourage particular behaviours such as brushing teeth, counting and culturally specific language speaking (Brakeley, 1950, cited in Trehub & Schellenberg, 1995).

Studies have shown that infant-directed versions of songs are sung in a more engaging manner and soothing or playful tone of voice than non-infant-directed versions (Milligan, et al., 2003; Trainor, 1996; Trainor & Heinmiller, 1998; Trehub, et al., 1997). Furthermore, infants demonstrate distinctive behaviours when listening to playsongs and lullabies. For example, infants demonstrate more outward focus of attention (to their parent) when listening to playsongs and more inward focus of attention during lullabies (Rock, et al., 1999). Researchers believe that distinctive features of playsongs and lullabies convey different emotional messages to infants and that the infants respond accordingly. de l' Etoile (2006a) states that infants are sophisticated listeners capable of detecting changes in musical stimuli and decoding their mother's singing accordingly.

Playsongs and lullabies share one common feature, that is, both are accompanied by rhythmical movements such as swaying and knee jogging (Rock, et al., 1999; Trainor, 1996; Trehub & Schellenberg, 1995). This suggests that playsongs and lullabies may facilitate sustained 'musical kinaesthetic bonding' experiences which may assist in the development of mother-infant attachment (Vlismas, 2007).

One empirical study has examined the effect of music and movement experiences on mother-infant attachment (Vlismas, 2007). Healthy first-time mothers with their healthy two to four month old infants participated in a music and movement program. The mothers learnt a variety of playsongs and lullabies as well as various ways to hold and move with their baby. The results of the experimental and control group were compared. According to the results, mothers who participated in the program demonstrated a *positive increase* in (1) the mothers' perception of the mother-infant attachment bond, (2) mother-infant reciprocity and (3) frequency and enjoyment of musical interactions. Importantly, mothers who did not participate in the program demonstrated negative results: mothers developed a lesser perception of the attachment bond, mother-infant reciprocity decreased, and the frequency and enjoyment of musical interactions decreased (Vlismas, 2007). Although more empirical studies are required to conclude that music and movement will positively affect mothers and infants above five-months old or from other cultural, socio-economic and medical backgrounds, the results suggest that playsongs and lullabies are effective vehicles of emotional communication. However, there is little understanding of how or why infant-directed *songs*, as opposed to the more

improvised infant-directed speech/singing, are effective facilitators of emotional communication.

One known study has analysed the musical elements of infant-directed songs (Longhi, 2009). Longhi (2009) examined the temporal structure of twenty-seven playsongs all with an 8-beat phrase structure, sung live by mothers to their infants. The results showed that mothers emphasise the upbeats, particularly the last beat of the phrase. The combination of lengthening the duration of the upbeat and other gestural behaviours was argued to help infants process and segment the musical event into smaller units, helping them to anticipate the following downbeat thus enabling them to time their participation to match the relevant beats of the song. Longhi (2009) suggests that temporal elements of playsongs may help to assist mother-infant synchrony. However, perhaps there are other melodic, harmonic, rhythmic and performance elements that also encourage synchronisation. More research is needed to better understand how the musical and non-musical features of playsongs and lullabies facilitate reciprocal interaction (Reyna & Pickler, 2009).

Music use by parents

The literature clearly supports the use of playsongs and lullabies as a medium for mother and infant to engage in musical emotional communication. However, researchers have previously suggested that the use of music by parents is decreasing (M. Papoušek, 1996; Vlismas & Bowes, 1999). In Australia, Vlismas and Bowes (1999) found that only two of thirty-nine mothers had sung lullabies to their young infants before participating in a formal music program, and Baker and Mackinlay (2006) found only four of forty-two mothers had sung to calm or engage their babies before participating in a lullaby program.

There are many potential contributors to the decreasing use of music including:

- *lack of time* - Over one third of Australian parents interviewed in 2005 felt that they do not spend enough time with their children and 75% found balancing work and family to be a serious issue (Tucci, Mitchell, & Goddard, 2005). With decreasing time availability, the amount of time that may be dedicated to daily one-on-one music interactions also decreases (de Vries, 2007; Vlismas, 2007)
- *lack of confidence in musical abilities, particularly singing* – lack of confidence causes parents to substitute their own live music-making with music CDs and DVDs. Parents have indicated they would like to play musical games and engage in music-making with their child but feel they lack the skills and experience to do so (de Vries, 2007);

- *limited knowledge of infant-appropriate repertoire* - parenting resources do not seem to guide or support the use of music, leaving parents to learn songs through children's television programs or recordings (Trehub, et al., 1997; Vlismas & Bowes, 1999). This suggests that mothers' practice of music activities with their infants is not recognised as an important part of daily caregiving (Vlismas, 2007).

The majority of parents believe that how they were raised by their own parents is very influential in their own parenting practices (Tucci, et al., 2005). Parents who recall their mother singing to them are significantly more likely to sing songs to their own children than parents who do not recall this experience (Custodero & Johnson-Green, 2003). Therefore, if parenting resources continue to limit their advocacy of musical practices, the knowledge of infant appropriate repertoire and the prevalence of musical practices will continue to shrink; being perpetuated through the similar practices of future generations (Vlismas, 2007). It is therefore important to provide parents with resources to expand their repertoire of playsongs and lullabies as well as encourage the use of musical interactions during infancy.

Music as intervention

Group music therapy early intervention programs provide many benefits to the participating families including: an expansion of child-appropriate repertoire, an increase in the parents' frequency and enjoyment of musical interactions with their children and an increase in parents' confidence in sharing music with their infant (Abad, 2002; Mackenzie & Hamlett, 2005; Nicholson, Berthelsen, Abad, Williams, & Bradley, 2008; Oldfield & Bunce, 2001; Shoemark, 1996). Participating in group programs may provide the supportive, non-threatening, motivating and enriched environment necessary to promote positive and emotional musical companionship and regenerate the tradition of musical practise (Vlismas, 2007). However there is little longitudinal empirical evidence to support this suggestion. Most early intervention music therapy studies are descriptive case studies that rely on parents' self-reports pre and/or post participation in a program and therefore, it is unknown whether the increases in musical practices are maintained in the months or years after participation in the program. Furthermore, most early intervention music therapy programs are offered to families with children aged between zero to five years old; only a few known studies focus on musical interaction during the first year of the infant's life specifically (Baker & Mackinlay, 2006; Vlismas, 2007).

Baker and Mackinlay (2006) conducted an educative music therapy program for healthy twenty-three to thirty-nine year old first-time mothers and their healthy babies. The mothers were taught how to effectively settle and calm their babies by singing lullabies in a way that first matched the

baby's emotional state and then calmed and soothed the baby. The mothers learnt to reflect their baby's distress by singing a faster and more up-tempo lullaby with a stronger vocal timbre and volume, and then lower the emotional intensity of their singing by using a sweeter, gentler, quieter voice and decreasing the tempo to soothe and calm the infant (Baker & Mackinlay, 2006). Using this technique the mothers learnt the skill of reading and responding to their baby's cues as well as emotional regulation; the mothers were able to more quickly settle their babies after the educative program. This suggests that individualised and educative music therapy programs may positively influence the emotional communication between mother and baby through lullaby singing, however, more research and empirical evidence is needed to support this suggestion.

Bargiel (2004) theorises that the utilisation of parental singing, particularly playsongs and lullabies, may support the emergence and/or consolidation of a secure attachment. She suggests an individualised attachment intervention approach where the therapy is based not on therapeutic work through the medium of sound, but rather the reproduction of real-life situations. The therapist creates a supportive environment while also modelling and facilitating musical interaction so that the parent may (1) become conscious of changes in the affective state and levels of anxiety and arousal of the baby, (2) develop and practise their vocal responses to the baby's sounds, signals and cues, (3) recognise the baby's needs for increased or limited stimulation, (4) enrich his/her lullaby and playsong repertoire, and (5) maintain sustained interaction with the baby. The objective of the therapy sessions therefore is to provide a supportive and encouraging environment in which the parent may learn and practise musical forms of interaction. The success of the intervention then, is the continuation of sensitive and attuned musical interaction outside of the therapeutic setting.

de l'Etoile (2006a) also suggests an individualised 'coaching' approach where the therapist models interaction, the mother describes her infant's responses, the therapist assists the mother with interpreting her infant's behaviour and guides the mother to understand the connection between her infant's cues and specific musical elements and finally assists the mother to sing in a style that is most appropriate to the infant's current needs. She believes the intervention should focus on recognition of her infant's responses and various configurations of musical elements, that is, learning to modify musical elements while singing in order to elicit her infant's attention and match and/or alter the infant's current mood and arousal level.

Despite Bargiel's (2004) and de l'Etoile's (2006a) suggested intervention models, de l'Etoile (2006a) highlights the need for more research. She suggests future research examine live musical interactions in order to reveal both the mothers' and infants' most natural and genuine reactions and be conducted with typically-developing infants and healthy

mothers to establish possible behaviour ranges. She also states that “additional studies are needed to clarify the non-musical aspects of ID (infant-directed singing)” (p. 27). In order to develop a well-informed attachment-specific intervention program more research into understanding the musical plus behavioural, physiological and subjective aspects of ID singing and songs is required.

Subjective experience of music

Most of the research previously discussed focuses on the behavioural and musical side of emotional communication and attachment. However there are emotional and psychological factors to also consider. Condon and Corkindale (1998) and Condon (2010) focused on the mother’s subjective experience of attachment and identified four indicators of attachment in the first year of the infant’s life, known as *attachment constructs* or *domains*, including:

- *Pleasure in proximity* – desire to interact with the infant, pleasure in interaction
- *Tolerance* – the ability to tolerate frustrating/irritating behaviours, level of resentment due to personal sacrifice
- *Need-gratification and protection* – a desire to identify and meet the infant’s physical and emotional needs
- *Knowledge acquisition* – a desire to understand the infant, curious about ‘what goes on’ inside the infant.

Condon and Corkindale (1998) also created a self-report questionnaire to allow parents to objectively report on the frequency and intensity of the above thoughts, feelings and behaviours involving their infant. Only one music study has used Condon and Corkindale’s (1998) attachment questionnaire: Vlismas (2007) examined the effect of a music and movement program on the attachment of mothers with healthy two to four month old infants. Both the experimental and control group completed the questionnaire before and after the 5-week program. Results showed a significant increase in the overall quality of attachment for the experimental group and a decrease for the control group. These results suggest that all attachment domains are associated with music and movement interactions in some way. However more empirical evidence is required to support this suggestion and to better understand how or why this effect is produced. For example, more research is required to determine whether the domains are associated with music and movement experiences for mothers with infants above four-months old, if specific domains are more influenced by musical interaction than others, if there are other thoughts and feelings specifically related to playsongs and lullabies, and if there are thoughts and feelings unique to either playsongs or lullabies.

Baker and Mackinlay (2005, 2006) examined the subjective experience of a lullaby education program by analysing diary entries of participating mothers. The data demonstrated that singing lullabies was beneficial to the mother's wellbeing, providing a 'lift' in moments of despair as well as increasing their empowerment and control. The feelings of success as a result of lulling their baby to sleep validated that they were 'good' mothers, further providing a sense of pride, renewed confidence and self assurance in their capacity to be a good mother. Baker and Mackinlay (2005, 2006) suggest that such positive experiences are vital for mothers who may be struggling to cope with the daily demands of mothering, and therefore lullaby singing has the potential to be a preventative measure in "what could otherwise become a spiralling cycle of negative feelings leading to the potential for post-natal depression and mother-infant detachment" (Baker & Mackinlay, 2005, p. 86).

On considering the findings of Custodero and Johnson-Green (2003), it is perceivable that a decreasing use of music within families may produce a snowball effect affecting the mother's wellbeing and mental health, consequently affecting attachment, child development, the musical practices of future generations and therefore the development of future generations (Custodero & Johnson-Green, 2003; Tucci, et al., 2005). It is paramount to promote the significance of music in early interactions between the mother and the child to prevent the potential spiral of negative feelings.

Singing may be a vehicle for the transmission of self (Escandón, 2008; Likierman, 1988). Through singing a mother may transmit her own feelings of love and caring and the infant 'picks up' on the quality of feeling in the mother's interactions. Likierman (1988) calls this emotional transmission *projective identification*. A mother needs to have her feelings received by another and appreciated; she "needs to know not only that she is a responsive care-giver, but also a nice person to have for a mother, someone whose personal rather than functional mode of loving is wanted" (Likierman, 1988, p. 31). Consequently she transmits her good, loving and caring parts of herself not to intrude upon the infant, but to offer a pleasure or emotional goodness which is not in the infant's own making, like an unexpected gift. This provides the infant the experience of "receiving, as opposed to the experience of earning and demanding pleasure. It also gives him the experience of being wanted rather than catered for" (Likierman, 1988, p. 31).

One study discusses a mother's musicality in projective identification. The author observed one mother-infant dyad as a case study on a weekly basis over a two year period (Escandón, 2008). The mother was often observed singing and dancing and her infant would stop his current playing, look to the mother, kick his legs, shake his hands, smile and laugh in pleasure and joy. Escandón (2008) suggests that the mother was using musical expression to transmit the 'good parts' of herself which were felt by the infant as if he were penetrated by pleasure. Over time the regular experience

of projective identification became internalised in the infant as a representation of the positive union or bond between mother and child. It was proposed that the infant would recall and hold onto the internalisation of the mother's repertoire to defend himself against the anxiety of separation from the mother. Utilising regular musical interaction as a vehicle of positive projective identification may contribute to the development of the mother-child attachment bond by reinforcing and internalising an 'imprint' of the positive mother-child union and may therefore help the infant cope with the stress of separation anxiety (Cozolino, 2010).

Summary

The literature clearly supports infant-directed singing as a vehicle for reciprocal/synchronous interactions. Playsongs and lullabies may facilitate emotional communication and positively contribute to the development of mother-infant attachment. By participating in supportive and encouraging educative programs, mothers may be re-educated about musical resources, gain experience with musical interaction and be encouraged and supported in their use of music (de Vries, 2007; Vlismas & Bowes, 1999). Thus, musical practises may be reintegrated into family life.

It is important for music therapists to be aware of the theories, concepts and research concerning attachment and emotional communication to better inform interventions involving early mother-infant interactions. The reciprocity of interactions develops mother-infant attachment which is linked with neurological, emotional and social developmental outcomes for young children. Positive and synchronous mother-infant interactions therefore will positively impact upon attachment and child development.

However, more research is needed to develop a greater understanding of how infant-directed singing and songs facilitate emotional communication and positively contribute to attachment. More empirical research is needed to examine the behavioural, musical, physiological and subjective features of reciprocal and non-reciprocal musical interactions. By expanding our knowledge and understanding of musical emotional communication therapists may enhance current programs as well as develop new programs that focus on encouraging positive emotionally available mother-infant relationships and synchronous musical interactions.

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Mother-infant musical interaction and emotional communication: a literature review. A commentary on Creighton's article.

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Author Alison Creighton offers a comprehensive review of research literature related to the role of music in mother-infant interactions. Her comments further underscore the adaptive significance of certain musical behaviors, such as infant-directed (ID) singing. Additionally, Creighton's discussion reflects a heightened interest in the topic that has emerged in recent years, largely fueled by an increased understanding of infants' perceptual capacities and the effects of early experience on development. Finally, while Creighton establishes critical connections from previous research, her observations stimulate further thought regarding the practical implications for music with mothers and infants.

Adaptive significance of singing to infants

By connecting mother-infant interactions with infants' neural plasticity as well as to emotional regulation and attachment, Creighton underscores the importance of singing to infants. Her insights reveal what many researchers and theorists have long-suspected: ID singing has adaptive significance; that is, this unique musical interaction appears to benefit infants in an important way. Previous researchers have observed that singing to infants is a universal caregiving behavior; present in every known human culture and documented throughout history (Lewkowicz, 1998; Trehub, 2001; Trehub, Schellenberg, & Hill, 1997). Some theorists have suggested that music itself evolved from the practice of singing to infants as a way of maintaining proximity with caregivers (Gaston, 1968; Huron, 2003; Mithen, 2006). With Creighton's perspective, one can see that infants who receive timely and appropriate forms of musical stimulation may acquire the self-regulation skills needed to manage a variety of emotional demands across the lifespan. Additionally, such infants are more likely to experience secure attachment with a primary caregiver, thereby establishing a constructive template for subsequent relationships.

Connecting basic and applied science

In addition to clarifying the adaptive significance of singing to infants, Creighton's writing helps to explain why a growing number of researchers have focused on this topic in recent years, and why clinicians are now proposing ideas for clinical applications. Essentially, owing to the efforts of such veteran researchers as Sandra Trehub or Laurel Trainor, we now understand how infants make sense of musical information, and specifically what attracts them to their mothers' singing. Thus the basic science exists to explain how infants perceive music. This knowledge plays a critical role in designing effective interventions, and understanding how they work. With this basic evidence, researchers can move forward with applied studies that utilize ID singing as a therapeutic intervention with functional outcomes; that is, to promote the neural connectivity needed for self-regulation and synchronized social interactions. Ultimately, Creighton's comments help to establish a much-needed connection between basic and applied science in regard to ID singing, which will help to answer the critical questions of "did the intervention work?" and more importantly, "*how* did the intervention work?" Only by answering both questions can researchers achieve the internal and external validity that is the hallmark of rigorous scientific investigation.

Practical implications: Typical and clinical populations

Much of Creighton's writing appears to focus on typical mothers and infants. She seems to suggest that by encouraging ID singing in this typical

population, secure attachment can be supported. Meanwhile, musical interactions can be extended across time and musical forms can be conveyed from one generation to the next. Such comments are valuable and certainly worthy of exploration. Considering the connections now established between ID singing, self-regulation and attachment, researchers may want to expand upon Creighton's ideas by exploring ID singing with clinical populations. By definition, a clinical population in this case may be any mother-infant pair considered to be at-risk for poor self-regulation and thus, insecure attachment. Populations that come to mind include infants at risk for autism spectrum disorder, and infants born with Down syndrome. Both infant populations may display difficulty with emotion regulation that reflects deviations in central nervous system development and thus can negatively impact interactions with caregivers. Additionally, mothers with depression or other mental health issues may struggle with their own self-regulation, such that they have difficulty attending to their infants' needs and signals (de l'Etoile & Leider, 2011). For these at-risk populations, ID singing may play a critical role in helping mothers to promote their infants' neural development, as needed for effective self-regulation and secure attachment.

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