Video Article

Clinical Practice Protocol of Creative Music Therapy for Preterm Infants and Their Parents in the Neonatal Intensive Care Unit

Friederike B. Haslbeck[1], Dirk Bassler[1]

[1]Department of Neonatology, University Hospital Zurich, University of Zurich

Correspondence to: Friederike B. Haslbeck at friederike.haslbeck@usz.ch

URL: https://www.jove.com/video/60412
DOI: doi:10.3791/60412

Keywords: Medicine, Issue 155, preterm infants, parents, creative music therapy, responsiveness, communicative musicality, entrainment, empowerment, infant-directed singing, lullaby

Date Published: 1/7/2020

Citation: Haslbeck, F.B., Bassler, D. Clinical Practice Protocol of Creative Music Therapy for Preterm Infants and Their Parents in the Neonatal Intensive Care Unit. *J. Vis. Exp.* (155), e60412, doi:10.3791/60412 (2020).

Abstract

Creative music therapy for preterm infants and their parents (CMT) has emerged as a promising family-integrated early intervention involving communicative musicality to improve infant development, parental well-being, and bonding. It aims at relaxing and nurturing the infant as well as promoting safety and social interaction for the parent-infant dyad. A music therapist specially trained in CMT hums or sings in an infant-directed, improvised, lullaby style continually adjusting to the individual needs, expressions, and breathing pattern of the preterm infant. Based on the principles of family-integrated care, the family is incorporated individually in the therapeutic process, namely by delivering CMT during kangaroo care (KC) and by motivating and facilitating parental vocal interaction with their infant to strengthen the parent-infant bonding. CMT aims at relaxing, stimulating, and coregulating premature infants at a time when many other interventions are still risky and can overwhelm the vulnerable patient group. CMT may be advantageous not by educating and teaching parents, but rather by uncovering the intuitive capacities of parenting that are often overshadowed by the traumatic experience of preterm birth. However, CMT can only be provided when the infants are clinically stable. CMT with parental integration is feasible when parents are available and receptive to participate. This paper presents a detailed protocol on how to use CMT to empower preterm infants and their families.

Video Link

The video component of this article can be found at https://www.jove.com/video/60412/

Introduction

Preterm infants represent a growing population in health care, and many infants suffer neurodevelopmental impairments that persist into later life (e.g., motor dysfunction, cognitive and behavioral problems)[1,2]. In addition to other risk factors, sensory deprivation (e.g., the lack of the intrauterine multisensory experience of the regular maternal heartbeat and the maternal voice) and the stressful sensory overload of the NICU, or neonatal intensive care unit (e.g., monitor beeping, mechanical noises), may negatively impact brain maturation[3,4].

Preterm birth is a stressful and traumatic event for preterm infants and their parents[5]. Infants and parents are separated too early, and the parents lack their autonomy as primary caregivers, which can impede the development of healthy bonding between parents and their infants[6]. Parents may suffer from feelings of disappointment, ambivalence, helplessness, anxiety, and guilt[7]. Unresolved psychological trauma is linked to parental stress, thereby compromising parental well-being, attitudes, and behaviors, potentially adversely impacting the attachment process between infants and their parents[8,9,10].

Family-integrated early interventions are warranted to decrease these adverse consequences of preterm birth and to actively involve parents as primary caregivers as soon as possible[11]. Music therapy in neonatal care is exactly that: an early and promising intervention to stabilize and nurture the infant as well as to promote connectedness at a time when many other interventions are still at risk to overwhelm the fragile infant. CMT for preterm infants and their parents has emerged as one of these interactive music therapy approaches in the NICU[12,13,14]. CMT is an individualized and interactive approach, resource and needs-oriented[15,16,17]. CMT is related to Nordoff-Robbins music therapy[18], which assumes that being responsive to music is an intrinsic quality to being human, regardless how handicapped or even premature a human being is[19,20]. CMT directs the trained music therapist to assess the meaning of the infant's breathing rhythms, facial expressions, and gesticulations, and to construct a musical response[15,21]. The therapist hums or sings in an infant-directed improvised lullaby style, continually coregulating the infant's behavioral states (affects, emotion, arousal[22]). CMT aims to relax the infant as well as to offer individualized interaction, meaningful stimulation, and entrained rhythms (e.g., to facilitate stable and regular breathing rhythm and suck-swallow-breath rhythm)[23,24].

Based on the principles of family-integrated care[11], the family is incorporated individually in the therapeutic process, namely by delivering CMT during KC when the infant is placed chest-to-chest or skin-to-skin on the chest of the parents to enhance parental feelings of security and thereby prevent their retraumatization[5]. The music is tailored continuously to the affects, rhythms, and needs of the infants as well. CMT aims to honor the family's musical and cultural heritage and to integrate their favorite music or song to empower the family in their cultural identity[23] similar to the "song of kin" techniques of Loewy et al.[25]. CMT further aims to promote parental self-confidence and autonomy and to

enhance the parent-infant attachment process. The music therapist generates the parent's awareness to reconnect with their musical self and their infant via vocal interaction by supporting parental infant-directed speaking and/or singing in a responsive and attuned way. During KC the therapist may accompany the voice with a monochord, a single-stringed wooden instrument (~30 strings tuned to one base tone with octaves and fifth generating vibroacoustic sounds of overtones). It may evoke the deep-frequency sounds and vibroacoustic of the womb. It generates an open, nurturing sound that may be inviting to sing along with in all musical keys and styles, as proposed by the parents. Techniques such as positioning the instrument against the parent's elbow allows its vibrations to convey relaxation. The monochord has proven itself effective in inducing relaxation and lending a feeling of intensity to parent-infant encounters[26]. Parents in the NICU reported after CMT that particularly the monochord sound generated the feelings of security, relaxation, and increased physical closeness to their infant[27]. Additionally, KC itself is a natural technique for enhancing the multisensory bonding experience between mother (or father) and infant and has become standard routine in many NICU units[28].

Even among siblings, premature birth is challenging. Siblings may struggle with feelings of neglect, envy, and sometimes grief, which can lead them to refuse to accept their preterm sibling[29]. Consequently, CMT also aims to include preterm infants' siblings by letting them choose a song for their prematurely born sister or brother and by singing it together, for example. Generally speaking, CMT aims to facilitate communicative musicality to promote parent-infant connectedness. Music is the pathway for each family to engage in a meaningful ongoing relationship "to support the infant coming into being, the parents into parenthood, and the triad into bonding"[30].

Several systematic reviews and a meta-analysis[31,32,33] suggest favorable effects of music therapy in neonatal care (e.g., physiological parameters, behavior state, respiration). The meta-analysis, including 964 preterm infants and 266 parents, showed a beneficial effect of music therapy on the infants' respiratory rate and maternal anxiety[31]. The authors highlight the need for neonatal music therapy provided by specially trained music therapists[31]. Equally, the authors of a multicenter randomized controlled trial (RCT)[13], a mixed-method study[34], and a qualitative study[35], call for the informed use of music in a therapeutic relationship by certified music therapists. Several trials revealed that music therapy, and particularly entrained music therapy[13], has a favorable impact on preterm infants' respiratory rate, and quiet alert and sleep states[13,31]. Integrating parental-preferred lullabies in the live music therapy process was associated with enhanced bonding and decreased parental stress and anxiety[13,34].

Researchers have further investigated if live music therapy during KC may affect the well-being and stress levels of parents more than KC alone. Two randomized studies from Israel demonstrated that active harp music therapy during KC may reduce maternal anxiety more than KC alone[36] and that a mother's anxiety may decrease when singing while holding the baby in KC and increase calmness in preterm infants more than KC alone[37]. Similarly, researchers from Finland[38] suggest that live music therapy combined with KC may have more relaxing effects than KC alone. Although these results have to be confirmed with more extensive trials, they already indicate the potentials and possible advantages of music therapy over other nonpharmacological interventions such as KC and call for family-integrated music therapy in neonatal care. In this manuscript, we present a detailed step-by-step protocol on how to use CMT as a family-integrated, needs-oriented, and individualized live music therapy approach in the NICU to empower preterm infants and their parents from the very beginning.

Protocol

The clinical protocol follows the ethical guidelines of the University Hospital at Zurich. All methods and techniques are based on the described approach of CMT in the NICU and are recommended to be provided by music therapists specially trained in CMT (CMT training or the Rhythm Breath and Lullaby training with CMT modules[39,40,41]). CMT can be delivered when the infant is clinically stable, as defined by nurses and doctors of the neonatal team, 2-3 times per week, for approximately 20 min each session.

1. Preparation

1. Before initiating music therapy, conduct an in-depth assessment with team members of the unit (e.g., doctors, nurses, psychologists) and as soon as possible with the parents to identify the needs of the infant and parents. Based on these needs create therapeutic objectives oriented towards the principles of neonatal music therapy and family-integrated care approaches[42,43,44].
2. Introduce music therapy to the parents. Assess their needs, resources, musical heritage, and culture. Assess what song or music they wish for as well as their natural vocal range. Assess if they already provided music to their infant during pregnancy, and if so, integrate this music in the therapy procedures referred to as "song of kin"[45].
3. Supply the parents with empowering intercultural music material (e.g., the lullaby book "Wiegenlieder für die Kleinsten. Ausgewählte Lieder von Eltern für Eltern frühgeborener Kinder" [Lullabies for the most little ones. Songs of parents for parents of preterm infants])[46]. Parents of preterm infants sang all the international songs in this book and framed each song with their written experiences on why and how they sang to empower and to motivate other parents to sing for their infant as well[47]. Alternatively, provide further information (e.g., a flyer) to motivate parents to engage in vocal interaction with their infant.
4. Continue to assess the infants' and parents' needs during their clinical trajectory over time by attending interdisciplinary neonatal rounds and or meetings regularly and by intensifying the dialogue with the parents. Continue to adapt to these families' needs to facilitate a needs-, and resource-based therapeutic process.
5. Identify a reasonable time frame with the neonatal staff and the parents in which to conduct the music therapy session to minimize the chance of interfering with healthcare routines, treatments, emergencies, infant resting periods, and needs of the parents.
6. Discuss with neonatal staff and/or parents if the session should take place at the incubator or bedside only with the infant or together with the parents. For example, when the parents spend a lot of time in the NICU and enjoy the shared sessions, conduct as many joint sessions as possible, mostly and preferably during KC. When parents have less time, fewer possibilities to visit, or are not accountable, offer music therapy with other caregivers or just the infant as well.
7. Before providing CMT, seek the latest meaningful clinical information on the infant and its family as well as approval of the neonatal team. Tune the monochord in the key of the unit (the most dominant and frequent monitor beeping tone of the unit) if the instrument is needed for the session[48].

8. Before conducting each music therapy session and entering the patient zone, disinfect hands, arms, and the instrument by following the hygiene guidelines of the neonatal unit and the individual infant. Disinfect and prepare a chair at the bedside of the infant or next to the parents.

2. Creative Music Therapy with the Preterm Infant at the Bedside or Incubator

1. When the infant tolerates touch, start with initial touch by touching the infant at the head and feet and change it into therapeutic touch by lightly laying one hand on the chest or the back[49,50]. While touching the infant connect with the infant, notice any increased or decreased muscle tension, any voluntary or involuntary movement, and support the breathing movements and patterns by adapting the pressure and weight of the hand on the chest or back to these patterns.
2. After a period of observation, start with infant-directed humming entrained to the infant's breathing pattern, incorporating the infant's signs of mimicry and movements to attune to the infant's needs and to support or regulate breathing. Fade in the music: Start with a few long and calm notes proceeding in small steps with a high degree of repetitions and continuity.
3. Develop the melody slowly over time. Often this occurs synchronously: for example, when the infant's eyebrows lift, move the melodic pitch and tempo upwards[16]. In contrast, when the infant is overly aroused, reduce the melody's span of pitches and pitch range and shift it downwards, slow the tempo, and repeat the closing notes to soothe the infant.
4. Hum to sooth and sing to activate, synchronize and interact with older infants, or infants who open their eyes and mouth and/or start "mouthing" (i.e., shaping their mouth to make "oh" and "ah" sounds and tongue play) and/or move their fingers or arms smoothly[50].
5. Hum and sing simply in lullaby style in order not to overwhelm the infant: Keep the voice calm, slow, simple, predictable, repetitive, and contingent with the pitch range of children's songs based on the guidelines of neonatal music therapy[24,43,44]. Hum with flowing breath and a free natural voice full of overtones and total ease.
6. Incorporate the "song of kin"[25] in lullaby style in the individualized, attuned improvisation. If necessary, attune to environmental sounds to integrate and thereby mitigate disturbing noises such as a monitor beeping[50] oriented towards environmental music therapy approaches[4,48].
7. After ~15-20 min (adapt the duration to the individual needs of the infant) fade the humming or singing slowly out by reducing the notes, the tempo, the rhythms, and conclude by repeating the last note[51].
8. Hold the infant some seconds longer before removing hands slowly and cautiously.

3. Creative Music Therapy with the Parents During Skin-to-skin Care

1. Assess the current needs of the parents (e.g., assess if they would like to listen and relax during the music therapy session or if they would like to sing along).
2. Invite the parents to sit or lie down comfortably. Position the monochord next to the side chair of the parent with the infant in KC. Place the instrument next to the elbow or arm of the parents so that the relaxing vibrations can transmit to their body.
3. If appropriate, invite the parents to breathe in and out deeply. Invite the parents to close their eyes, to focus on their breathing, and afterward to focus on feeling their infant. Alternatively, invite the parents to observe and interact with their infant, as they prefer. This procedure may be appropriate as preparation for the joint music therapy session and/or during the session accompanied by monochord sounds and singing and/or speaking.
4. After a short period of observing the parent-infant dyad, start with long, calm sound waves on the monochord, entrained to the infant's breathing pattern (e.g., three sets of infant inhalations and exhalations = one long continuous strum on the monochord). Fade the sound in smoothly.
5. After a while (~90 s) hum along with the monochord sound, as described above, or accompany and support the parental humming/singing for their infant.
    1. Attune and tailor the humming and singing to the affects, rhythms, and needs of the infant and environmental sounds as described above and additionally to the parents' needs (compare previous publication[23,47]).
    2. Hum or sing within the parents' vocal range to facilitate parental humming or singing. To honor the family's musical and cultural heritage integrate their favorite music in the singing[23,25].
6. After ~15-20 min (adapt the duration to the individual needs of the infant), fade the humming or singing slowly out by reducing the notes, the tempo, the rhythms, and repeating the last note. Continue to play the monochord for 1 or 2 min more and fade the monochord sound smoothly out. Hold the moment of reverberation and silence some seconds longer before removing the instrument slowly and cautiously.
7. If appropriate, ask the parents how they experienced the music therapy session for themselves and how they perceived their infant's reactions. If appropriate, share perceptions of the infant's behavioral state and reactions (e.g., smiling, finger movements, if occurred). Give feedback about observations and thereby encourage and value observed appropriate parental and infant behavior as well as appropriate parental-infant interactions to promote parental self-efficacy and parent-infant attachment.
8. Encourage the parents to use their voice to connect with their infant in their daily NICU routine. Encourage the parents to use infant-directed speech with "motherese"[52,53] and humming and singing, as preferred by the parents.
9. When therapeutically indicated, invite the parents to engage in song writing, a widely used music therapy method to express and validate experiences, to externalize emotions and thoughts[54], and to intensify and personalize the parent-infant interactions in neonatal music therapy in particular[30,55,56]. Invite the parents to write about their musical experiences in their dairy (or the diary pages of the lullaby book "Wiegenlieder für die Kleinsten") and to quote their song.

4. Creative Music Therapy with Additional Family Members

1. Prepare and adapt to the current needs of the infant and parents as described above, but assess the needs of siblings, grandparents, or other significant caregivers, if and how they wish to participate in the music therapy sessions. Assess well-known family songs and model the song in lullaby style for the preterm infant.
2. Assess the context, history, and heritage of the chosen songs and invite the family to share their associations and emotions regarding the chosen music. Sing the song for or with the family based on the infant's and family's current needs. Sing and or accompany as described

above or let the family members sing for the infant and accompany or listen and coach them. Encourage the family to use infant-directed speech or singing when they visit the infant as well.

5. Follow-up

1. Make a new appointment with the parents, if appropriate. Upon exiting the patient zone, disinfect following the neonatal hygiene guidelines.
2. Document the sessions as described elsewhere[16]. Give feedback to and discuss with neonatal staff and parents (if available). Attend integrative rounds and continuously assess the needs of the team and parents to incorporate these needs in the therapeutic process.
3. Write a final patient report before hospital discharge and advise parents on how to use music at home, including written recommendations. If appropriate, give the parents a call 2 weeks after discharge to inquire how they are doing and to recommend further musical support.

Representative Results

A microanalysis of video material (122 videos) collected for a qualitative, grounded-theory-based, multiperspective study of CMT[23,50], identified three central interaction categories: 1) responsiveness of the therapist and parents, 2) resulting in communicative musicality with the infant, and 3) infants' and parents' empowerment as a consequence of categories 1 and 2 (**Figure 1**). The study results suggest that the therapists' prevailing attitude of responsiveness via musical attunement and entrainment may facilitate shared communicative musicality (e.g., interactional synchrony, moment of meeting, interplay). By experiencing this relatedness in music, parents and infants may be supported to relax and to engage in mutual relationship. However, preterm infants still act and re-act with most subtle facial expressions and movements[23].

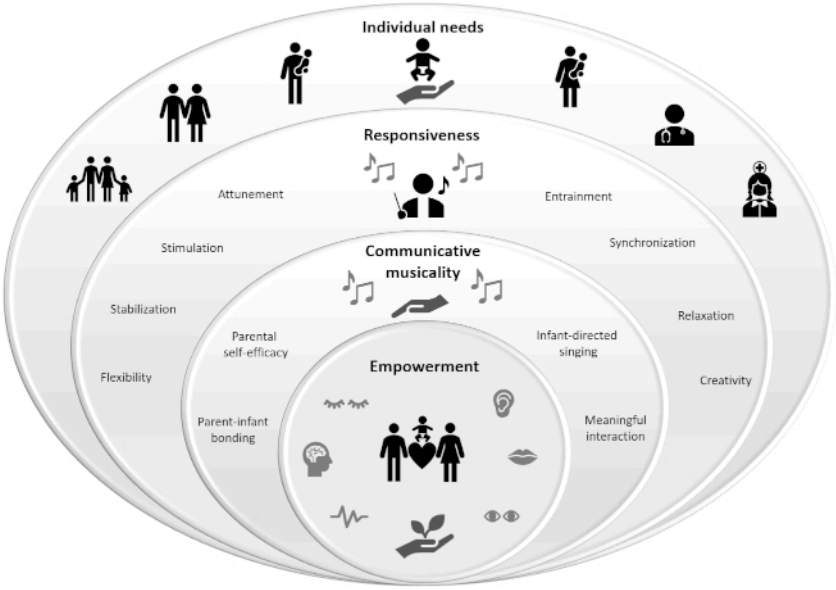

Figure 1: Logic diagram of categories inherent in the CMT process. This figure has been modified from Haslbeck[23]. Please click here to view a larger version of this figure.

In this context, responsiveness means the therapist`s ability to observe, interpret, and respond reasonably with musical capacity[57]. The video microanalysis revealed that when the infant is aroused, the therapist sings as simple and repetitive as possible to calm down the infant. The therapist softly hums only two long holding notes centering around the tonic of the scale to provide a musical holding, stability, and safety (**Figure 2**, blue circle voice line, 0:21-0:55). The therapist continually entrains the singing to the breathing rhythms of the infant (**Figure 2-4**: infant`s breathing and therapist`s voice line continuously rhythmically entrained).

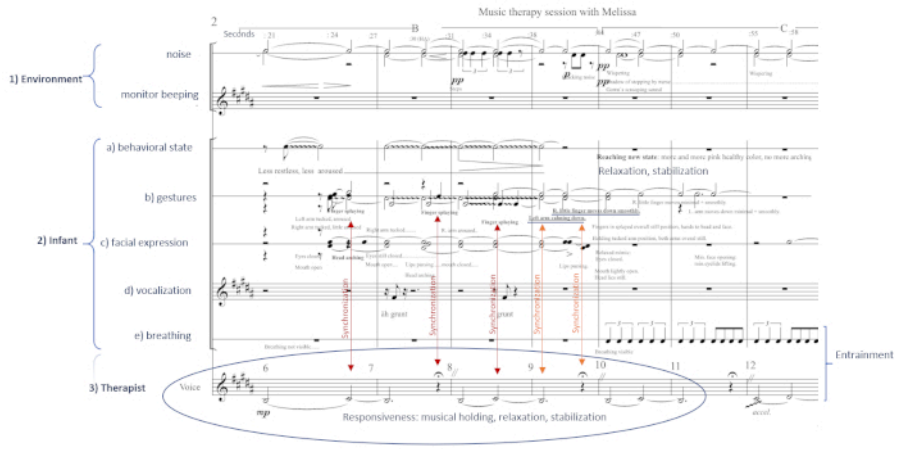

Figure 2: Transcription of responsiveness and therapist-infant synchronization. Detailed transcription of music therapy session with Melissa by using conservative music notation with Finale 2011 notation software[50] including three layers on the same timescale: 1) environment, 2) infant behavior (four layers: a) behavioral state b) gestures c) mimicry d) breathing pattern, if visible) and 3) therapist`s voice. This figure has been modified from Haslbeck[50]. Please click here to view a larger version of this figure.

Further responsiveness involves attuning to the environmental sounds such as the monitor beeping. The therapist sings in the key of the monitor alarms (**Figure 3**, blue arrows, 1:00-1:07) to integrate sudden stressful digital sounds in the music and thereby to mitigate disturbing noises. Consequently, "Melissa" remains calm (**Figure 3**, blue rectangles, 1:04-1:10) after the sudden alarm during music therapy (**Figure 3**, red star, 1:04) in contrast to beeping noise evoked stressed reactions without music therapy[50]. The therapist continuously tailors the singing to the facial expressions and gestures of the infant (**Figure 3**, orange arrows, 0:58, 1:09). For instance, when Melissa smiles and rises her fingers the therapist rises the melody, tempo and dynamics synchronously (**Figure 4**, blue circle: compare voice line with breathing, mimic mouth and gesture line, 1:30-1:45).

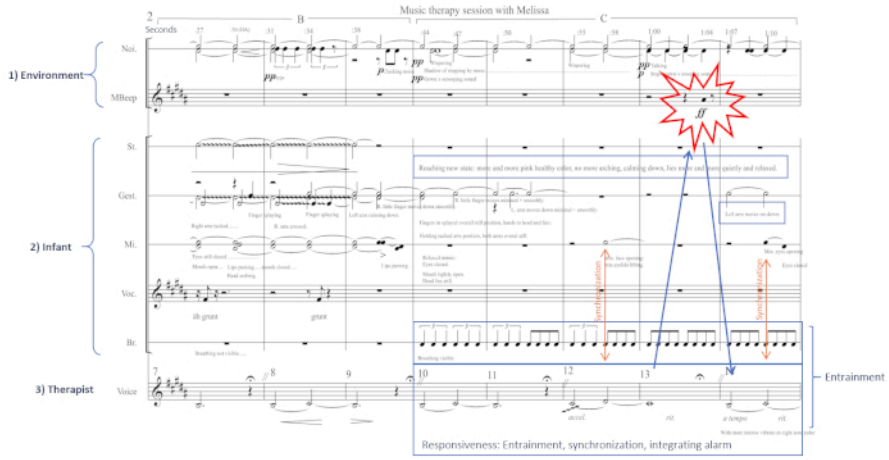

Figure 3: Transcription of responsiveness, entrainment, therapist-infant synchronization, and integrating of monitor alarm. Detailed transcription of music therapy session with Melissa as described in Figure legend 2. This figure has been modified from Haslbeck[50]. Please click here to view a larger version of this figure.

Figure 4: Transcription of communicative musicality and therapist-infant synchronization. Detailed transcription of music therapy session with Melissa as described in Figure legend 2. This figure has been modified from Haslbeck[50]. Please click here to view a larger version of this figure.

Communicative musicality acts like the intuitive affect attunement of a healthy caregiver-infant relationship. This sharing of emotional experiences is like a dance, like a musical performance[52,58,59,60]. Through shared rhythms, tempi, and affects, communicative musicality may support the infants' coregulation and stabilization and may transform the arrhythmic intensive care environment into a relational environment required for healthy socio-emotional development and growth[59]. The video microanalysis[50] implies that CMT may enhance relaxation, participation, self-regulation, and engagement in premature infants through experienced communicative musicality. Communicative musicality can evolve through interactional synchronization of affects. In **Figure 2**, at first, Melissa synchronizes her stressed movements with the tension in the music. She splays her fingers synchronously with the higher more suspenseful note or in the tense pause (**Figure 2**, red arrows, 0:24-0:37). After synchronizing with the tension in the music, she may then be able to synchronize with the relaxation of the music. When the first musical phrase ends, she relaxes her body and moves her arms and fingers smoothly down (**Figure 2**, orange lines, 0:38-0:44). Throughout the session, Melissa remains in this relaxed behavioral state and engages with increasing smooth facial reactions and finger movements (**Figure 3**, orange arrows, 0:58 -1:09). When the melody rests with the ritardando (rit.), she sighs deeply (**Figure 4**, blue circle, orange arrow, 2:03) interpreted as a sign of relaxation. When the melody, dynamics, and intensity ascend, she raises her finger and smiles (**Figure 4**, blue circle, orange arrows, 2:03-2:05) interpreted as engagement in communicative musicality.

By relaxing and engaging the parents in meaningful, sensitive interactions with the infant, the parents may experience self-confidence, self-efficacy, and autonomy. They may thereby be empowered in their role as primary caregivers and participants. In this context, empowerment means to facilitate self-regulation in the infant and to uncover intuitive parental capacities for parental responsiveness that are often overshadowed by anxiety and stress[23,47]. Parents reported in the qualitative interviews of the study that they could relax and relate more intense to their infant through music therapy: *"I notice when I can relax that I am much more connected, much more intense, much more closely connected with my daughter because of the music, because of the singing."*[23]

The video microanalysis revealed that mothers who were stressed and distanced connected with their infants through meaningful vocal interaction. **Figure 5** & **Figure 6** show the microanalysis of shared mother-infant rhythms of a previously stressed and detached mother. The mother entrains her singing to the sucking rhythms of her daughter. She sings with "motherese" (infant-directed, with a loving tone and free voice, responsive with facial expression and gestures) rocking the infant in the rhythm of the song. "Emila" begins with her sucking pattern precisely at the beginning of the musical phrase of her mother (**Figure 5** & **Figure 6**, orange arrows) except in bar 9 (**Figure 5**, red circle, 0:26). The mother immediately recognizes, interprets correctly, reacts appropriately and promptly with sensitivity as referred to as appropriate bonding behavior[23]. She reduces and ceases her singing to hold and readjust (**Figure 5** & **Figure 6**, blue circle, 0:26-0:28). After this moment of readjustment, she begins the musical phrase again in synchrony with the sucking pattern of Emila (**Figure 6**, blue circle, 0:28 following). Mother and daughter meet once more within communicative musicality in shared pulse and quality. They connect in a mutual gaze at the end of the musical phrase, and the mother smiles (**Figure 5**, 0:28 following). Mother and daughter meet in a "neonatal moment of meeting" described as tender moments after birth to generate the attachment bond and the mother's self-confidence in her role as primary caregiver[23]. Immediately after this singing episode, the mother expressed her love and empowerment by picturing herself as a lion mother. She phrases her self-confidence and autonomy by the sentences' causal dependence (underlined): *"If I would not have so much love, right? Then my daughter would have no chance to survive. I am like a lion."*[23]

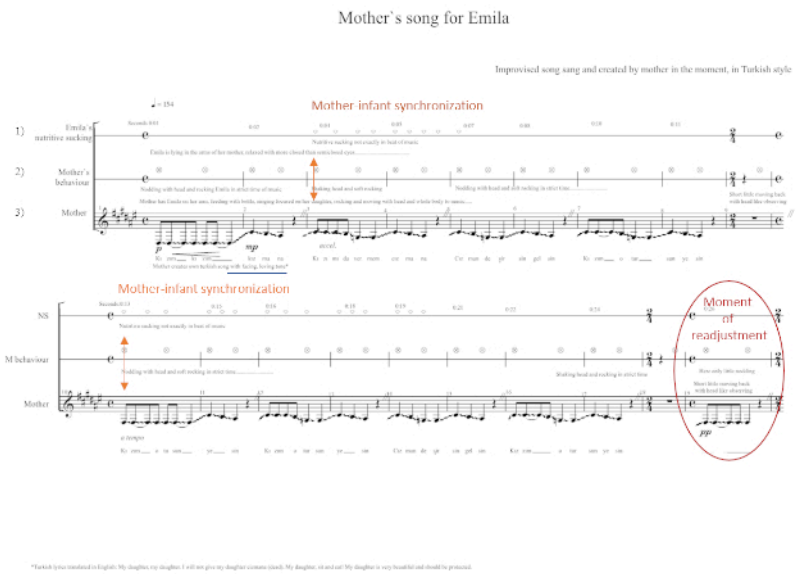

Figure 5: Mother-infant synchronization. Detailed transcription of mother`s singing for her daughter Emila by using conservative music notation with Finale 2011 notation software[50] including three layers on the same timescale: 1) Emila`s nutritive sucking pattern, 2) mother`s behavior and 3) mother`s singing. This figure has been modified from Haslbeck[23]. Please click here to view a larger version of this figure.

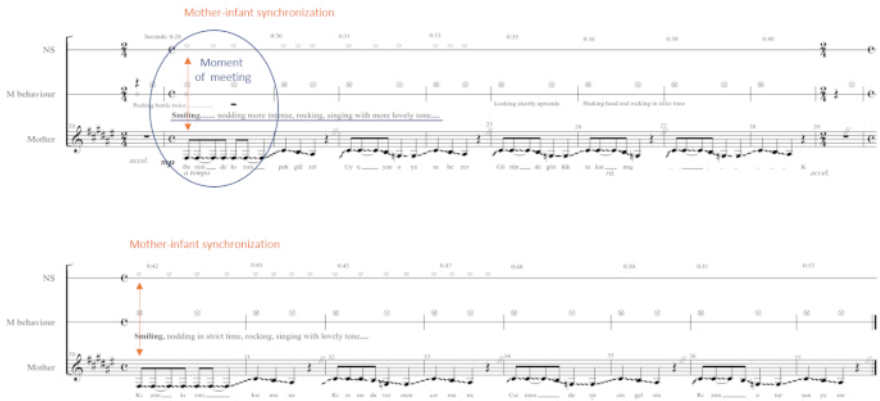

Figure 6: Mother-infant synchronization and moment of meeting. Detailed transcription of mother`s singing for her daughter Emila as described in Figure legend 5. This figure has been modified from Haslbeck[23]. Please click here to view a larger version of this figure.

First results of a mixed-method pilot trial underline these results. The study revealed that parental depressive symptoms decreased and physical closeness increased across hospitalization time in the CMT group compared to the control group[27]. The parents reported that CMT evoked feelings of relaxation and joy and empowerment to interact more profoundly with their infant[27].

Discussion

The therapeutic, responsive, empowering, and creative use of music in CMT may be of great potential for preterm infants, their parents, and the parent-infant attachment. Individually tailored soft music, shared affects attunement, and joint attention may support relaxation, development, and the bonding process even in the stressful and artificial environment of an intensive care unit.

However, music therapy plays a subordinated and complementary role in the lifesaving priority setting of medical treatment and intensive care. Mostly, CMT should be delivered when the infants are clinically stable and do not suffer severe or life-threatening instability as defined by the neonatal team. Nonetheless, music therapists can provide CMT as palliative care as well when recommended by the neonatal team and or requested by the parents[61]. CMT with parental integration can only occur when the parents are present and willing to participate. Often, the music therapist has to reschedule planned sessions so as not to interfere with healthcare routines, treatments, emergencies, and infant resting periods. Sometimes, planned joint music therapy sessions in KC have to be changed to sessions at the bedside of the infant because the infant is too medically unstable for KC. The needs of the infant are of highest priority in all decision-making processes because the preterm infant is the most vulnerable component of the parent-infant-environment triad, even when this may evoke parental feelings of disappointment. This priority setting is warranted for the whole music therapy process as well.

When working with the parents, the aim is to enable intuitive parental roles to emerge through interactions with their infants, more than to explicitly teach new skills. While working with the family, the music therapist should act as a facilitator and collaborator, rather than as an educator or expert teaching parents how to use their voice and or sing since many parents experience helplessness, dependence on NICU

experts, and a lack of self-control, self-confidence, and autonomy as primary caregivers[9,62]. Therefore, the role of the therapist is to advice by supporting the parental role as primary caregiver rather than compromising it. The task of the therapist is to integrate the cultural heritage of the family because supporting parents in their cultural identity is argued to be particularly empowering and may build transcultural bridges[47,63,64]. Because infant-directed humming is characterized by musical parameters across cultures such as slower tempo, higher pitch, and a distinctive style of humming and singing[65], these musical parameters can be used to facilitate communication and interaction with the parent-infant dyad even beyond potential cultural and language barriers[66]. In cases when parents are not accountable (e.g., due to severe mental health issues or drug addiction), CMT should aim to integrate other potential caregivers of the infant. Moreover, the overarching challenge of the music therapist is to assess steadily the interweaving and constantly changing needs of the infant, parents, and neonatal intensive care environment in order to be flexible, creative, and therapeutically responsive. Therefore, only specially trained music therapists are recommended to provide CMT in neonatal care by following the described step-by-step protocol.

Nowadays, CMT is aligned with key principles of family-centered care: e.g., empowering each child and family, honoring choices and cultures, adapting to caregivers' needs, and collaborating with parents in treatment[24]. CMT draws further on the elements of family-integrated care by integrating parents as partners and primary and most meaningful (vocal) caregiver as soon as possible[11].

CMT may enhance the widely used approach of KC by reducing stress, promoting relaxation, and intensifying feelings of safety and connectedness[38,67]. CMT may be of particular significance not least because of providing meaningful, socio-emotional, joyful, and playful "moments of meeting" which are argued to foster a secure relationship between the parent-infant dyad[9,68]. CMT aims at relaxing, stimulating, and coregulating premature infants at a time when many other interventions are still at risk to overwhelm the vulnerable patient group. Particularly in the first weeks after preterm birth when very preterm infants are sometimes too unstable for KC, infant-directed humming can facilitate nurturing connectedness. Additionally, the music therapist can provide CMT during sleep without awakening but stimulating the infant[50].

Socio-emotional experiences and early auditory experiences make an impact on brain development as suggested by human and animal studies[69,70,71]. Because preterm infants are in the most rapid and vulnerable period of brain development, auditory and socio-emotional experiences may influence the plasticity of auditory and cortical brain regions[72,73].

We may speculate that the enriched musical and socio-emotional experience in CMT may promote brain development, notably functional and structural connectivity, as well as emotional and cognitive development[74]. Rigorously designed trials are required to evaluate short and longitudinal effects of music therapy on brain development in preterm infants and psychosocial adaption. In Switzerland, such a study is implemented, and a multicenter study is prepared[17]. In conclusion, CMT may be a promising and feasible family-integrated therapy involving communicative musicality to promote neurodevelopment, parental psychosocial adaption, and mutual socioemotional connectedness from the very beginning.

Disclosures

The authors have nothing to disclose.

Acknowledgments

This work was funded by the foundation Vontobel-Stiftung Zurich.

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