

REFLECTIONS ON PRACTICE | PEER REVIEWED

Implementing Live Music Therapy in a Level III NICU in Italy in Synergy with an Existing Positive Touch and Babywearing Program

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Abstract

A neonatal intensive care unit (NICU) is often a stressful environment for infants, potentially impeding developmental progress. Each interaction between a premature infant and their caregiver holds the potential to influence the infant's neuro-emotional developmental trajectory. Premature birth can interrupt the natural bonding process, leading to increased parental stress levels. A parent's ability to appropriately respond to their baby's behavior is fundamental to the development of attachment and early relational connection. This article details the establishment and implementation of a live music therapy (LMT) program within a level III NICU in Italy. Situated within the Italian healthcare tradition of "humanization of care," this program reflects a culturally responsive, family-centered approach. It operates in collaboration with other non-pharmacological interventions, including positive touch (PT), kangaroo care (KC) and babywearing (BW). These flexible interventions were delivered individually or in combination, tailored to meet the specific needs of each family, from the earliest days of NICU admission. This approach aims to provide age-appropriate and evidence-based sensory experiences across tactile, auditory, visual, and kinesthetic domains. The program was led by a certified NICU music therapist and a pediatric nurse babywearing consultant, both trained as infant massage instructors through the International Association of Infant Massage (IAIM) and as positive touch specialists for preterm infants.

This paper provides a reflective account of the program's establishment, focusing on its integration into clinical practice rather than formal research findings.

Keywords: NICU; music therapy; positive touch; babywearing; parent training; family-centered care; preterm infants

Introduction

A premature birth can be a traumatic experience for both infants and their parents. The bonding process, which begins during pregnancy, may be delayed or altered by an early and unexpected separation, leading to significant short- and long-term consequences (Als et al., 2004; Korja et al., 2012). The hospitalization of an infant often leads to parental feelings of disorientation, helplessness, anxiety, and emotional disconnection. The limitation of physical contact can further interfere with the parent-infant relationship (Greene et al., 2015; Muller-Nix et al., 2004).

The progressive development of sensory systems from fetal to neonatal life follows a specific timeline (Kuhn et al., 2011). However, premature infants in the neonatal intensive care unit (NICU) may be overwhelmed by an influx of unpleasant and inappropriate stimuli. These sensory experiences in the neonatal unit directly impact on a preterm infant's mental health, brain development, sensory processing, and long-term neurodevelopmental outcomes. An excess of negative and stressful experiences can contribute to a state of intense, toxic stress in the infant (Sanders & Hall, 2018).

Infants and their parents form a dynamic interactive system with mutual co-regulatory capacities (Givrad et al., 2021). A secure parent-infant relationship is crucial for an infant's ability to regulate their responses to environmental stressors such as pain, loud noises, and bright lights (Welch & Myers, 2016). Co-regulation provides a survival advantage and helps maintain homeostasis in both the parent and infant. Conversely, parents may feel stressed, frustrated, or discouraged when attempting to engage with their infant, which can lead to a gradual reduction in their involvement. High-quality parent-infant interactions have been associated with a protective effect on the infant's social-emotional, cognitive, and behavioral development (Rocha et al., 2020). Given that attachment is influenced by both the infant's behavior and the parent's sensitivity and responsiveness, it is essential that preterm infants experience meaningful interactions and appropriate stimulation from their parents. Concurrently, parents should receive support and training on how to provide appropriate touch and vocalization to nurture their baby and strengthen the parent-infant bond. When parents learn to understand their infant's cues and respond appropriately, it enhances their sense of ownership and connection to the infant (Feeley et al., 2013; Filippa et al., 2021). Research suggests that parental involvement can be a low-cost intervention with a positive influence on preterm health outcomes (Benzies et al., 2013). Furthermore, parental anxiety and stress have been shown to decrease when parents are given a purposeful role in their infant's care, as this provides a sense of control and being well-informed (Lee & O'Brien, 2014; McLean et al., 2022).

The World Health Organization (WHO) recommends immediate postnatal skin-to-skin contact (SSC) for preterm or low-birth weight infants, citing increased survival rates (Arya et al., 2021). SSC has been associated with improved parent-infant interaction patterns (Athanasopoulou & Fox, 2014), enhanced quantity and coordination of vocal and tactile interactions (Velandia et al., 2010), and positive infant interactive behaviors and affect at four months corrected age (Lilliesköld et al., 2023).

Positive touch (PT) is a powerful affective and social cue that conveys a caregiver's love and care (Ardiel & Rankin, 2010; Liu et al., 2007). As a non-invasive intervention, PT has also been found to reduce parental anxiety, increase confidence in parenting abilities, and assist parents in transitioning into their new role (Vicente et al., 2017). Similarly, music

in the NICU is a non-invasive intervention that may mitigate some of the negative effects on an infant's brain development. It achieves this by reducing the stress response, providing positive social contact, and offering a form of environmental enrichment (Anderson & Patel, 2018).

The European Standards of Care for Newborn Health (ESCNH) provide comprehensive guidance on critical aspects of preterm birth, serving as a foundation for national guidelines and protocols. These standards, supported at the European level, strongly advocate for continuous parental access and high levels of active parental involvement (The Lancet Child & Adolescent Health, 2019). Furthermore, the ESCNH identifies music-based interventions, touch, and massage as potentially beneficial sensory experiences, provided they are individually tailored and appropriately attuned to the infant's behavioral state (Kuhn et al., 2018). Echoing these recommendations, the forthcoming WHO guidelines include massage as a preventive and promotive care strategy for preterm or low-birth-weight infants, aiming to increase opportunities for a supportive and nurturing environment (WHO, 2022).

Reflecting these clinical frameworks, music therapy and positive touch may contribute to supporting the experience of hospitalized infants and their families. These interventions offer an opportunity to strengthen the parent-infant relationship during a vulnerable period. Rather than reporting empirical research findings, the purpose of this article is to provide a descriptive account of the safe implementation of a live music therapy (LMT) program within a Level III Italian NICU. This program was developed in collaboration with positive touch (PT), kangaroo care (KC), and babywearing (BW) interventions, all of which align with established standards of neonatal care and evidence-based clinical guidelines.

This article is written from the perspective of the clinicians and supervisors who designed and implemented the integrated LMT, PT, and BW program. The first author, a certified NICU music therapist, operated as a specialist funded by the hospital-based association for parents of preterm infants, composed of families of former patients from the unit. The second author is a pediatric nurse babywearing consultant and permanent staff member of the hospital, representing the institutional integration of non-pharmacological care into medical practice. The program was developed under the guidance and supervision of a senior music therapy specialist (third author) and a positive touch specialist (fourth author), ensuring the clinical and theoretical rigor. Administrative oversight was provided by the director of the NICU (fifth author), whose leadership facilitated the systemic humanization of the unit. Our approach is rooted in the Italian "humanization of care," seeking to bridge high-tech medical intervention with relational support. The clinical implementation was specifically informed by the first and second authors' shared training as positive touch specialists and infant massage instructors. By writing from within the program, we acknowledge our role not as detached observers, but as reflexive practitioners—clinicians, supervisor, and directors—committed to evolving the sensory environment of our Level III NICU.

Skin-to-Skin Care and Positive Touch

Touch is the first sense to develop in the fetus, playing a fundamental role in the formation of the maternal-fetal bond (Lubbe, 2008). After birth, tactile experiences continue to shape somatosensory development (Maitre et al., 2017). A lack of touch has been associated with potential impairments in physical and emotional development and may limit the formation of secure attachments or contribute to challenges in thriving later in life (Chorna et al., 2014; Duhn, 2010). The tactile, vestibular, and proprioceptive systems develop sequentially. During gestation, these systems are stimulated by fetal and maternal movement, as well as contact with the uterine wall, body parts, and amniotic fluid. The

uterine wall provides secure boundaries that promote a state of generalized flexion and gentle containment; this, in turn, is thought to support the development of proprioception. These early sensory experiences provide an important foundation for infant learning. However, abnormal sensory reactivity is often observed in preterm infants, who may face difficulties regulating homeostasis and responding to environmental stimuli. This dysregulation may interfere with the development of perceptual and self-regulatory abilities. Research indicates that preterm infants discharged from the NICU may exhibit decreased cortical processing of touch compared to full-term infants. Such alterations have been associated with potential disruptions in the scaffolding of motor skills, tactile and multisensory exploration of the environment and self, and social-emotional interactions (Field, 2010).

The skin contains a diverse array of receptors that respond to various forms of tactile stimulation. A specific class of unmyelinated nerve fibers, known as C-tactile afferents (CTs), are thought to be critically involved in affective touch (McGlone et al., 2014; Olson et al., 2016). CTs are specifically tuned to respond to a low-force, dynamic, and rhythmic touch delivered at normal skin temperature, such as a gentle caress (Ackerley et al., 2014). These fibers have been shown to have excitatory projections primarily to emotion-related paralimbic cortical systems, particularly the insular cortex (Olausson et al., 2002). Humans appear instinctively inclined to provide touch within the optimal velocity range (1-10cm/s) required to activate these CT fibers (Croy et al., 2016; Püschel et al., 2022; Van Puyvelde et al., 2019). Research has demonstrated that dynamic touch has been associated with greater reductions in physiological arousal in preterm infants compared to static touch (Manzotti et al., 2019). Despite the potential advantages of such interactions, parents often hesitate to touch their preterm infant in the NICU due to fear of causing harm. Affectionate touch from a caregiver is considered vital for infant development and is often perceived as pleasant and rewarding (Ackerley et al., 2014; Löken et al., 2009). Gentle touch has been linked to the release of oxytocin from the hypothalamus (Smith & Wang, 2014), a hormone associated with relaxation and social bonding in both parent and infant. This physiological response may contribute to a nurturing environment conducive to growth and development.

Early skin-to-skin contact (SSC) is a well-documented practice associated with improved thermal control in both preterm and term infants (Bergman et al., 2004; McCall et al., 2018). The proximity between parent and infant during kangaroo care (KC) enhances the well-being and coregulation of the dyad, fostering positive interactions (Williams & Turner, 2020). SSC is recognized as a highly effective method for providing proprioceptive sensory input, which may support early brain development and sensory integration (Feldman et al., 2014). Furthermore, KC has been associated with positive effects on an infant's perceptual-cognitive and motor development, as well as on the parenting process at six months of age (Feldman, Eidelman, et al., 2002). Babywearing (BW) operates on principles similar to KC. The infant is swaddled in a stretchy wrap, nestled in a curled-up position on the parent's chest. This practice provides containment and stabilization along the median axis, supporting the progressive development of motor and vestibular functions. BW is typically performed hands-free, allowing the caregiver to remain active. It may serve as a supportive intervention during the NICU stay, potentially supporting health outcomes and well-being for both infant and parent. Studies have shown that parents who continue to carry their infants after discharge from the NICU experience reduced stress and anxiety, better attachment, and increased empowerment (Miller et al., 2020). Recent research suggests that BW provides comfort for infants diagnosed with Neonatal Abstinence Syndrome (Williams et al., 2020). It may influence autonomic co-regulation (Han et al., 2024), effectively managing distress and supporting the parenting process. The soothing effects of babywearing on infants undergoing withdrawal may be optimized through the activation of C-tactile afferents (Rankin et al., 2024).

Preterm babies who receive consistent caregiver skin contact exhibit accelerated hemispheric maturation and improved functional connectivity (Scher et al., 2009; Schneider et al., 2012). Positive touch experiences are crucial for helping a preterm infant maintain a regulated state (La Rosa et al., 2024). The term *positive touch* (PT), coined by British neonatal nurse and IAIM trainer Cherry Bond, refers to a family-centered and developmentally sensitive approach to touch in the NICU. PT encompasses various types of infant touch-interaction during handling, holding, KC, and massage. According to Bond (2002), the primary goals of PT include helping parents develop a sense of mastery in caring for their infant by facilitating attunement to the infant's behaviors and enhancing the infant's experience by potentially preventing prolonged stress and tactile aversion. Background literature on interventions using affective touch, such as massage therapy, has reported various beneficial effects, including greater weight gain, shorter hospital stays, and increased feeding tolerance. Studies have also linked massage to improved sleep patterns, enhanced vagal activity, and reduced parental stress (Álvarez et al., 2017; Diego et al., 2007; Ferber et al., 2002; Field et al., 2010; Gursul et al., 2018; Lai et al., 2016; Mathai et al., 2001). Furthermore, research suggests that moderate-pressure massage may yield greater benefits than light-pressure massage, highlighting the potential role of CT fiber activation in these therapeutic effects (Field et al., 2006).

Preterm infants in the NICU are exposed to frequent and unpredictable procedural pain and unpleasant tactile experiences, such as medical examinations, intravenous line insertions, and blood draws. These experiences activate the sympathetic nervous system stress response, and have been associated with alterations in brain development, sensory processing, and long-term neurodevelopmental outcomes (Grunau, 2013; Smith et al., 2011; Vinall & Grunau, 2014). The detrimental role of stressful and painful stimulations and their potential long-term consequences have been well-documented (Brummelte et al., 2012; Vinall et al., 2014). In response to these findings, our clinical approach seeks to counterbalance negative experiences with positive, nurturing touch. This practice is designed to be directly responsive to the infant's behavioral cues and supportive of their need for sleep and interaction, offering tactile experiences that are not solely for clinical purposes. A central component of this implementation involves providing parents with the knowledge and skills to identify the type of safe touch their preterm infant prefers and can tolerate, adapting it to the infant's specific stage of neurodevelopment, physiological status, and medical condition.

The Role of Music Therapy in Neonatal Care

Music therapy is an evidence-based practice supported by a growing body of research. Existing literature on music therapy in the neonatal intensive care unit (NICU) is defined by its focus on multiple key areas, including the physiological symptoms of the neonate, the social and emotional needs of caregivers, and the holistic needs of the family unit. Music therapy intervention in the NICU has been increasingly implemented worldwide. The approach is inspired by individualized, family-centered care (Als & McAnulty, 2011; Kuo et al., 2012) and complements other established early interventions like KC (Feldman & Eidelman, 2003).

A sudden and unexpected birth can significantly alter the parental role, making it a major source of stress (Caporali et al., 2020). Family-centered music therapy can increase parents' confidence in handling and interacting with their infant (Cevasco, 2008; Ettenberger, 2017), providing a valuable opportunity for normalcy and connection. The music therapist uses a flexible approach, considering the family's dynamics, cultural background, and the infant's medical diagnosis to select appropriate techniques (receptive

or active music) and meaningful musical pieces to support the whole family throughout the hospitalization.

Consistent evidence demonstrates that music therapy supports physiological stability, enhances the sucking reflex and improves neurodevelopment in preterm infants (Filippa et al., 2017; Haslbeck et al., 2017; Haslbeck et al., 2020; Kraft et al., 2021; Loewy, 2015; Loewy et al., 2013; Lordier et al., 2019; Pineda et al., 2017; Standley, 2000). It also has positive effects on breastfeeding (Jayamala et al., 2015; Vianna et al., 2011), enhances comfort and sleep (Kobus et al., 2021; Loewy et al., 2013; van der Straaten et al., 2024), and strengthens and increases parent-infant bonding (Ettenberger et al., 2014; Palazzi, Filippa, et al., 2021). Furthermore, music therapy may beneficially reduce parental stress and anxiety (Bieleninik et al., 2016; Kehl et al., 2021; Loewy et al., 2013; Palazzi, Meschini, et al., 2021). Recent literature suggests that live music interventions can be an effective form of engagement that avoids overstimulation as they are tailored to the infant's immediate needs and promote greater parental involvement (Arnon et al., 2006; Loewy, 2015; Loewy et al., 2013). Interventions using live singing, adjusted to the infant's signals, promote self-regulation, development, and communicative musicality, while also improving maternal well-being and the quality of mother-infant interactions (Haslbeck, 2014; Loewy, 2015; Malloch et al., 2012; Palazzi et al., 2017, 2020).

Premature infants communicate in various ways, but it is through consistent, repetitive, and attuned interaction with a caregiver that they begin to develop emotional self-regulation. Shoemark et al. (2015) suggest that musical interventions for this population should be based on predictable patterns in rhythm, melody, and phrasing, incorporating gradual changes in tempo, smooth melodic contours, and an absence of complex harmonies. They also emphasize the importance of including the parent's voice. Music therapy songwriting provides parents with a creative outlet to express their feelings and thoughts, allowing them to engage in musical interaction with their infant during hospitalization. Literature suggests that this approach may serve as a meaningful resource for addressing bonding, mental well-being, and anxiety levels in parents (Ettenberger & Beltrán Ardila, 2018). Historically, established music therapy protocols, such as those developed by Standley (2000), have been structured according to the infant's gestational age and developmental stage (Standley, 2003). At approximately 31/32 weeks gestational age, these clinical frameworks indicate that music can be used to support an infant's tolerance to stimulation through techniques like multimodal stimulation, where music is combined with stroking, rocking, and eye contact (Standley, 1998; Whipple, 2005). Music can also be integrated with kangaroo care (Lai et al., 2006). Furthermore, parental counseling is often incorporated into the treatment to promote bonding and goal-oriented interactions, teach developmental skills, and provide crucial emotional support for parents (Whipple, 2000).

Our implementation was informed by the Italian protocol, Premature Family Music Therapy Intervention (PFMI) (Sgobbi & Shoemark, 2020), which provides an integrated psychological and music therapeutic framework spanning from the first days of hospitalization to post-discharge. As a music therapist trained directly in this specific framework, the first author served as the primary clinical implementer, adapting the PFMI core principles to the specific socio-cultural and institutional landscape of our NICU in Naples. By adopting this framework, we aimed to provide a continuous and family-centered support system that aligns with the specific needs of the Italian NICU environment. The initial phase encourages parents to sing live a combination of parental songs and lullaby-style pregnancy music near the incubator and during KC. This is intended to support infant stability and may induce a state of well-being and relaxation. The music therapist guides parents to continually observe the infant's cues to prevent overstimulation and assists them in composing personal lullabies. As the infants achieve greater stability, a combination of relaxing and activating live music is introduced. This is

designed to comfort the infant, stimulate interactive attention towards their parents, and may support the development of nutritive sucking. Prior to discharge, the primary intervention focuses on the parent's voice accompanied by the music therapist playing an instrument. This supports the process of understanding and reciprocity within the parent-infant dyad. Following discharge, families are encouraged to participate in a group music therapy activity to promote socialization, language development, and the communication and motor skills of the preterm infant.

Multisensory Stimulation and Sensorial Saturation

This section synthesizes prior research on multisensory stimulation to provide a clinical context for our program. This literature review serves as a theoretical foundation and does not represent new outcome data.

The intrauterine environment provides a rich, rhythmic, and predictable soundscape (Lahav & Skoe, 2014) that includes continuous sounds like maternal breathing and heartbeats, as well as rhythmic stimulation from the mother's speech, singing, dancing, and walking (Provasi et al., 2021). In contrast, the NICU environment is often characterized by disorganized and unpredictable sounds, such as those produced by monitors, ventilators, infusion pumps, and loud conversations. Infants in the NICU are primarily in a horizontal position within an incubator, lacking the vestibular stimulation from walking and the familiar rhythms of their mother's heartbeat, breathing, and voice. Only 2% to 5% of the sounds reaching their ears are vocal, which has been associated with differences in early language exposure (Caskey & Vohr, 2013). This sensory deprivation underscores the need for targeted interventions. Both physical contact interventions (KC, PT, BW) and music therapy provide essential multisensory stimulation, including emotional, tactile, vestibular, visual, and auditory stimuli.

KC is well-established for its benefits in improving autonomic functioning, enhancing mother-infant interaction, and regulating sleep-wake cycles (Feldman, Weller, et al., 2002). Compared to KC alone, combining physical contact with LMT or maternal singing leads to greater autonomic and physiologic stability in stable preterm infants. This combination also reduces maternal anxiety and shortens the length of hospital stays (Arnon et al., 2014; Ettenberger et al., 2017; Schlez et al., 2011; Teckenberg-Jansson et al., 2011; Yusuf et al., 2017). When parents sing a lullaby during KC, it promotes a better synchronization of rhythms between the parent and infant, increases the duration of maternal gaze fixation, and enhances the infant's state of relaxation (Provasi et al., 2021). A recent integrative review on sensorial interventions in the NICU supports this, suggesting that multimodal interventions, such as SSC combined with music, may offer additional benefits (Pineda et al., 2017). This perspective is further reflected in recent literature. For instance, preliminary findings suggest that LMT combined with physical contact (skin-to-skin or hand touch) may be associated with reductions in parental stress and cortisol levels during the first four weeks after birth (Dewan et al., 2024). Additionally, research by other authors has indicated that combining LMT with hand touch was found to be linked to lower post-therapy COMFORTneo scores and improved absolute vital sign values compared to hand touch alone (Kobus et al., 2024).

Early multimodal sensory programs, such as the auditory, tactile, visual and vestibular stimulus program (ATVV) (Burns et al., 1994; White-Traut & Tubeszewski, 1986) were developed to provide a structured approach to sensory input for preterm infants. In this program, the human speaking voice was used as the initial auditory stimulus to capture the infant's attention before beginning tactile, vestibular, and visual stimulation. ATVV has been associated with several positive short-term outcomes, including improved feeding, behavioral states, and neuromotor development, as well as enhanced maternal-infant

interaction (Kanagasabai et al., 2013; Medoff-Cooper et al., 2015; White-Traut et al., 2013; White-Traut et al., 2014; White-Traut et al., 2015). Building on this foundation, Standley (1998) developed the Multimodal Neurological Enhancement (MNE) technique, initially known as Music and Multimodal Stimulation. This technique replaced the spoken voice from the ATVV program with the quiet humming of lullabies, pairing music with gentle stroking, rocking, and eye contact to promote homeostasis and increase the infant's tolerance for stimulation. Caregivers are actively included in these sessions to foster bonding and enhance their overall confidence in interacting with their infant. The MNE technique has been shown to improve infant neurodevelopment (Walworth et al., 2012) and has yielded significant positive results on heart rate, oxygen saturation, self-regulation, and length of hospital stay (Cevasco & Grant, 2005; Cevasco-Trotter et al., 2019; Standley, 2012; Standley & Swedberg, 2011). Furthermore, while smaller-scale studies have suggested that mothers who received music therapy demonstrated increased bonding with their infant and decreased stress levels (Hamm et al., 2015; Whipple, 2005), recent large-scale research and systematic reviews indicate that these positive effects on parental bonding and anxiety are not always consistently replicated across larger, more rigorously controlled cohorts (Ghetti et al., 2023; Haslbeck et al., 2023). A recent study also identified positive long-term developmental effects, as the experimental group performed significantly better than the control group on the Visual Reception and Early Learning Composite scores (Detmer et al., 2020).

Non-pharmacological interventions, including swaddling, non-nutritive sucking (with or without sucrose), kangaroo care, positive touch, music therapy, and multisensory stimulation, have been shown to modulate pain in preterm infants. These methods work by capturing the infant's attention, and by providing a distraction from pain and altering its perception (Cignacco et al., 2007). Combining these interventions may be particularly effective. The concept of sensorial saturation (SS) based on the "gate control theory" of pain (Melzack & Wall, 1965), posits that the infant's brain can filter peripheral stimuli. SS is a technique that uses a "sensory jam" of a positive stimuli—tactile, auditory, gustatory, olfactory, and visual, often delivered by parents—to counteract the perception of painful stimuli (Bellieni et al., 2007; Locatelli & Bellieni, 2018). Specifically, music can provide an auditory stimulus that modulates pain perception (Hartling et al., 2009; Timmerman et al., 2023), potentially reducing or eliminating the need for pharmacological agents. The combination of music and touch interventions may decrease the pain response in preterm neonates by significantly improving the β -endorphin concentration (Qiu et al., 2017). Furthermore, Ullsten and colleagues (2018) describe infant-directed singing as a nonpharmacological emotion regulation intervention. When parents are coached and empowered to use singing before, during and after a painful procedure, they can modify the painful experience for both their infant and themselves.

Program Development

This section provides a descriptive account of the clinical implementation and development of the music therapy program. It is intended to illustrate the integration of services within the unit rather than to present findings from a formal research study.

The Neonatal Intensive Care Unit at Betania Evangelical Hospital is a Level III unit that provides comprehensive care for infants of all ages and weights. It operates as an open-bay unit, allowing parental access for 12 hours a day. The unit's developmental care program focuses on promoting an infant's neuro-emotional development, strengthening family attachment, and enhancing family well-being through an individualized approach with active parental involvement. Key components of this program include parental active-presence, kangaroo care, babywearing, and positive touch. To further these aims, a 14-

month music therapy (MT) service was established with external funding provided by a parents' association dedicated to supporting families of premature infants. Eligibility for MT was contingent on clinical stability, with sessions typically beginning 1–2 weeks after birth. This timing was chosen to align with established clinical and research practices regarding post-natal clinical stability and the theoretical frameworks intended to prevent early sensory overload, as suggested by the work of Loewy, Haslbeck, Palazzi, and Sgobbi (Loewy et al., 2013; Haslbeck & Bassler, 2018; Palazzi et al., 2021; Sgobbi & Shoemark, 2020). Priority criteria for enrollment included a gestational age of less than 32 weeks, a birth weight below 1500 grams, the need for long-term care, and parental emotional support requirements. Families were also given the option to participate in a post-discharge, integrated group program. This program, which included infant massage, music therapy, and babywearing sessions, was not supported by the grant.

Ongoing collaboration and regular meetings between the music therapist and the medical team were crucial for establishing and maintaining a safe acoustic environment conducive to infant development. Individual or combined sessions of MT, PT and BW were utilized based on the infant's stage of hospitalization, clinical stability, and specific therapeutic objectives.

An initial introductory session was conducted by the music therapist and the nurse-touch therapist to inform parents about the benefits of music therapy and touch for their infant. These sessions also provided instruction on proper vocal and tactile technique, and offered guidance on optimal positioning, management of environmental factors (such as noise, light, and heat), and recognition of signs of overstimulation. During MT or PT sessions, caregivers were encouraged to observe their infant's cues and were guided on how to respond contingently through attuned vocal, visual, and tactile interactions. The nurse-touch therapist also used a doll to provide hands-on training for tactile approaches.

Based on Sgobbi's protocol (Sgobbi & Shoemark, 2020), which integrates multicultural, personal, and biopsychosocial aspects of the patient and family, the music therapy intervention began with a comprehensive assessment, consistent with the recommendations of Loewy, Haslbeck, Palazzi, and Sgobbi. Sessions were adapted to the infant's clinical condition and parental presence, occurring while the infant was in the incubator, a warming bed, or held by parents (KC or BW). If an infant was too unstable to be removed from the incubator, parents were guided to provide gentle touch during the session. As recommended by Loewy, Haslbeck, Palazzi, and Sgobbi, parents were empowered as primary caregivers by being given the option to either directly participate in the MT session with their infant or observe from the bedside. They were gradually encouraged to actively participate through vocalizing, humming, holding (when medically appropriate), providing hand-over-hand support, or offering gentle touch and movement. This approach was designed to optimize opportunities for bonding and to facilitate multisensory stimulation. Each family also had the opportunity to participate in individual songwriting sessions. These sessions aimed to provide a creative outlet for parents to externalize their thoughts and emotions, strengthen the parent-infant bond, and enhance parental skills. Parody was the predominant songwriting technique, whereby the music therapist assisted families in re-writing the lyrics of a song they had chosen. Sharing these personalized songs with the infant creates a unique space to deepen their relationship. The songs were performed live by the parents next to the incubator or open crib, with the music therapist providing guitar accompaniment. In a separate MT session, a recording of the song, performed by the parents and accompanied by the music therapist, was created and provided to the family to serve as a memento of their journey. In the absence of parents, the music therapist engaged the infant musically. This involved improvisational humming, singing, and guitar playing, mirroring the infant's vital signs, respiratory patterns, behavioral state, muscle tension, and emotions. Hand hugs and containment were provided as needed. Sessions typically lasted for approximately 20 minutes. If parents were

present, they were given the opportunity to ask questions and discuss their experiences before and after each session. Infant vital signs (heart rate, respiratory rate, and oxygen saturation) were collected at three distinct points: pre-session, during the intervention, and post-session. This monitoring was conducted exclusively to ensure infant safety during the intervention. In line with Sgobbi's recommendations, the music therapist also documented signs of overstimulation as part of standard clinical practice. A detailed report encompassing the music intervention, caregiver interactions, and infant responses was compiled for internal clinical records to ensure continuity of care. The number of sessions was not predetermined, as families were followed until their infant's discharge. However, we can state that families received a minimum of 4 sessions and a maximum of 21 sessions.

Approximately halfway through the therapeutic process, a non-validated self-assessment questionnaire was administered to the parents. This tool allowed the team to explore parental perception of the comforting effects of the intervention on themselves and their infants, as well as the specific skills they had acquired (see Appendix A). To evaluate the overall program as a quality-improvement measure, parents were also invited to complete an anonymous satisfaction questionnaire at discharge. This second survey focused on their involvement in MT, PT, and BW, the perceived effects on themselves and their infants, and their likelihood of continuing these practices at home (see Appendix B). All data from clinical monitoring and internal survey were used solely for service refinement and program evaluation; they were not subjected to formal research analysis nor intended for empirical study.

Touch was introduced cautiously and progressively. The provision of tactile interventions to preterm infants was guided by the Five-Step Dialogue, a framework developed by Bond (Warren & Bond, 2010) to ensure a respectful and effective approach. This method views the infant as a unique individual, empowering parents in their caregiving role, promoting attuned communication, and assisting the infant's ability to regulate their response to unexpected tactile stimuli. The framework also supports the development of a positive memory of touch and teaches parents how to use responsive, co-regulatory touch techniques. The approach teaches caregivers a five-step process for interaction:

1. Preparation: Caregivers learn to observe their infant's cues and adjust the environment accordingly.
2. Touch Permission: They are taught how to communicate your intention to the infant before initiating touch.
3. Tuning in and pacing: This step focuses on attuning to the infant's rhythm, providing time for them to adjust, and allowing the infant to lead the interaction using a calm and reassuring voice.
4. Connection: This step emphasizes establishing and maintaining a meaningful connection while being aware of one's own breathing.
5. Conclusion: Finally, caregivers are guided on how to appropriately conclude the interaction, with includes slowly withdrawing their hands and observing the infant to assess if further support is needed.

The initial intervention introduced was *Connection Without Touch*, a technique in which parents provided a calming vocal presence (e.g., talking or singing) and positioned their hands near the infant to establish a sense of presence through scent and proximity. The first direct tactile step, *Resting Hands*, was then introduced once the infant demonstrated clinical stability. This involved placing a firm, stationary hand on the infant's back (in the prone position) or head (in the supine position) to provide a sense of security without movement. Following the establishment of calming presence through Resting Hands, the intervention proceeded to *Containment Holds*, also known as *Hand-Hugs*. This technique

involves placing one hand on the infant's extremities to encourage flexion and containment while the other hand provides a firm touch to the head or abdomen. This method is effective for calming unsettled infants and mitigating stress associated with procedural pain. Specific dynamic-touch sequences, developed by physiotherapist and Newborn Individualized Developmental Care and Assessment Program (NIDCAP) professional Isabella Bianchi (Artese & Bianchi, 2009), were progressively introduced after the infant demonstrated tolerance for firm touch. These sequences were informed by principles of cephalocaudal development and research concerning C-tactile afferent stimulation. This approach aligns with both the Five-Step Dialogue and the principles of the NIDCAP (Als, 2023) for supportive developmental care. It was applied while the infant was in the incubator, an open bed, or during KC. Throughout each session, parents were guided to closely monitor the infant's physiological and behavioral cues and to adjust their responses to promote optimal development.

Maternal affectionate touch has been found to play an important role in the development of secure attachment in low-birth-weight infants (Weiss et al., 2000). Secure attachment is considered a key protective and promotive factor for social development, and research indicates that mothers who continued to massage their infants at least twice weekly for nearly a year had babies who were more securely attached (Norman & Roggman, 2025). The infant massage techniques developed by Vimala McClure are currently taught globally by the IAIM (McClure, 2017). Given the clinical context, infant massage was not applied during the NICU stay. Inspired by Sgobbi's (Sgobbi et al., 2023) work advocating for family participation in music therapy groups after discharge, a five-session weekly group course titled *Infant Massage and Music Therapy* was developed to provide continuity of care and support families following discharge. This program was designed to provide a safe, nurturing, and supportive non-judgmental environment where parents could share experiences with other families facing similar challenges. Sessions focused on each baby's unique responses and developmental potential, while also empowering parents to build confidence in connecting with their babies through massage, singing, and active listening. These follow-up sessions were based solely on clinical observation, with no formal data collection.

Combined Interventions

The integration of live music therapy, positive touch, and babywearing was guided by clinical judgment, with interventions tailored in real-time. These three modalities were utilized individually or in combination, based on the infant's stage of hospitalization, clinical stability, and tolerance to stimulation. Stimuli were introduced gradually with the clinical intent to promote stability, increase tolerance, and enhance both consistency in caregiving and parent-infant interaction. Throughout each session, the music therapist and the nurse continuously monitored the preterm infant's reactionary state. Based on these clinical observations, they facilitated reciprocal dyadic interactions and coached parents on behaviors such as making eye contact, observing cues, and following the infant's lead to foster a more intimate connection.

During kangaroo care (KC), the music therapist provided live interventions aimed at supporting relaxation and comfort in both parents and infants. These interventions were individually tailored to the family's needs at the moment, and parents were encouraged to hum or sing. Additionally, parents were coached on the use of firm, supportive touch, such as placing a hand on the infant's back, or providing a gentle cuddle. Music therapy was also delivered while the infant was feeding during KC.

During the positive touch (PT) sessions while the infant was in the incubator, the music therapist used a guitar to flexibly mirror the parents' static or dynamic touch. Music was

consistently attuned to the infant's breathing and reactions. As the infant progressed and parents gained confidence in applying specific touch strokes, parental humming or singing—primarily using a “song of kin” (Loewy, 2015), a familiar song or lullaby selected by the family for its cultural or emotional significance—was introduced. Sessions concluded with the parent slowly fading their humming and holding the infant with their hands. In cases where Resting Hands was the only touch tolerated by the infant, the music therapist suggested the use of a song of kin or a parent-composed lullaby to accompany the firm touch.

Around 32 weeks, a cumulative stimulation protocol was initiated following a clinical assessment of the infant's stability. The infant was placed in the parent's arms, and once the infant appeared to have regained homeostasis, the music therapist accompanied the parent's quiet and steady humming or singing with guitar. Subsequently, tactile stimulation was introduced, with strokes following a cephalocaudal and proximodistal pattern. Throughout this process, parents were encouraged to maintain eye contact with the infant. Once the positive touch sequence was completed, slow and steady rocking was added while the parent's humming or singing continued and the tactile sequence was repeated. In our clinical experience, if the infant displayed disengagement cues or signs of overstimulation, the intervention was paused, with the parent maintaining a firm hold, and then restarted. If signs of overstimulation re-emerged, the intervention was stopped for the remainder of the session.

Similarly, these practices were applied during babywearing (BW) as a clinical choice to facilitate a gentle transition from KC, enabling parents to walk with their infant in the intermediate care area. It also promotes parental independence in securing the infant, which is a valuable skill for discharge. All nurses on our unit are trained to instruct parents on the safe use of a specific tying method, the *Front Wrap Cross Carry*, tailored for the preterm infant. During BW, the rocking motion generates vestibular stimulation, which the clinical team may combine with parental humming or singing. The music therapist accompanies this with a sustained or slow-relaxing guitar accompaniment, synchronized with the infant's needs. Parents could also provide a firm touch by placing a hand on the infant's back or by providing a gentle cuddle.

Music, parental voice, and touch were also utilized during some medical procedures as a supportive clinical measure to create a calm environment for the infant and caregiver and to mitigate the infant's perception of pain or discomfort. For instance, during a heel stick procedure, a protocol adapted from the work of Ullsten and colleagues (Carlsen Misic et al., 2024) was implemented:

- *Pre-procedure*: for five minutes, a parent provided containment touch while talking to the infant.
- *During procedure*: the music therapist used gentle guitar playing to support the parent's singing and engagement with the infant.
- *Post procedure*: parent and music therapist continued the intervention for five minutes; the parent then gradually faded the humming and maintained a firm hold on the infant.

Throughout the procedure, a pacifier and/or sucrose was also administered. According to the clinical judgment of the staff present, the infant appeared to remain calm and comfortable, occasionally engaging in eye contact with the caregiver while being comforted. These observations were captured as part of a clinical narrative to provide qualitative context in lieu of systematic outcome measurements.

Final Reflections

The current report describes the implementation of a nurturing program intervention at the NICU of Betania Evangelical Hospital. Initially, parents often expressed fear of harming or disturbing their infants and had difficulty recognizing their cues. Despite a desire to touch and comfort their infant, they frequently avoided contact, standing by the bedside without vocalizing and, on occasion, only touching the infant's extremities. Clinical observations suggest that the program provided families with strategies to understand and comfort their infants; by learning to interpret infant cues, parents appeared to gain confidence in their caregiving abilities.

Parental reports and clinical feedback suggest that the program was perceived as a positive and supportive experience. Parents reported observing signs of relaxation in their infants during and after MT and PT sessions; these were viewed as intimate opportunities that seemed to foster emotional closeness, created meaningful moments of interaction, and provided a welcome distraction from the medical routine of the hospital. Mothers, in particular, noted that singing during SSC appeared to enhance emotional synchrony and promoted relaxation for both the infant and themselves.

The creation of parent-composed lullabies was described by participants as an unexpected yet deeply emotional way to bond with their infants. The lyrics parents drafted often reflected the family's personal journey, story, emotions, and desires for their child, which helped parents process their thoughts and feelings. As one parent noted, "These personalized lullabies reflect us and will be a precious treasure for the rest of our life."

Similarly, babywearing was perceived as a practical method of care, with mothers frequently expressing the immediate feeling of their "baby still in the womb, close to me." This close interaction was associated with a perceived boost in attachment and responsiveness, with parents appearing to become more attuned to their infant's subtle movements.

Parents stated that they could envision continuing to sing, carry, and massage their child after discharge. While these qualitative reflections suggest that the program may support parental confidence and the early bond, they should be interpreted as clinical reflections rather than evidence of proven efficacy. The infants' calm demeanor and the parents' perceived sense of competence highlight the potential value of such family-centered approaches. Overall, the program provided a valuable, low-cost intervention with the potential for long-term impact. However, future empirical research is required to systematically evaluate the effectiveness of these interventions and to determine their long-term impact on neurodevelopmental outcomes and family well-being.

List of abbreviations

NICU	Neonatal Intensive Care Unit
LMT	Live Music Therapy
PT	Positive Touch
KC	Kangaroo Care
BW	Babywearing
IAIM	International Association of Infant Massage
WHO	World Health Organization
SSC	Skin to skin contact
ESCNH	European Standard of Care for Newborn Health
CTs	C-Tactile Afferents
ATVV	Auditory Tactile Visual and Vestibular stimulus program
MNE	Multimodal Neurological Enhancement
SS	Sensorial Saturation

NIDCAP Newborn Individualized Developmental Care and Assessment Program

Declarations

Competing Interests

The authors declare that they have no competing interests.

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Barbara Sgobbi is a certified Master of Music, Music Therapist, RMT and PhD Candidate in Music Therapy Neuroscience at Alessandria-Conservatory. She specializes in Obstetrics, NICU-PICU music therapy settings, integrating clinical-practice, research, and teaching. She lectures at Italian Universities, publishes in peer-reviewed journals, and works in NICU-PICU at Filippo-Del Ponte Varese-Hospital-Italy.

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Appendix A

SELF-ASSESSMENT QUESTIONNAIRE

Infant..... Caregiver..... Date..... Session n°.....

- 1) **How did your infant respond to the Positive touch combined with singing?**
 - He was relaxed
 - He fell asleep
 - He tried to look in the direction of the sound
 - He was restless
 - He was angry and/or crying
 - Other (please specify).....
- 2) **How did you feel singing?**
 - Useful and important
 - Involved
 - It was pleasant
 - Effortless
 - I did not feel anything in particular
 - Other (please specify).....
- 3) **How did singing, massaging and/or carrying support you?**
 - They made it easier to get an emotional connection with my infant
 - They strengthened the interaction
 - They made me feel able to take care of my infant
 - Other (please specify).....
- 4) **Learning to read my infant's behavioral cues:**
 - Allowed me to know my infant
 - Allowed me to interact with him
 - Made me feel able to understand his needs
 - Other (please specify).....
- 5) **How did singing affect your general state of well-being?**
 - It improved my mood
 - It helped me to manage a difficult time
 - It positively influenced my general state of well-being
 - I had no reaction
 - Other (please specify).....
- 6) **Tell us about your impressions on composing and singing the personalized lullaby for your infant**

.....

.....

.....
- 7) **Are you singing to your infant when there are no music therapy sessions?**
 - Yes, every day
 - Yes, sometimes
 - No
- 8) **Are you applying positive touch even when there are no positive touch sessions?**
 - Yes, every day
 - Yes, sometimes
 - No
- 9) **Are you practicing kangaroo or babywearing even when there are no music therapy or positive touch sessions?**
 - Yes, every day

- Yes, sometimes
- No

10) Have you noticed any difference when practicing music therapy/singing combined with positive touch?

If yes, please specify how:

11) Have you noticed any difference when practicing music therapy/singing combined with kangaroo/babywearing?

If yes, please specify how:

Appendix B

SATISFACTION QUESTIONNAIRE

EVALUATION OF MUSIC THERAPY SERVICE

	NOT AT ALL	SOMEWHAT	QUITE A BIT	VERY MUCH
Do you think the music therapy sessions have helped your infant in relaxation and stress reduction?				
Do you think that music therapy sessions have helped you better understand your infant, his signals and needs, strengthening your relationship?				
Before participating in this service, were you aware of music therapy and its benefits, particularly in practicing it in the NICU?				
How satisfied are you with the music therapy service provided during your infant’s hospital stay?				
Do you think the service should be re-proposed in the coming years?				
Do you plan to continue practicing music with your infant at home?				

RELATIONSHIP WITH THE MUSIC THERAPIST

	NOT AT ALL	SOMEWHAT	QUITE A BIT	VERY MUCH
Professionalism				
Kindness				
Patience and willingness to assist				
Understandability of the language used				
Ability to involve you in the project				
Ability to listen actively				
Ability to understand your needs (as a family)				

EVALUATION OF POSITIVE TOUCH SERVICE

	NOT AT ALL	SOMEWHAT	QUITE A BIT	VERY MUCH
Do you think the positive touch sessions have helped your infant in relaxation and stress reduction?				
Do you think that positive touch sessions have helped you better understand your infant, his signals and needs, strengthening your relationship?				
Before participating in this service, were you				

aware of babywearing and its benefits, particularly in practicing it in the NICU?				
How satisfied are you with the positive touch and babywearing service provided during your infant’s hospital stay?				
Do you plan to continue carrying your infant at home?				
Do you plan to continue massaging your infant at home?				

RELATIONSHIP WITH THE POSITIVE TOUCH AND BABYWEARING CONSULTANT

	NOT AT ALL	SOMEWHAT	QUITE A BIT	VERY MUCH
Professionalism				
Kindness				
Patience and willingness to assist				
Understandability of the language used				
Ability to involve you in the project				
Ability to listen actively				
Ability to understand your needs (as a family)				

USE THIS BOX TO SHARE YOUR EXPERIENCES AND TO PROVIDE ANY OTHER FEEDBACK, SUGGESTIONS AND CRITICISM TO IMPLEMENT THE POSITIVE TOUCH-MUSIC THERAPY SERVICE