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Connected Care: the Relationship Between Infant-Caregiver Interaction & Preterm Infant Development

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The Relationship Between Infant-Caregiver Interaction & Preterm Infant Development

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Abstract

This thesis encompasses how families and healthcare workers alike can uplift preterm infants' development in the Neonatal Intensive Care Unit. The use of positive facial expressions, skin to skin contact, verbalizing with the infant, quality time, and focused attention are explored to promote the preterm infant's positive development. Additionally, this thesis includes research on optimizing the transition from hospital to home for both parents and infants.

This thesis aims to gather information that caregivers can easily reference and put into action with preterm infants. At the end of each body paragraph, the reader can promptly locate summarizing bullet points of how caregivers can apply the information learned in the previous section to promote the development of their preterm infant. This thesis aims to be a resource to improve the quality of life for any infant battling the complications that may come with preterm birth.

***Keywords*: infant, NICU, preterm, caregiving, child development, facial expressions, kangaroo care, nursing, parenting, newborn**

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Every year over 15 million children are born preterm worldwide (Quinn et al.). These children are granted an early entrance into our world and immediately face what can become a lifetime of developmental challenges (Arpi & Ferrari). The World Health Organization defines the preterm infant as any live-born infant born "before 37 completed weeks of gestation or fewer than 259 days since the first day of the woman's last menstrual period" (Quinn et al.). There is no primary cause for an infant being born preterm. However, there are contributing factors that may induce an early birth. These most commonly include but are not limited to "antepartum hemorrhage or abruption; mechanical factors such as uterine over-distention and cervical incompetence; hormonal changes; and bacterial infection and inflammation" as well as spontaneous birth or premature rupture of membranes, which can occur as a result of multiple births from one woman (Quinn et al.). There are additional maternal risk factors to preterm birth, including a "maternal age of fewer than 17 years or more than 35 years, being underweight, having an overweight pre-pregnancy body mass index, and short stature" (Quinn et al.). It is crucial to devise a care system to promote an infant's successful development and how parents can have consistent positive interaction with their infant.

Aside from the physical attributes that may contribute to a preterm birth, a combination of socioeconomic risk factors impact the birth. These factors include but are not limited to occupation, income, race, and access to quality medical care. One particularly impactful external influence on pregnant mothers is stress (Stylianou-Riga et al. 1). A recent Swedish study discovered that over 50% of pregnancies with reported stress throughout the pregnancy resulted

in premature labor or an infant born with low birth weight and low head circumference (Stylianou-Riga et al. 6). A wide variety of reasons can cause stress in pregnant mothers. However, a primary source of stress may result from unfavorable working conditions such as long hours and manual labor. Stress stemming from adverse working conditions is influential with preterm births as with stress, a redistribution of blood flow in the pregnant woman is seen. This leads to a reduced blood flow into the placenta (Stylianou-Riga et al. 5) as well as causing a fluctuation of hormones in the pregnant woman and a decrease in nutrient distribution to the fetus, which may stunt fetal development (Stylianou-Riga et al. 5).

When an infant is born preterm and is admitted into the Neonatal Intensive Care Unit (NICU), there is an almost immediate separation of the infant from their parents or guardian. Not only is this transition difficult for the infant, but it is particularly challenging for new mothers as many natural processes such as breastfeeding and infant bonding are disrupted (Williams et al. 1). The challenges of having an infant in the NICU layer on top of those already expected with a newborn infant. These additional challenges include scheduling time for visitation & traveling to and from the NICU, which increases the difficulty of developing a consistent feeding schedule, ensuring quality time, and establishing a secure bond with the infant (Williams et al. 1).

Because of this separation at birth and additional complications, we must recognize how family involvement and visitation in the NICU is a “key to realize the potential for long-lasting positive effects on the physical, cognitive and psychosocial development of all babies, including those in the NICU” (Craig, J.W. et al.). It is essential to support this process in a way that reduces parental feelings of “guilt” and “blame,” all the while fostering positive mental health for all involved in the infant-caregiver interaction*.

In addition to the immediate health complications faced by a preterm infant, there is a high potential that this infant will grow up to be at a "higher risk of later developmental abnormalities in childhood" (Arpi & Ferrari). In particular, these children can experience both "'high-prevalence and low-severity' disabilities such as learning disorders and behavior problems" such as issues with "regulation, including hyperactive/aggressive behavior; interactive, attention, sleep, eating, and sensory sensitivity problems; as well as anxiety, depression, and somatic symptoms" (Arpi & Ferrari).

With proper support from both the family and healthcare team, an infant's development can be supported and uplifted. This thesis encompasses how families and caregivers (defined in this thesis to include parents, healthcare workers, and other non-parental caregivers) can work to uplift preterm infants' development. Caregivers can support this positive development through various care techniques in both the hospital and home settings. Each method's effectiveness depends entirely on the infant's initial health and the quality and consistency of care provided. To remain within the scope of this thesis, there will be a specific focus on the incorporation of 1) positive facial expression (von Hofsten 6; Nagy 3), 2) skin-to-skin contact (Conde-Agudelo & Díaz-Rossello 2; Field et al. 1), 3) talking and singing (Filippa et al. 1017; Loewy et al. 900), and 4) quality time and focused attention (Latva et al. 1) to influence healthy growth and development for the infant.

**** Disclaimer:*** *This thesis focuses on what is categorized as the "traditional" family— a mother, father, and baby. I recognize and appreciate the dismantling of this traditional family construct in our more modern times. However, I am limited to research that focuses on mother-father families for this project. Many of the referenced studies came out of a time that recognized mothers as the primary caregivers. There is limited research on how these findings may translate onto male or non-binary people as primary caregivers. I hope that if this disclaimer applies to you, you can draw benefit from these findings nonetheless and use them in your family structure.*

Positive Facial Expressions

The importance of facial engagement during human interaction is undeniable, as communication and learning about each other is facilitated through facial expression every day. Facial expression in conversation is essential for developing strong interpersonal relationships and social skills. This holds for infants, especially since they are continually learning about the world around them and mirroring those they interact with.

It is primarily essential to consider the development of an infant's eyesight at this time in their lives. The infant must see and comprehend the caregivers' facial expressions to react and respond to them. A recent study conducted by researcher Olov von Hofsten provides a photographic representation of an infant's eyesight functionality. As seen in *Figure 1,* a 2 to 3-day old infant can adequately perceive faces and emotional facial expressions at a maximum distance of 11 inches (or ~30 centimeters). This distance of 11 inches corresponds to the caregiver's average distance and their nursing / bottle-feeding baby (von Hofsten 6). If the caregiver's distance from the infant is increased to 23 inches (or ~60 centimeters), the visual becomes blurred, and the baby cannot perceive faces and expressions (7). The study also stated that it is easier for an infant to recognize and interpret movement rather than a still image or face (2). Caregivers can use the information found in this study by ensuring that their facial expressions are exaggerated and that

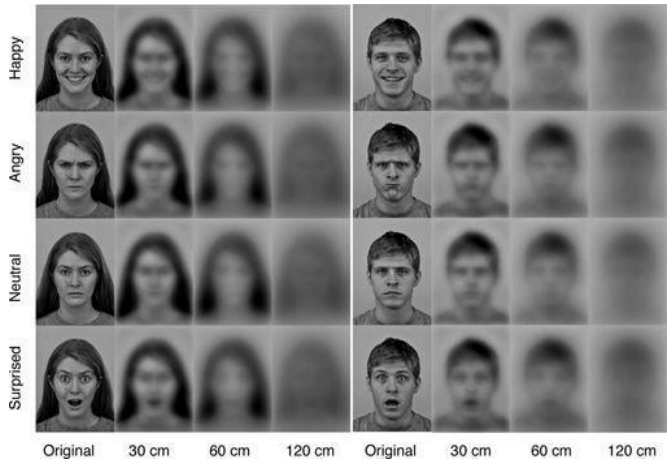

Figure 1: *How a newborn infant views facial expressions at varying distances. Illustration by Olof von Hofsten/ Eclipse Optics and Bruno Laeng/ UiO.*

their faces are optimally within 11 inches (~30 cm) and no further than 23 inches (~60 cm) of the infant.

As emphasized in the von Hofsten study, it is crucial to have engaging and animated facial expressions presented while caring for an infant. It is proven through infant testing and observations that "newborn infants sensitively monitor the behavior of others and react as if they had innate expectations regarding rules of interpersonal interaction" (Nagy 3). One primary method of testing this theory and the importance of maintaining entertaining expressions is through the *Still-Face* paradigm, where the infant is shown a suddenly unresponsive interaction partner— essentially the equivalent of someone freezing mid-conversation (1).

Through the *Still-Face* procedure, it is observed that "human neonates not only imitate but also initiate communication, thus being able to participate in reciprocal interactions" (2). With this procedure, we can see how infants quickly become distressed when their caregiver displays a blank face rather than a set of warm and engaging facial expressions. Additionally, through this study, it was discovered that infants adjust their actions and mannerisms to match the responsiveness of their interaction partner (4). For example, if the caregiver becomes unresponsive, the infant will also alter their behavior by reducing eye contact and portraying feelings of distress (3). However, the infant's mood doesn't stabilize when the caregiver re-engages; the procedure shows that even when the caregiver re-engages, the unresponsive behavior impacts are still displayed in the infant. Nagy summarizes that "these results indicate that even newborn infants sensitively monitor the behavior of others and react as if they had innate expectations regarding rules of interpersonal interaction" (1).

This evidence helps to explicate the importance of creating comfort and fostering positive mental health for the infant, as well as helping to further their socioemotional interactions and interpersonal behaviors. Parents and caregivers can engage in this phase of development by:

- Increasing the frequency and maintenance of eye contact with the infant whenever possible during care.
- Display joyful, entertaining, and engaging facial expressions and avoid blank-stares and emotionless facial expressions during infant care.
- Keep your face within 11 inches (~30 cm) and no further than 23 inches (~60 cm) of the infant during care.
- Reduce the amount of interrupted communication with your infant as much as possible.

Skin-to-Skin Contact

As we navigate the complex issue of infant development, it is crucial to address the impact that touch, specifically skin-to-skin contact, can have on an infant's development. This topic is extensively researched and practiced in NICUs as it can have incredible impacts on the health of vulnerable infants (Conde-Agudelo & Díaz-Rossello 2). The most commonly implicated practice of skin-to-skin contact, also known as Kangaroo Care (KC). KC is defined as skin-to-skin contact where infants are firmly bound to the caregiver's chest, preferably between the mother's breasts and below the clothes (6). KC is incredibly impactful when both mothers, fathers, and other caregivers partake in skin-to-skin contact and is not an activity limited only to mothers (6). Overall, the aim is to provide the infant with as much warm and comforting skin-to-skin contact as possible. The impact that KC has on an infant's development and growth is significant. These effects include reducing infant mortality (25), a reduced occurrence of

severe hospital-acquired infection, and other illnesses like sepsis, lower respiratory tract disease, and hypothermia (2). There is additionally a direct link between KC and an increase in weight, body length, and head circumference gain per day, as well as an increased likelihood for successful breastfeeding (when applicable) and a decrease in the span of hospital stays by 1.6 days (2).

Not only is KC influential towards the infant, but it can influence parental health as well. The evidence gathered by Conde-Agudelo and Díaz-Rossello indicates an increase in measures of maternal satisfaction and attachment for mothers and involvement and competence by fathers (22). Families using KC also displayed a higher-quality home environment, using "H.O.M.E" Inventory (U.S. Bureau of Labor Statistics) as a means of measuring. In the study, parents were asked to rate their perceptions of several items, including competence, worry, and stress, during birth and at the start of NICU intervention (if the infant was admitted to NICU), versus if the infant was not admitted to the NICU. This study also covered infant responsiveness in each scenario. The outcomes showed a significantly higher response rate for KC parents versus a control group (4), supporting the claims that KC positively impacts parental health.

Supporting the claims made by Conde-Agudelo & Díaz-Rossello, researcher Felicity Hunt states in her study, the *Importance of Kangaroo Care on Infant Oxygen Saturation Levels and Bonding,* how crucial early contact between infants and mothers is for strengthening their relationship (Hunt 49). Often due to medical complications, preterm infants and mothers are separated at birth; this, in turn, delays physical contact. This delay may hinder the development of a positive mother-infant relationship (49). Another critical study that strengthens these claims is the Ludington-Hoe and Swinth study. Their study concluded that kangaroo care significantly affected their neurodevelopment (49) and helped prove that mother-infant contact is crucial in

the infant's physical and mental growth and development (49). Additionally, skin-to-skin connection has an essential role in growth and development both for the infant and caregiver. More specifically, KC can increase oxygen saturation in the infant and significantly reduce required oxygen levels throughout the time of KC contact (50).

In addition to KC, other beneficial methods of physical touch have been explored. One key area of research circles around the use of massage therapy for preterm infants. Studies show that "massage therapy had led to weight gain in preterm infants when moderate pressure massage was provided. In studies on passive movement of the limbs, preterm infants also gained significantly more weight, and their bone density also increased" (Field et al. 1) Simultaneously, the use of massage oils such as coconut oil and safflower oil was shown to enhance "the average weight gain, and the transcutaneous absorption of oil also increased triglycerides. Also, the use of synthetic oil increased vagal activity, which may indirectly contribute to weight gain" (Field et al. 1).

The weight gain provided through the use of massage therapy is "associated with shorter hospital stays and, thereby, significant hospital cost savings." In terms of monetary concerns, this factor can undoubtedly impact parent stress levels as well. For example, "a 15-minute massage therapy protocol, three times per day, for ten days resulted in 21-47% greater weight gain than standard care alone". Because of massage therapy and other contributing factors, "those infants were also discharged six days earlier on average than control infants, saving approximately ten thousand dollars in hospital costs per infant" (Field et al. 2)

Additionally, massaged infants exhibit fewer stress behaviors and display more rapid brain maturation-- no harmful outcomes have occurred due to the use of massage therapy (Murtaza 1). However, despite the many benefits of massage therapy with preterm infants, it is

only being offered in one-third of all NICU's (1). Caregivers could benefit from contacting NICU staff about the allowance of massage therapy with their infant.

To best make use of the benefits that physical touch has on an infant, caregivers can focus on:

- Increasing frequency of kangaroo care and ensuring maximum skin-to-skin contact. Caregivers of all genders should practice kangaroo care, for those with breasts, KC can be practiced by placing the infant firmly and upright between the caregiver's breasts and under the clothes against bare skin (Conde-Agudelo & Díaz-Rossello). Those without breasts may practice KC by merely attaching the infant to their chest area onto bare skin firmly.
- With medical approval, caregivers should practice passive limb movement and gentle massage therapy. When massaging, make use of coconut and safflower oil to aid in infant growth potentially.

Talking & Singing

Despite little interaction with the outside world, the fetus is exceptionally attuned to music and the maternal speaking voice. It has been proven that by the last trimester, fetuses will respond to sounds and even recognize some characteristics of the mother's voice (Filippa et al. 1017). Additionally, there are physical changes in the infant we can observe in correlation with the mother's voice. For example, we can see through near-term fetal heart rate changes that they have the ability to determine intensity and frequency of auditory simulation, as well as possessing the ability to process melodies in both talking and music (1017). These impacts show true even with a simple recording of the maternal voice being played for the infant. Recorded vocal stimulation may affect the infant's heart and respiratory rates, as well as influencing

oxygen saturation and reducing pain responses in hospitalized infants (1017). Additionally, talking and singing help these infants be more tolerant of feedings and be able to consume more nutrients when exposed to the recorded maternal voice (1018) and encourage infant vocalization (1018).

In addition to recordings of speech and music, we can see that live singing is also associated with changes in heart rate, sucking, and sleep patterns, as well as positive mood changes in hospitalized infants (1018).

Another development influenced by the use of music therapy in NICUs includes intermittent sucking, which allows for productive swallowing and breathing. Infants sucking without coordination may result in drooling, choking, and oxygen desaturation" (Loewy et al. 900). Music therapy can allow the infant to coordinate their suckling to the rhythm of the music, allowing the infant to foster consistent and healthy means of sucking.

Overall, incorporating live speech, singing, and music can dramatically increase the infant's quality of life in the NICU. However, it is vital to consider the risk of overstimulating the immature senses of an infant (903). Because of this, only particular music should be played or performed. To promote the physical growth and psychological development of an infant, music should aim to be live, synchronized, and soothing (lullabies) performed by a music therapist.

To use speech, singing, and music, in its most optimal extent, families and NICU staff should incorporate the following into care:

- Communicate and talk to the infant as frequently as possible. The topic of conversation holds little to no significance. The important aspect is merely having the infant being able to hear your voice.

- Preferably, all music should be played or sung live, avoid recorded options as much as possible.
- Sing lullabies rather than music from other genres. Lullabies specifically have a strong influence on vital signs (decreased heart rate) and an increased activity level. (Loewy et al. 902).
- The use of the musical instrument called a *gato box*, which creates sound simulating that of a steady heartbeat, can positively influence passive heart rate as well as sucking and feeding behaviors (Loewy et al. 904).

Figure 2: Gato Box

- The use of an *ocean disc* drum is shown to induce a quiet–alert state and improve oxygen saturation both during the period music is being played and long term (Loewy et al. 904). If these two instruments are unavailable, parents are encouraged to use their bodies to replicate the sounds these two types of drums create.

Figure 3: Ocean Disc

- Parents are encouraged to "produce a single breathy voiced 'ah.'" This sound, and the vibration your body makes when producing it, helps to calm the infant (Loewy et al. 910) and model productive inhalation and exhalation for the infant.

- Be cautious and try to avoid overstimulating the infant. Too much chaotic noise may cause the infant to become distressed. Be sure to keep all songs to a calm and melodious lull (Loewy et al. 903),
- Lastly, caregivers should rest assured that there is no such thing as a *bad singer* to the infant. Their voice is "unique and recognizable to their infants, and that their voice has been audible to their infant from 16 weeks throughout their entire pregnancy" (Loewy et al. 910). The infant finds physical and emotional comfort in merely the sound of a parent's unique and particular voice. Because of this, it is best to use your authentic singing and speaking voice, as that is what the infant recognizes and adores.

Quality Time & Focused Attention

Nearly every aspect of infant care covered thus far revolves around the importance of providing quality and focused attention for the infant. The effects of quality time in the NICU can continue to impact children's development— some effects can be traced to where they affect a school-age child who was once a preterm infant. In a study on NICU visitation, Latva found the children whose mothers visited daily had fewer behavioral and emotional problems at school age than those who had had fewer visits (Latva et al. 1). The effects from a lack of visitation were determined even to be a "stronger risk factor for later psychological development than the medical risks of the preterm infant" (Latva et al. 1). Understandably, it may be emotionally straining for families to visit their child in the NICU due to a range of reasons including, but not limited to, "the alterations in the parental role and the appearance and behavior of their infant" (Latva et al.). Additionally, it may be more difficult for some parents to visit due to various health determinants such as demographic factors and environment. It is explained that "parents'

low socioeconomic status, parents' not living together, and a child with birth order of 2 or higher are associated with less frequent visits"(Latva et al. 1). Regardless, the importance of quality time and attention for an infant in the NICU is undeniable, and caregivers should aim to regularly practice it.

Having quality and undivided time spent between the parent/caregiver and the infant will contribute towards positive infant growth. Through this information, measures that can confidently be recommended to caregivers while spending time with a preterm infant include:

- Removing all potential distractions from the bonding space. This especially includes silencing or turning off cellphones if possible, as well as avoiding work-calls and television, as they are a primary source of distraction in our modern-day.
- Try to clear one's mind, focus on the infant in front of you as you care for them. Give all your attention to them, allow yourself to become immersed in the bonding experience.
- Show up for the infant as much as possible. Visit the NICU as frequently as you can. However, keep in mind that you must also take time to care for yourself as the quality of care you provide may diminish due to caregiver exhaustion, feelings of high stress, and burnout.

Transition to Home

Once the infant leaves the hospital, the work towards positive development does not end. As the infant may be physically stable, a long road of healing still lies ahead for both the infant and caregivers. Primarily, "problems such as breastfeeding barriers, re-hospitalization, morbidity, and mortality" present to be "risk factors that accompany infants during their transfer from NICU to home especially in the sensitive period of early infancy" (Valizadeh et al.). Discharge from the NICU has the potential to be stressful for parents as they will no longer have continuous medical

attention to support them in infant care. When measuring cortisol (a stress hormone) levels in parents transitioning from the NICU to a home setting, we can see that fathers tended to show increased stress over the transition home (displayed by lower wakeup stress levels and higher bedtime cortisol); these stress levels indicate that fathers may be particularly vulnerable to stressors during this transition. When observing mothers, there is an increase in *perceived* stress over the transition home and higher bedtime cortisol levels (Garfeild et al. 1). This data suggests a link between high levels of *perceived* stress and high *physiological* stress (2). Additionally, mothers tested to be more "physiologically stable, perhaps suggesting they are better prepared for this transition" (7).

During the hospital-to-home transition, the feelings of NICU parents can be described as "pervasive uncertainty" when it comes to having to care for the medically vulnerable infants outside of the hospital (Garfeild et al. 131). Regardless of how involved parents were in caring for their infant in the NICU, parents still displayed a desire for more information and frequently described themselves as feeling "unprepared for discharge" (132).

A method that has been proven useful to ease this transition out of the hospital is home visits by nurses. These home visits are described as "a key component" as they provide parents with "education, support, and nursing care"(Lopez et al. 8). It is very highly recommended that a NICU program incorporate a means by which caregivers of preterm infants can contact a nurse, whether that be via home visits or video-chats (6).

Suggestions that can be drawn for transitioning parents include:

- Utilizing both maternal and paternal leave from work during this time to relieve pressure from outside stressors. This is important for both fathers to consider as "familial stressors such as employment and social support are particularly common among new fathers'"

(Garfeild et al.), primarily due to how paternal leave is not as normalized in today's society.

- Getting in contact with a nurse and scheduling video-calls or home visits after you transition out of the NICU and into your home. This can provide peace of mind for parents and caregivers as well as ensure that all precautions are taken correctly.

Conclusion

Through the evidence posed in this thesis, it is clear how these external influences can pose a lasting, positive impact on the preterm child. The use of facial expressions shows us how infants quickly can become distressed when their caregiver displays a blank face rather than a set of warm and engaging facial expressions. Additionally, it is evident how infants adjust their actions and mannerisms to match the responsiveness of their interaction partner (Nagy 4). Therefore, ensuring that you use joyful and engaging facial expressions and eye contact (about 11 inches or ~30 cm and no further than 23 inches or ~60 cm) will create a more comfortable and welcoming environment for the infant to grow and heal in.

With skin-to-skin contact, commonly performed with KC, is incredibly impactful when both mothers, fathers, and other caregivers partake in skin-to-skin contact, and is not an activity limited only to mothers (6). The impact that KC is proven to have on an infant's development and growth is significant. These effects include reducing infant mortality (25), a reduced occurrence of severe hospital-acquired infection, and other illnesses like sepsis, lower respiratory tract disease, and hypothermia (2). There is additionally a direct link between KC and an increase in weight, body length, and head circumference gain per day, as well as an increased likelihood for successful breastfeeding (when applicable) and a decrease in the length of hospital

stays by 1.6 days (2). Additionally, infant massage therapy is shown to lead to weight gain and an increase of bone density and exhibit fewer stress behaviors and display more rapid brain maturation. No harmful outcomes have occurred due to the use of massage therapy (Murtaza 1)

Skin-to-skin contact is also seen to be influential towards parental health. The evidence gathered by Conde-Agudelo and Díaz-Rossello indicated an increase in measures of maternal satisfaction and attachment for mothers and involvement and competence by fathers (22). In conjunction with skin-to-skin contact, the importance of quality time should be heavily emphasized as well. The effects of quality time in the NICU can continue to impact children's development— some effects can be traced to where they affect a school-age child who was once a preterm infant. Older children whose mothers visited the NICU daily grew up to have fewer behavioral and emotional problems at school age than those who had had fewer visits (Latva et al.).

Lastly, we can see how talking and singing may affect the infant's heart and respiratory rates, as well as influencing oxygen saturation and reducing pain responses in hospitalized infants (Filippa et al. 1017). Additionally, talking and singing helps infants to be more tolerant of feedings and be able to consume more nutrients when exposed to the recorded maternal voice (1018), as well as encourage infant vocalization (1018). Singing is also associated with changes in heart rate, sucking and sleep patterns, and positive mood changes in hospitalized infants (1018).

Overall, through the methods discussed above and throughout this thesis, it is incredibly evident how caregivers, even those without medical expertise, can impact the lives and development of the infant. For caregivers who feel reluctant to begin this care method, beginning

with talking and singing and quality time is suggested. This is because these methods involve the lowest physical contact with the infant and may help uplift the caregiver's beginning comfort levels. Additionally, it is crucial for caregivers to develop a care-plan to implement these methods, which compliments the NICU medical staff and their current care-plan. Along with medical care, caregivers can promote optimal cognitive and physical development of the infant by applying these methods.

Each infant is different and may require an alternate care plan. These methods may not work for every infant, but caregivers need to take advantage of the time throughout a hospital stay. Through infant-caregiver studies, caregivers "of premature and sick babies must develop and maintain an appropriate understanding of their babies' needs in order to be prepared for home caregiving" (Craig et al.). In order for caregivers to set themselves up for optimal success with the infant at home, it is crucial to engage with the infant when they are at their most vulnerable state. Both parent and infant will learn their cues through different facial expressions and cries. These skills will benefit both infants and caregivers in the long-term and lead to reduced stress-levels at home. Every action taken for an infant's mental and physical health can influence the future development and growth of both child and caregivers; as the great Frederick Douglass once stated: "it is easier to build strong children than to repair broken men" (Douglass qtd. in Mapp).

Works Cited:

Arpi, Elena & Ferrari, Fabrizio "Preterm birth and behaviour problems in infants and preschool-age children: a review of the recent literature," *Developmental Medicine and Child Neurology*, vol. 55, no. 9, pp. 788–796, 2013.

Conde-Agudelo A, Díaz-Rossello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database of Systematic Reviews* 2016, Issue 8. Art. No.: CD002771. DOI: 10.1002/14651858.CD002771.pub4.

Craig, J.W., et al. "Recommendations for involving the family in developmental care of the NICU baby." *Journal of Perinatology*, vol. 35, no. S1, 2015, p. S5+. *Gale OneFile: Health and Medicine*.

Field, Tiffany et al. "Preterm infant massage therapy research: a review." *Infant behavior & development* vol. 33,2 (2010): 115-24. doi:10.1016/j.infbeh.2009.12.004

Filippa, Manuela, et al. "Live Maternal Speech and Singing Have Beneficial Effects on Hospitalized Preterm Infants." *Acta Pædiatrica (Oslo)*, vol. 102, no. 10, 2013, pp. 1017–1020.

Garfield, Craig F., et al. "Supporting Parents of Premature Infants Transitioning from the NICU to Home: A Pilot Randomized Control Trial of a Smartphone Application." *Internet Interventions*, vol. 4, May 2016, pp. 131–37. ScienceDirect, doi:10.1016/j.invent.2016.05.004.

Garfield, Craig F et al. "Stress From the Neonatal Intensive Care Unit to Home: Paternal and Maternal Cortisol Rhythms in Parents of Premature Infants." T*he Journal of perinatal & neonatal nursing* vol. 32,3 (2018): 257-265. doi:10.1097/JPN.00000000000002

Hofsten, O. Von, et al. “Simulating Newborn Face Perception.” *Journal of Vision*, vol. 14, no. 13, 2014, pp. 16–16., doi:10.1167/14.13.16.

Hunt, Felicity. “The Importance of Kangaroo Care on Infant Oxygen Saturation Levels and Bonding.” *Journal of Neonatal Nursing*, vol. 14, no. 2, 2008, pp. 47–51., doi:10.1016/j.jnn.2007.12.003.

Latva R, Lehtonen L, Salmelin RK, Tamminen T. Visiting Less Than Every Day: A Marker for Later Behavioral Problems in Finnish Preterm Infants. *Arch Pediatr Adolesc Med.* 2004;158(12):1153–1157. doi:10.1001/archpedi.158.12.1153

Loewy, Joanne, et al. “The Effects of Music Therapy on Vital Signs, Feeding, and Sleep in Premature Infants.” *Pediatrics*, vol. 131, no. 5, *American Academy of Pediatric*s, May 2013, pp. 902–18. *pediatrics.aappublications.org*, doi:10.1542/peds.2012-1367.

Lopez, Greta L., et al. “Transition of Premature Infants From Hospital to Home Life.” *Neonatal Network :* NN, vol. 31, no. 4, 2012, pp. 207–14.

Mapp, S., Gabel, S.G. It Is Easier to Build Strong Children than to Repair Broken Men. *J. Hum. Rights Soc. Work* 4, 145–146 (2019). https://doi.org/10.1007/s41134-019-00106-z.

Murtaza, Ghulam. “Massage Therapy in Preterm Infants.” *Pediatrics & Therapeutics*, vol. 03, no. 02, 2013. *DOI.org (Crossref)*, doi:10.4172/2161-0665.1000155.

Nagy, E. (2008). Innate intersubjectivity: Newborns' sensitivity to communication disturbance. *Developmental Psychology*, 44(6), 1779–1784. https://doi.org/10.1037/a0012665

Quinn, Julie-Anne et al. “Preterm birth: Case definition & guidelines for data collection, analysis, and presentation of immunization safety data.” *Vaccine* vol. 34,49 (2016): 6047-6056. doi:10.1016/j.vaccine.2016.03.045

Stylianou-Riga, P., Kouis, P., Kinni, P. *et al.* Maternal socioeconomic factors and the risk of premature birth and low birth weight in Cyprus: a case–control study. *Reprod Health* 15, 157 (2018). https://doi.org/10.1186/s12978-018-0603-7

Tanner, Allison M., "The Effects of Premature Birth on Language Development" (2012). *Research Papers*. Paper 250. http://opensiuc.lib.siu.edu/gs_rp/250

Valizadeh, Leila et al. “Factors affecting infant's transition from neonatal intensive care unit to home: A qualitative study.” *Iranian journal of nursing and midwifery research* vol. 18,1 (2013): 71-8.

Williams, Kristen G et al. “The Neonatal Intensive Care Unit: Environmental Stressors and Supports.” *International journal of environmental research and public health* vol. 15,1 60. 3 Jan. 2018, doi:10.3390/ijerph15010060