

Narrative Review

Touch: A Review of the Infant-Caregiver Relationship in the Neonatal Field

Ana Raquel Figueiredo¹, Pedro Moniz², Maria Laureano³

¹ Paediatrics, Coimbra Hospital and University Centre, ² Médio Ave Hospital Centre, ³ Coimbra Hospital and University Centre

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Touch is a domain of enormous importance with implications in development, from birth, and across the lifespan. This work aims to review touch implications within infant-caregiver interaction. A non-systematic review of the literature was performed to assess the relevance of touch in the neonatal period, on attachment, and in child development. The review was conducted on PubMed database, in May 2023 using the following keywords: “infant”, “child”, “baby”, “newborn”, “neonatal”, “touch”, “contact”, “tactile”, and “attachment”. In the neonatal period, close skin contact facilitates caregiver sensitivity and responsiveness, promotes parent-infant reciprocity, reduces psychological distress both in caregiver and infants, and regulates the infant’s physiological systems (circadian rhythm, autonomic regulation). Touch also plays a crucial role in attachment by contributing to synchrony and self-regulation abilities, since secure attachment promotes learning of emotional regulation, social skills, and behavioural organization. Early sensory experiences are critical to developmental dimensions such as cognitive, motor, and socio-emotional, and influence physical growth rate. Concluding, in neonatal care services, touch should be systematically addressed in routine appointments. Within the field of infant-caregiver interactions, there is an urgent need to create a reliable tool for tactile assessment, allowing clear interpretations and the development of target interventions.

INTRODUCTION

Newborns establish a connection with the world, especially with their relatives, through touch.¹ Human beings are born highly immature compared to other species so the existence of responsive and supportive caregivers is crucial.² In humans, the tactile sense is the first sensory system to emerge, and by birth, it’s the finest and most developed sensory pathway.^{3,4} In the transition from the 2nd to 3rd trimester of pregnancy, mothers can notice their baby’s movements, and babies can respond to parents’ voices and touch.⁵ During pregnancy, the baby receives tactile stimulation from the womb, which they seek out after birth through situations like being held.² Montagu argues that during labour, uterine contractions provide tactile stimulation that optimizes the infant’s postnatal functioning.⁶

Tactile information concerns a domain of enormous importance with implications in the relational field, from birth, and across the lifespan. Montagu suggests that touch is a fundamental basic need, vital for healthy development and harmonious attachment.⁶ Touch is an essential aspect of the human experience. Physical contact has been linked to features of development in social, emotional, cognitive, neurological, and physical domains,⁷⁻⁹ and so in situations where physical contact is limited or absent, it can lead to negative physical and psychological consequences.

The role of touch has been relatively disinvested despite its crucial importance. This work aims to review the touch domain literature concerning infant-caregiver interaction.

METHODS

A non-systematic literature review was performed to assess the relevance of touch in infancy, regarding attachment and child development and the importance of neonatal period. The literature review was conducted on PubMed database, in May 2023, relying on the following words: “infant”, “child”, “baby”, “newborn”, “neonatal”, “touch”, “contact”, “tactile”, and “attachment”.

The terms used were chosen to ensure a comprehensive and accurate approach in the research on the interaction between infants and caregivers in the neonatal field. “Infant”, “child,” “baby,” and “newborn” allow for a clear inclusion of children in the neonatal period. “Neonatal” emphasizes the specific context of the period immediately after birth. “Touch,” “contact,” and “tactile” assure the inclusion of different aspects of physical interaction between infants and caregivers. “Attachment” seeks to investigate the interaction of touch in fostering emotional attachment and potential implications. The terms used in the research aim to provide a comprehensive analysis of the dynamics of

physical contact in the infant-caregiver relationship in the neonatal context.

The search strategy included: books, documents, clinical trials, meta-analyses, randomized controlled trials, reviews, and systematic reviews, after chosen based on the relevance of the title, abstract, and following pertinence of the study content to the subject of this research.

The exclusion criteria were established based on the limited relevance of topics outlined in the abstract, specifically those that did not address the discussion of touch, communication, or attachment in the neonatal field. All studies not written in English were excluded.

RESULTS

We have decided to structure the body of the article into 3 sections: “Touch in the neonatal period,” “Touch in attachment,” and “Touch in development” based on the clusters of topics found in the conducted research on the importance of in the neonatal context.

1. TOUCH IN THE NEONATAL PERIOD

Mothers discover their babies gradually after birth, starting with touching the baby with their fingers, then with their hands, and finally with their arms, but this is a reciprocal process where the mother and baby learn from each other through touch.¹⁰ There is enough evidence to support the existence of a sensitive period for establishing tactile contact between caregivers and neonates.¹¹ It is in the early postpartum period, that this sensitive period takes place, in which precocious skin-to-skin contact (SSC) is critical and the establishment of breastfeeding occurs.¹²

SSC practice and kangaroo care (KC) involve physical contact between newborns and their parents.¹³ KC gained recognition as an important practice following studies conducted in the 1970s in Bogota where insufficient incubators were available for low-birthweight infants.¹⁴ SSC facilitates a smooth transition from intrauterine to the external environment by providing sensory stimuli, such as touch, sound, and smell, that mimic the ancient milieu.¹¹ At short term, SSC facilitates maternal sensitivity, and responsiveness, decreases intrusiveness, and has a positive influence on maternal mood and breastfeeding associations; to the newborn, it regulates sympathetic nervous activity and lowers negative emotionality; in the relational field, it promotes parent-infant reciprocity, decreases psychological distress both in mother and infants and reduces parental stress and anxiety; in the long term promotes parents' sensitivity and cohesiveness, facilitates anxiety regulation and parenting stress management and stimulates a less intrusive relational pattern.^{11,15-17} The World Health Organization (WHO) recommends KC as an effective method for maintaining body temperature and promoting sensory development, as well as perception of maternal affection.¹⁸ KC habits may affect the amount of paternal touch, perhaps due to a co-parenting alliance.¹⁵ There seems to be a lack of scientific knowledge underlying mechanisms of SSC. Literature indicates that early-life tactile stimulation patterns

can alter stress regulation with potential health impacts throughout the lifespan, yet it is hard to clarify the contributors to this modulation, it could derive from breastfeeding, physical contact, maternal responsiveness, or others.¹⁹ Our review strongly suggests that close interaction between caregivers and infants, particularly with the attachment figure, fulfils the infant's needs for warmth, touch, and comfort. This interaction regulates the infant's physiological system, including the hypothalamic-pituitary-adrenal (HPA) axis.²⁰ Touch can influence HPA activity, particularly during critical periods of development, since maternal contact has been found to reduce infants' physiological stress.²¹

When discussing the role of touch in neonatal pathology, it is inevitable to think about prematurity, failure to thrive (FTT), and maternal depression. Prematurity refers to a medical condition where a baby is born before 37 weeks of gestation, which often leads to a period of maternal separation and limited body contact. SSC has been shown to have several benefits in preterm infants, including improvements in psychomotor development, hormonal regulation, brain development, autonomic nervous system maturation, and regulation of circadian rhythms.^{22,23} In premature infants, both stroking touch and proprioceptive stimulation promote behavioural organization and growth, regardless of caloric intake.^{24,25} Physical touch is important for mothers as it helps them feel connected to their infants and promotes thriving.²⁶ According to Schanberg and Field in the 1980s, touch can stimulate physical activity, which may in turn promote the child's growth rate.²⁷ Thus, touch could play a role in malnutrition and FTT. Poland and Ward found evidence that less amount of physical touch or unintentional touch, and less proprioceptive stimulation are associated with FTT.²⁸ Lastly, it is recognized that maternal depression negatively impacts infants' ability to regulate their emotions,²⁹ since maternal depression can lead to emotional and physical detachment, resulting in low affect and less tactile stimulation. Depressed mothers can exhibit a particular profile of non-synchronic behaviour (under-stimulating or overstimulating) toward their infant's cues.³⁰ In the still-face paradigm, infants respond to their mothers with decreased gaze and smile.³¹ However, when actively touched during the stationary facial period, the infant's directed attention, gaze, and smile increase.³¹ Negative touch, which communicates rejection, is associated with negative outcomes such as child aggression and the development of psychiatric disorders over time.^{32,33}

2. TOUCH IN ATTACHMENT

Attachment is an innate behavioural system that aims to seek security and comfort from an attachment figure during stressful situations.³⁴ Harlow, through his experiments on rhesus monkeys, was the first to address maternal deprivation, demonstrating the significance of physical comfort in the establishment of emotional bonds, suggesting the importance of comfort contact over food provision.³⁵ Bowlby suggested that the attachment figure could transmit comfort to the child through their physical proximity in a special conjugation with voice.³⁴ He also argued that infants

have an innate drive to seek contact with a caregiver and classified the quality of the bond based on the caregiver's responsiveness.³⁶ According to Ainsworth, the key to establishing attachment is the quality and consistency of physical contact,³⁷ more consistent physical contact is associated with accurate maternal awareness and a coordinated response to the infant's signals. Bowlby and Ainsworth, two of the most recognized theorists of attachment, established physical contact as a central feature of safety perceived by infants and as an elementary requirement to bond and for further attachment relationships. The literature suggests that postnatal physical contact helps bonding, and touch is important in the attachment process as well as in the emotional dimension of infant lives.³⁸ Physical contact facilitates secure attachment, a greater quantity of contact enhances the infant-mother relationship, promotes maternal competencies, and fosters a more attuned behaviour toward the newborn.^{39,40} The main caregiver is crucial in assisting the infant in the development of relationships, aided by the effect of physical proximity with the attachment figure in reducing fear in the face of possible threats.⁴¹ From Harlow and Zimmermann's studies, it's understood that physical contact is crucial for the development of an infant's sense of security and that a lack of comforting contact is linked to a maladaptive response dominated by fear.⁴² Less sensitive caregivers may be reluctant to touch the infant in a disorganized.⁴³ Infants with insecure attachment patterns tend to have caregivers who dislike close physical contact with some aversion to touching,⁴⁴ and those who are carried less tend to have more disorganized attachments.³⁹ There is evidence that the caregiver's aversion to physical contact (most often ventral-ventral) could have detrimental consequences for the attachment relationship and lead to psychopathological manifestations.³⁸ The damaging effect of physical rejection is easy to predict because it signals the absence of a safety world. Under these circumstances, children are more likely to show aggression and anger (hitting, biting) and strange behaviour (stereotyping, hand flapping, hair pulling), and later in life, the child may show more aggressiveness and anger.⁴⁵

Although there is little literature discussing the independent role of touch in attachment, it is widely recognized that human nurturing touch is crucial in establishing a connection with the caregiver and in the development of secure attachment. Parent-infant attachment is an adult physical health predictor, with particular implications in the trauma-resilience construct.¹¹ Nurturing touch enhances prediction, synchrony, empathy, and reciprocity between caregiver and infant since secure attachment promotes learning of emotional regulation, social skills, and behavioural organization.³⁹

3. TOUCH IN DEVELOPMENT

There is a large body of research demonstrating the relevance of early sensory experiences in promoting developmental dimensions such as cognitive, motor, and regulatory processes.^{15,21,22} Concerning infant's development, close physical contact contributes to a faster sleep organization and adjustment of the circadian rhythm with implications

in the neural maturation of the autonomic nervous system, improves brain development, thermoregulation, and physiological outcomes, promotes sleep efficacy in the long term, emotional regulation abilities, harmonious socio-emotional development, and influences physical growth rate.^{9,11,17,23,29,46,47}

Infants' reactions to touch must always be considered within the context of the child-caregiver relationship. The contribution of the child's differences in responding to the stimuli should be taken into account. Depending on the infant's sensory profile, emotional and behavioural responses vary depending on the individual's level of tolerance to the stimuli. For example, if extreme (high or low) tactile reactivity is present, the child may interact with the caregiver in a pattern of avoidance or unresponsiveness that influences the interaction and learning and therefore the child's development.⁴⁸ Different responses to tactile stimuli promote distinct developmental profiles, particularly about social and self-regulatory skills.⁴⁹

Indeed, it is pertinent to reflect on the relationship of tactile interaction during the neonatal period and its potential effects on later psychopathological tendencies. Nonetheless, contemporary literature is notably deficient in studies dedicated to investigating these correlations during the neonatal epoch. Still, a study conducted in 2019, albeit involving cohorts of older children (aged beyond 3 years), focused on understanding the influence of touch on the child's psychosocial and moral development, as well as its effects on mental health in adulthood, it was found that positive maternal touch, characterized by affection and support, promotes better behavioural regulation and adequate social skills in the child (pro-social orientation), and negative touch, such as corporal punishment, was associated with externalizing behaviour problems and lower social competence in children (self-defence and oppositional orientation).⁵⁰

DISCUSSION

Tactile contact provides caregivers with knowledge of infant information, and in early life, fosters physical and emotional intimacy between caregivers and infants. Assessing the infant's response pattern to tactile stimuli within the caregiver-infant interaction is essential for understanding the child's self-regulatory skills and developmental profile.⁴⁸

Touch may play a main role in attachment, particularly by contributing to the self-regulation domain. Maternal touch appears to regulate the stress response, and infants whose mothers felt safe with touch based on their own childhood experiences are more prone to form secure attachments. Touch may play a special role in attachment because it represents a close co-regulatory agent that necessarily involves a dyadic relationship, in contrast to gaze, which might be unidirectional (without necessarily involving the receipt of information). When examining the relationship between emotional development and touch, it is important not to forget other caregivers beyond the main one.⁵¹ Multiple caregivers' physical contact and emotional

representations may be related to the development of future attachment-based relationships.⁵¹

Early sensory experiences are used by infants to engage and learn from the environment and close interactions. Depending on the type of sensory input, which includes sensitization, sensory processing, habit formation, and behavioural organization, infants exhibit varying levels of tolerance and responses with distinct implications for later development.⁴⁸

The dyadic significance of the cultural influences of touch varies across different societies. A longer period of touch could allow the infant to better discriminate information, and also give him more opportunity to access his transgenerational history. Tactile parameters contribute to the delivery of a message that considers two partners, where one of them has, in the neonatal period, a burden of transgenerational information that will be communicated also through physical contact. The history and the individuality, the multicity and singularity, should meet and complement, disclosing to the child a congruent message.

When reviewing the literature for this work, the team realized the existence of an intimate connection between touch, emotion, and communication, which the topic seemed suitable for further research. If touch is an important aspect of neonatal care, it is important to address it systematically. Within the field of infant-caregiver interactions, there is an urgent need to create a reliable tool for tactile assessment, allowing clear interpretations and the development of target interventions.

As our work entails a narrative review, it allows for flexibility in exploring a broad spectrum of sources and perspectives, providing authors with the freedom to formulate unrestricted critiques and associations within the domains under study. However, limitations may arise from the potential for bias in the selection and analysis of the included studies.

CONCLUSION

Tactile stimulations are a major component in infant-caregiver interaction, with an important role in attachment. Touch is fundamental to child development as parents repeatedly send messages through tactile stimulation. Pos-

itive tactile stimulation in the neonatal period is crucial promoting an affectionate caregiver-infant bond with long-term consequences for the child's development, especially in the emotional and cognitive domains. Nurturing touch regulates homeostatic functions, affect, autonomic and endocrine pathways, and is also known to be beneficial for children's physical, social, emotional, and cognitive development. Physical contact is crucial in the ability to regulate emotions and contributes to the infant's internal regulation.

In neonatal care services, touch should be systematically addressed in routine appointments. Human development is not a deterministic variable and therefore contains a reasonable degree of discontinuity, in which many opportunities for intervention are possible, based on the continued interchange nature of human relationships.

ETHICAL CONSIDERATIONS

This work did not require any ethical approval as it is a narrative review.

DISCLOSURES

All authors declare no conflicts of interest.

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AUTHORS CONTRIBUTION

Ana Raquel Figueiredo wrote the main manuscript text. Pedro Moniz contributed to the elaboration of the discussion. Maria Laureano was the main reviewer.

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