

Cradling Bias Occurrence and Purpose

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Abstract

Maternal cradling bias is the act of human females to tend to cradle newborns to the left side in the first few weeks of life. Many factors contributing to the occurrence of leftward cradling bias have been explored including handedness and hemispheric dominance, neural development in neonates, breast-feeding influences and early communicative acts [1-7]. Accepted best practices for developmental support for premature infants incorporate positioning and holding neonates in their protocols [8,9]. Questions as to what function leftward cradling serves and what impact it has on the developmental trajectory of the infant in the first few weeks of life is the subject of much research [1,10-13]. This paper will review the literature focusing on maternal cradling bias and explore implications on best practices for pediatric professionals.

Keywords: Maternal Cradling Bias, Neonate, Early Neural Development.

Introduction

The phenomenon of leftward maternal cradling bias has been the subject of research for several decades. There are questions about what purpose, if any, this particular interaction serves in fostering attachment and social engagement between the newborn and her mother. Currently, it is widely accepted that this bias appears to be “innate” in a majority of the human female population [13]. This is not to say that all mothers of newborns will cradle their infants to the left. In a study of the maternal cradling activities in mothers who are deaf, leftward cradling bias occurred in the incidence only of neonates with normal hearing. In contrast, it was observed that deaf tend to cradle their deaf newborns to the right [14]. At odds with this is a previous investigation into the relationship of leftward cradling bias and processing of prosody with individuals who are profoundly deaf. Turnbull, Rhys-Jones, and Jackson observed cradling behaviors in profoundly deaf children, deaf adults, and a control group of adults with normal hearing. The stimuli used in this study was a doll meant to simulate a newborn. Results indicated a strong leftward cradling bias in all groups, and, the authors noted, the bias appeared even stronger in individuals who were deaf [15,16]. In a review of the literature, Sieratzki and Woll also concluded that leftward cradling might be related to processes that occur in the right cerebral hemisphere. According to these authors, there is evidence to suggest that cradling bias to the left subserves social attachment in neonates and their mothers [17]. This concept is indirectly supported by Kim, who observed neural changes in mothers occurring during the first hours, days, and weeks of the postnatal period. Kim posited that specific changes in neural circuitry may support the development of positive parenting skills [18]. Measures of specific changes during

cradling interactions were unavailable.

Cradling bias and handedness

The relationship between cradling laterality and handedness has also been a topic of study. It is a reasonable assumption that hemispheric dominance would influence the act of cradling a newborn baby and a majority of the population exhibit right-handedness, a trait that is reflective of left-hemispheric dominance. Functional cradling was the focus of a study by van der Meer and Asmund. According to these researchers, “functional” cradling is the act of cradling an infant in the non-dominant arm while at the same time keeping the dominant hand free to complete functional tasks [1]. In their study, the relationship between hand dominance and directional functional cradling was observed with 765 participants. The stimuli utilized was a doll that resembled a newborn infant. Van der Meer and Husby actively recruited left and mixed-handed participants for their experiment, however, right-handed individuals comprised 64.3% of the cohort, while 24.7% were “mixed” handed. The left-handed participants made up 11% of the sample. Outcomes indicated that a significant majority of the participants (regardless of handedness) tended to utilize the non-dominant arm during “functional” cradling. The authors concluded that the data supported a hemispheric dominance hypothesis as the main influencing factor to account for left-ward cradling bias. The researchers surmised from their data that left-ward cradling bias occurred with such frequency because this particular positioning of an infant would “intuitively” keep the dominant hand of the individual free to complete other tasks [1].

Weaknesses of the study data observed lies in the selection of participants, a majority of which were right-handed or ambidextrous and the use of a life-like doll as opposed to a live infant. A hemispheric dominance theory for functional cradling to

the non-dominant arm could be clearly demonstrated in a situation where the stimuli (doll) is a live newborn and participants were all left-handed. The hemispheric dominance hypothesis for maternal cradling bias should stipulate that left-handed mothers “intuitively” cradle their infants to the right arm. The results of the study by van der Meer and Husby leave the question of hemispheric influences that support maternal cradling bias unclear.

Cradling and brain development

The act of cradling may foster the beginnings of regulation of experiential learning [3]. It has been suggested that leftward maternal cradling bias may serve to facilitate and support synaptogenesis of circuitry in the neonate [3]. Development and solidification of neuronal tracts occur in response to repetitive external stimuli and a mother cradling her newborn could be considered a recurring situation in the first weeks of life [19]. The actual perceptual stimuli that both mother and infant experience during cradling include vision, hearing, touch, and smell. Research on the topic of the tendency of the occurrence of maternal leftward cradling has not directly indicated what purpose it serves [20,2]. It may be that cradling to the left initiates and supports a specific component of infant neural development. As with other reflexive motor patterns observed at birth, observation of the act of cradling to the left may also be supportive of brain development; however, the actions of the mother of a neonate are not routinely monitored for cradling laterality or thought of as an indicator of improved developmental outcomes. If it is the case that cradling postures contribute to improved developmental outcomes, cradling to the right may serve a wholly different purpose with regard to neural development and activation. Many researchers posit that it may be possible to determine if there is a direct relationship between maternal-newborn interactions and the creation specific neuronal connections [6,21,22]. Current knowledge of the development of specific neural substrates during cradling in neonates is incomplete. Additional study of neural activation during the act of cradling is necessary. The purpose of this paper is to revisit the literature and explore the information available on leftward maternal cradling bias to date. Outcomes of future studies should increase our understanding of the phenomenon of maternal cradling bias.

Cradling and infant positional biases

According to Kubis and Catala, the existence of newborn reflexive motor patterns may be partially due to the degree of myelination present in the pyramidal tract at birth [23]. These motor patterns appear in the absence of any specific stimuli and are referred to as general motor patterns. They are thought to serve an adaptive function in utero as well as in full term neonates [24]. General motor movement patterns in neonates have been documented and are thought to be representative of neuronal organization [24-26]. Of interest here is the effect that position of the infant has on neuronal development. When an infant is cradled, she is held in flexion. Ozdemir and Tüfekçi studied the effects of flexion and mother’s scent on premature neonates. Results indicated that both flexion and the mother’s scent had a positive influence on premature infants’ growth and development rate. Ozdemir and Tüfekçi, 2014, concluded that there was a direct relationship between amount of time spent in tactile contact and flexion and the resulting developmental gains.

Cradling and early intervention programs

Hane et al. observed the impact of the Family Nurture Intervention

(FNI) paradigm on the quality of maternal caregiving behavior. This paradigm is used in the neonatal intensive care unit to facilitate positive outcomes in premature infants [9]. The authors observed mother-infant “calming” sessions and measured maternal behaviors which included scent-cloth exchange, vocal soothing, skin-to-skin contact, holding, emotional expression, eye contact, and family-based support. Positive outcomes for premature infants were observed when FNI was actively utilized [9]. Maternal “holding” was an important component in this intervention; however, specific positioning of the infant including cradling was not recorded for the study. Kangaroo care is a technique that has also garnered much interest by researchers. Kangaroo care is the practice of holding an infant against the chest with “skin-to-skin” contact [8]. Kangaroo care has been associated with positive infant developmental outcomes; however the studies reviewed did not stipulate to which side the neonate was held, only that “skin-to-skin” or “skin-to-cloth” contact was established [27-30]. Investigations into cradling while utilizing kangaroo care have yet to be conducted.

Cradling and breast-feeding

It would seem plausible that leftward cradling bias occurs in most interactions between mother and newborn and there has been inquiry into maternal positioning of the newborn during breast and bottle feeding. An investigation by Donnot, Vauclair, and Bréjard explored the behaviors of cradling by depressed mothers during feeding using both bottle-feeding and breast-feeding as variables. The subjects in the study were divided into two groups consisting of mothers who had been diagnosed as depressed, and those who had not. Of interest to the researchers was the effect depression had on cradling during feeding, and if bottle or breast-feeding influenced side cradling in some way. During feeding it was noted that leftward maternal cradling bias was absent for breast-feeding mothers in either group. That is to say; a finding of cradling bias towards one side was not observed during breast-feeding. Examination of cradling bias during bottle feeding in clinically depressed mothers demonstrated a tendency of the mother to cradle her baby to the right. The authors concluded that cradling behavior in this circumstance was not due to a hemispheric specialization, but rather that higher levels of depression were associated in some other way with influencing cradling while bottle-feeding [4].

Reissland suggested that the function of the direction of cradling was associated with communicative interaction initiated by the mother towards her newborn. In situations where leftward cradling bias was observed, maternal pitch and intonation were measured and compared to the same stimuli while cradling to the right. The data indicated that maternal pitch and intonation differences corresponded to right hemisphere processing of prosody and inflection. The presence of right hemisphere specialization for emotional processing through pitch and intonation is supported by other investigations [31]. Reissland concluded that the leftward cradling actions correlated with the mother’s attempts to soothe her baby. Cradling to the right was associated with the mother’s attempts to arouse her baby [32]. When assessing how mothers from Arab cultures choose to soothe their infants, Abdulrazzaq, Kendi and Nagelkerke found that cradling was included in the activities a majority of mothers choose to use when attempting to soothe their babies. As with other studies that have been reviewed, the side to which mothers tended to hold their babies was not considered as a variable in this investigation [5].

In contrast, Saling and Tyson examined cradling behaviors of nulliparous females and found a tendency to cradle to the left, even in women who had not given birth. These results appeared to underscore the “innateness” of the leftward cradling bias in the absence of communicative interactions. One of the weaknesses of this study was that subjects cradled a life-sized doll rather than a live infant. Cradling was observed in three different situations with the primary variable being which way the infant doll’s head was turned. The researchers found that the leftward cradling bias is present in all conditions [33]. In a similar study by Saling and Bonert cradling behaviors were examined in preschool children (cradling a doll). It was determined from the data that leftward cradling is also exhibited at roughly the same ratio in female children as in their adult counterparts. The authors suggested that this data supported the theory of an innate bias in females for leftward cradling, regardless of age [34].

Cradling and hemispheric dominance

Bourne and Todd suggested that mothers cradle their infants to the left because of functional hemispheric differences in the brain [35]. Their study suggests hemisphere dominance for emotional and face processing as the underlying impetus for cradling to the left. This idea is further supported by a study conducted by Parente and Tommasi. Data from their study of implied hemispheric laterality during face processing supported the assumption that 1) the left side of the face is more important in determining gender and 2) the preference for the left side of the face was only present in faces in which the left side was female. The stimuli used included normal and chimeric faces. The authors concluded that data showed a right-hemispheric advantage for recognizing female faces. This right-hemispheric advantage may provide a partial explanation for the utility of most mothers to cradle their infants to the left [36]. More support for lateralization of emotional processing was found by Fleva and Khan who observed cradling behaviors in typically developing adults on the autism spectrum. Of interest was the observation that individuals who were found to be higher functioning (milder autistic symptomology) tended to cradle a life-size doll to the left. Individuals exhibiting significantly more characteristics of autism tended to cradle the doll to the right. The authors concluded that the data supported the relationship between leftward cradling bias and brain lateralization of emotional processing [11].

Cradling and face processing

The hemispheric dominance theory was further supported by an investigation by Prete, Fabri, Foschi, and Tommasi. This study concluded that normal individuals demonstrate a right hemisphere bias for identification of female gender, and left hemisphere bias for identification of male gender of faces. A functional Magnetic Resonance Imaging (fMRI) comparison was made between neurotypical adults and one individual with split brain during stimulus presentation. When subjects were viewing the left side of a face, they were able to consistently identify the gender of the photograph as that of female. Conversely, when the subjects were viewing the right side of the face they were substantially demonstrated higher accuracy in determining if the face was of a male. The authors concluded that their evidence supported previously studied face processing of gender data indicating a right hemispheric bias for female faces [37].

The configuration of the face versus other patterns of configuration is known to be preferred by neonates [38]. This fact is important when attempting to understand the purpose of a seemingly innate bias in females to cradle their infants to the left. Many factors could work together to create this leftward bias. For example, cradling an infant to the left side of the body establishes a view for the infant of the left side of the mother’s face. This data lends further support to the idea of hemispheric lateralization development as the impetus for positioning an infant in this way.

Cradling and autism spectrum disorders

Lastly, of particular interest are recent studies of the occurrence of leftward cradling bias in individuals with and Autism Spectrum Disorder (ASD). Pilleggi, Malcolm-Smith, and Solms theorized that occurrence of leftward cradling bias was facilitated by social-affective attachment processes in neurotypical mothers. If this were true, the authors surmised that the leftward cradling bias would not be present in individuals diagnosed with ASD. To test this hypothesis, the authors studied the cradling activity of 96 children who ranged in age from 5 to 15. The characteristics of the participants included those with ASD, those with Non-ASD intellectual disability, and those with neurotypical neural development. The cradling behavior of the children was observed on 4 separate occasions. Results indicated that leftward cradling laterality was present in neurotypical children and intellectually disabled children. The leftward cradling bias was found to be absent in children diagnosed with ASD [39]. Support for the absence of the leftward cradling bias in ASD was noted in the previously mentioned data garnered from a study by Fleva and Khan of the cradling tendency of adults on the autism spectrum. In their investigation, adults with and without ASD were asked to pick up and cradle a life-size infant doll. As with the children in Pilleggi, Malcolm-Smith and Solms’ study, the tendency to cradle the doll to the left was apparent by neurotypical individuals, and markedly absent in adults with autism spectrum disorder [11].

Conclusion

The function of leftward cradling bias needs further investigation. The data gathered to date suggests possible reasons that the majority of human mothers innately cradle newborns to the left as a function of brain lateralization on emotional processing, but no definitive conclusions have been reached. Several studies support positioning as an important component of the care of both premature and full term infants, but have not determined why cradling bias occurs and what purpose it serves.

Future research endeavors could utilize similar paradigms as the experiments mentioned previously, but rather than using a doll, the stimuli which would be most appropriate would be a live infant. For example, utilizing an observation tool of mothers and infants in the NICU may prove that leftward cradling has a significant impact on developmental outcomes. The major drawbacks of this type of study may be the recruitment of mother-infant pairs to participate and the pretence of the study. It would also involve a significant time commitment to follow developmental trajectories of the participating newborns. The result, however, would be of keen interest to many fields of study. In addition, studies that focus on positioning actual newborns as opposed to life-like dolls could add support to the theory of neonatal hemispheric dominance for the female face. The results of studies on specific populations,

especially those known for social cognitive problems may also shed light on the question of why leftward maternal cradling bias exists and what purpose it serves. At this time, the definitive answer to this question continues to be elusive.

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