

What About The Children?



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RESEARCH SUMMARY

Affectionate Touch in the Context of Breastfeeding and Maternal Depression Influences Infant Neurodevelopmental and Temperamental Substrates

Hardin, J.S., Jones, N.A., Mize, K.D. and Platt, M. (2021), *Neuropsychobiology*, DOI: 10.1159/000511604

Few people will be surprised to learn that depressed mothers have difficulty bonding with their infants. Mothers who suffer from depression have been shown to touch their infants less and to be less able to respond to changes in their facial expression, and these infants are at greater risk of developing behavioural problems. Furthermore, maternal depression influences how infants' brains and temperaments develop. Therefore, it seems likely that the extent of these adverse effects may depend, at least partly, on the quality of the interactions between the depressed mother and her infant.

A group of psychologists led by Jillian S. Hardin of Florida Atlantic University, Jupiter, FL, USA has now investigated the interaction between mood, touch, and early infant development using one of the most natural and necessary of all mother-infant interactions: feeding. They chose to study patterns of touch during feeding because of the length of time spent on this activity in the early months and the soothing qualities of affectionate touch. The overall aim of the study was to investigate how the feeding environment – specifically, whether the infants were predominantly breast or bottle fed – interacts with maternal depression to affect infants' temperament and brain activity.

About one in nine mothers of young infants are thought to be affected by some degree of depression, whether post-natal or longer standing. These mothers are more likely than their peers to report their infants' temperament to be 'difficult'; this is not just subjective, as those infants can show disruption of their emotions that continues into childhood and potentially beyond. Children of depressed mothers are more likely than other children to become depressed themselves.

Two basic theories of infant development underlie this work. The first is a model of 'neural plasticity' – or the brain's ability to adjust its activity in response to new situations – that suggests that early brain development can be altered by experiences. This would explain the finding that, in infants and young children, differences in EEG recordings of brain function have been associated with differences in how they are being cared for. In particular, stronger measured activity in the right hemisphere at the front of the brain (right frontal EEG asymmetry) is thought to be a marker of depression, whereas the reverse scenario (left frontal EEG asymmetry) is associated with stable emotions. Previous studies have shown that right frontal EEG asymmetry in infants of depressed mothers can be reduced by massage and by consistent breastfeeding.

(This Summary may be photocopied)

The second theory suggests that infants' temperament is regulated through the physiology and functioning of their brains in much the same way as depression and other mental illnesses are in adults, and therefore that a particular pattern of brain activity might reflect a greater risk of depression. In this model, infant temperament is affected by concentrations of hormones and the protein receptors that bind them in the brain. Both affectionate touch and breast-feeding release the so-called 'cuddle hormone', oxytocin, in a baby's brain, and this appears to decrease the 'fight or flight' hormone noradrenaline. Receptors for noradrenaline are more concentrated in the right brain hemisphere than the left, and one of the effects of noradrenaline-receptor binding is to decrease the amount of a breastfeeding hormone, prolactin, that is produced. Thus, this complex interplay of hormones and their receptors, which is influenced by feeding and affectionate touch, affects emotional regulation and brain development. Taken together, these theories suggest that touch and feeding patterns during infancy will influence a baby's development and relationships at least into childhood.

Research has shown that the pattern of EEG activity in an individual is relatively stable throughout childhood and adulthood. The commonest pattern is for frontal asymmetry to switch from right to left in babyhood, and the development of left frontal asymmetry can be used as a marker for a normally maturing brain. In infants of depressed mothers, the left hemisphere typically remains less active, and this transition is not observed. Right asymmetry is also observed in adults with depression, where it has been associated with negative emotions and emotional withdrawal. Several studies have shown this distinct pattern of both EEG and behavioural characteristics in infants of depressed mothers throughout the first year, and these also suggest environmental factors that may either add to or mitigate the risk.

Numerous studies have also shown that, in typically developing babies, affectionate touch from their mothers will dampen down the stress response even in the absence of sound and other stimuli. Touch during infancy and childhood also enhances the development of brain pathways involved in healthy social and emotional development. When a mother is depressed, she will tend to withdraw from her infant or touch him or her in a rough or intrusive manner, so the infant is less soothed and these positive effects on development to some extent lost. In this study, Hardin and her co-workers aimed to examine how the interactions between affectionate touch and temperament are affected by maternal depression and different feeding patterns. Here, previous work has already shown that breastfeeding tends to promote healthy patterns of touch even when mothers are depressed, and that high levels of breastfeeding are associated with increased maternal sensitivity beyond infancy into childhood.

The study by Hardin and her co-workers was designed to test whether depressed mothers who breastfed their infants showed higher levels of affectionate touch than those who bottle-fed, and whether there was any difference in infant temperament between these groups. It also examined EEG patterns to see whether there was any difference in frontal asymmetry between these groups.

The researchers recruited 113 mother-infant pairs into their study and invited them to visit the laboratory when the infants were a month old and return at three months; 81 of the pairs returned for the second visit. The mothers were predominantly middle-class and well educated, and the infants healthy and born at full term. The pairs were divided into four groups based on the mother's depression status and primary feeding method. Mothers were tested for depression using a reliable questionnaire developed by the Center for Epidemiological Studies; tests were carried out at both visits, and mothers typically showed a decrease in depressive symptoms between 1 and 3 months after birth. However, the difference between the 'depressed' and 'non-depressed' groups remained statistically significant. Mothers were classified as 'breastfeeding' if they described using this method predominantly and if no formula milk was given to the infant at either visit. Also, they were all asked to report their infants' temperament and behaviour on both visits using a 14-point questionnaire.

During each visit, the mothers were recorded feeding and playing with their infants, and a 5-minute EEG was recorded for each infant at each age while he or she was awake and quiet. The first 5 minutes of the feeding session only was used to code how the mothers and infants touched each other during feeding. One code was noted every second; patting, massage, kissing, caressing, stroking and merely resting a hand on the baby were classified together as 'affectionate touch', in comparison to no touch, awkward or rough handling. Infant touch was recorded in a similar way. Two or more observers coded 20% of the interactions independently to ensure that the classifications were reliable. A single score combining all the different types of affectionate touch was obtained for each mother and each infant. Usable touch data was collected for 91 pairs at the first visit and 76 at the second, and usable EEG traces from 92 infants at one month and 73 at three months.

A statistical analysis of the touch scores for the mother-infant pairs was carried out using the four group classifications: breast-feeding / depressed, formula-feeding / depressed, breast-feeding / not depressed and formula-feeding / not depressed. The touch scores were also correlated with the mothers' ratings of their babies' temperaments and with frontal asymmetry determined from the EEG plots.

Hardin and her co-workers found that, as expected, the breastfeeding, non-depressed mothers spent more time in affectionate touch than any other group at both ages, and that depressed mothers also touched their infants more if they breast fed. At three months, the only significant difference was between bottle-feeding, depressed mothers and the other three groups. The infants who were breast fed touched their mothers more at three months than those who were bottle fed, and here there was no significant difference between depression categories among breast-fed infants. The biggest difference in the mothers' scoring of their babies' temperaments was between the two sessions, with mothers consistently giving more positive scores when their infants were three months old: there was no significant difference in the total scores between any of the groups. Depressed mothers did rate their babies as being more active and more easily distressed than non-distressed mothers at both ages.

Examination of the EEG recordings of the infants' brains showed no significant differences between groups at the younger age point. At three months, however, there

was again a clear difference between the depressed, bottle-fed infants and those in the other three groups. This first group clearly showed greater right frontal asymmetry, whereas breast-fed infants of depressed mothers and all infants of non-depressed mothers showed greater left frontal asymmetry. There were no significant differences between groups in EEG findings from any other brain regions. Finally, a complex statistical analysis of all the variables showed that infant touch patterns could be predicted from a combination of breastfeeding and factors related to the infant's temperament.

Taken together, these findings suggest that, in infants of depressed mothers, breastfeeding has positive effects on both mother-infant touch and infant EEG patterns so that these babies resemble those of non-depressed mothers. In particular, shifts to the 'mature' EEG pattern of left frontal asymmetry in these infants occurred only if they were mainly breast fed. The association between breastfeeding and an affectionate, tactile relationship between a mother and her infant is particularly important because of the length of time spent feeding during the first months of life. It fits in with previous research that links breastfeeding to sensitive and responsive mothering and suggests that breastfeeding might ameliorate some of the negative consequences of a mother's depression. The researchers suggest that incorporating studies of the infants' neurobiology and hormone activity into future work would enable them to measure infant temperament objectively, without relying on their mothers' descriptions. It is already clear, however, that encouraging depressed mothers to breastfeed is an important strategy for promoting sensitive nurturing and protecting their infants from potential future harm.

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