Maternal cradling bias, neural activation, and early communicative interactions

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Introduction
Nurturing mothers cradle their babies during the first months of life while feeding or talking to them, calming and/or rocking them to sleep. The maternal cradling bias is a phenomenon that research shows to be an unconscious choice made by the mother to cradle her newborn to the left (4, 17, 18, 25, 30, 31, 32). Investigation of the reasons why this occurs has entertained possible relationships between this phenomenon and maternal left ear-right hemisphere advantage for the perception and processing of prosodic speech, specialization of emotion processing, asymmetry of attentional systems, social attachment and communicative behaviors, handedness, arousal and attention, maternal stress, pitch of maternal voice in child directed language, infant nipple preferences during breast feeding, lateralized processing of baby facial expressions in females and infant rightward head turning bias (4, 39, 49, 52, 61, 62, 32, 31, 49, 19).

The newborn brain
Current literature regarding the structure and function of newborn brain areas related to the foundations of bonding as well as interaction with caregivers during the first weeks and months of life has focused on:

- Basal ganglia
- Internal capsule
- Limbic system (39)

Current research demonstrates that many neural systems are functional at birth.

Research on maternal/infant interactions
Studies for the most part have paid particular attention to the maternal actions during cradling, noting that holding the infant to the left gives the mother optimum access to the newborn's face in order to read non-verbal cues regarding the newborn's state of being.

The literature has focused on:

- Gate behaviors of infants (5, 55)
- Early organization of attention and late-developing attentional abilities of newborns (27, 33)
- Rightward head turning bias (6)

The interaction between infant and mother during the act of cradling and the neural interactions occurring in this context would appear to facilitate social/emotional bonding between the two and in so doing, lay the foundation for communication and subsequently, language acquisition.

Maternal Neural activation study (43)

Activated maternal
- Ventral tegmental area/substantia nigra regions, the striatum, and frontal lobe regions involved in:
  - emotion processing (medial prefrontal, anterior cingulate, and insula cortex)
  - cognition (dorsolateral prefrontal cortex), and
  - motor/behavioral outputs (primary motor area).

Mother viewing picture of her own newborn

What are the implications of cradling for the foundations of language acquisition?

- Does the newborn do anything to facilitate or inhibit leftward cradling by the mother?
- What happens in the newborn brain during the cradling interaction?
- What role does this interaction play in the foundations of language development?
- Is there a correlation between the incidence of leftward cradling bias and developmental disabilities?

Data from early observations correlated with later developing disabilities could guide researchers in creating ways to identify children at risk at the earliest stages of development. Data could also drive the development of new and innovative treatments.

Figure 1. Example of maternal leftward cradling bias and newborn rightward head turning bias.