

Poster presentation

Functional neuroimaging and psychology of parent-infant attachment in the early postpartum

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Background

Adaptive postpartum parental thoughts and behaviors are governed by genetic+epigenetic processes that reorganize hypothalamic, limbic, and cortical circuits. These are strikingly similar to those in obsessive-compulsive disorder (OCD), such as intrusive/repeated infant-worries/checks to ensure that things are "just right" [1]. We hypothesize that human parental attachment and OCD share brain circuits.

Materials and methods

We are studying parental attachment in several ways in 40+ sets of parents: we are administering interview and self-report inventories of parental thoughts and actions, making videos of parent-infant interaction to assess attachment, performing functional magnetic resonance imaging (fMRI) of the brains of both mothers and fathers (using a Siemens 3T Trio scanner) as they attend audiovisual baby stimuli, and assaying salivary cortisol and urinary catecholamines with infant stimuli exposure. Also, all data are acquired longitudinally at 2 weeks and 3 months postpartum.

Results

fMRI brain activation maps from 2–4 weeks postpartum, comparing responses to own versus other baby cry stimuli, involve limbic and brainstem subcortical (alarm and attention) areas plus sensory and cingulate cortex (decision circuits). First-time parents activate more alarm centers than veteran parents, and mothers activate more than fathers. Over the first few months, alarm responses shift to hypothalamus (metabolic control), nucleus accumbens (reward), and frontal cortical (planning) activations as the parent-infant bond develops. Own baby pictures activate

fusiform (face response) and insular (mirror/empathy) cortex more in moms than dads and depending on the time spent with the baby.

Psychometric data confirm earlier studies [2] and indicate significantly higher preoccupations in moms compared to dads ($p < 0.001$), and correlations of pre-occupations with intrusive worries and checking ($p < 0.01$), depression ($p < 0.001$), and brain activity in the amygdala and basal ganglia (fear, worry and OCD circuits) at 2 weeks. Correlations between brain activations to own baby and parental preoccupations at 2–4 weeks hold at 3–4 months.

Discussion

This is the first longitudinal study to combine fMRI brain imaging in both mothers and fathers, with concurrent psychometric and endocrine measures, and using both audio and visual stimuli. Parental brain activations include circuits required for emotion, drive, salience, and habit – consistent with animal work on parental behaviors. Brain responses vary with gender, postpartum timing, type of stimuli, and quality of relationship. Further research on families with mental health vulnerabilities, as well as conditions such as postpartum depression and substance abuse, may yield biological models for protective and vulnerability factors in human family attachments [3].

References

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