Minds Shaped Through Relationships: The Emerging Biology of Parenting & The Impact of Maternal Depression

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How minds are shaped in relationships & how personal mindfulness shapes ability to care for others

Parenting as an Adult Developmental Stage
How Peripartum Depression Impacts Parenting
OUTLINE

• Emerging science on transition to parenthood
• Overview of peripartum depression
• How depression impacts cognition
• Mentalization and relation to depression
• Intervention Implications
“I do not believe it is possible to understand the functioning of the mother at the very beginning of the infant’s life without seeing that she must be able to reach this state of heightened sensitivity…and recover from it.”

D. Winnicott, 1956

“I can’t quite describe it but something is different in me since she came into our lives. She is center of nearly every waking moment, my thoughts, my plans – and when I wake up at night, she’s the first thought in my head. Everything I thought was important before has slipped down the list… Not only have I centered around her but somehow she has made me a different person….and I only want to be with her and attend to her every need”

New mother… 2011
WHAT THESE TEXTS SUGGEST

- Becoming a parent is a developmental process
- With transition to parenthood, there is a change in attentional focus, investment, what is rewarding, and what is stressful
- State of being “preoccupied” both reflects change in mental “economy” and also facilitates shift in attention and reward salience (“enhanced signal detection” or sensitivity to infant cues)
Decades of work on impact of parental care on child health and development, but.....

- Presence of a new infant activates specific neural circuitry involved in balance between reward and stress

- Enhancement in neural circuits with increasing time with infant

How does becoming a parent impact adults’ psychological and neuropsychological development?

STRATHEARN, et al., 2007
What’s “beneath” or required for parental “sensitivity” and parental care?

Adaptive parenting involves key capacities involved in reward seeking, motivation, and stress regulation:

- Self-control
- Distress tolerance
- Decision making/Consequence appraisal
- Reflective or mindful capacities toward self and child
STUDYING PARENTAL PREOCCUPATION & SHIFT IN MENTAL ECONOMY
Degree of Preoccupation

0 2 4 6 8 10
7m 8m Birth 1m 2m 3m 4m

Mothers
Fathers

N 31 27
Age (yrs) 33± 5
First child (%) 60 56
Mothers 35± 5
Fathers

AITHAB

31 27
33± 5

Leckman et al., 1999
Preoccupation & Early Parenting Phase

- Between 2 wks and 3 mos: preoccupation and anxious thoughts decrease, positive thoughts and feeling of personal transformation increase

- Experience makes a difference (Sensitization phenomenon in humans); experienced parents less preoccupied in beginning, behaviorally more like first time parents at three months

- Individual differences in the level of preoccupation

- Similar patterns between mothers and fathers

- Greater intensity of preoccupation = greater perception of “transforming experience”

Leckman, et al., 1999; Kim, et al., 2012, in press
Infant vocalizations of affect

- Auditory N100 ERP component heightened in mothers for both infant cries and control sounds compared to non-mothers (Purhonen et al., 2001; 2008)
OWN BABY VISUAL CUES ACTIVATE NEURAL REWARD CIRCUITS

Happy, but not neutral or sad own-infant faces, activated nigrostriatal brain regions.

STRATHEARN, et al., 2008
Yale SCHOOL OF MEDICINE
Gray matter increase from 2-4 weeks to 3-4 months postpartum (n = 19, p < .05, (FDR corrected) > 100 voxels

- Grey matter increase from 2-4 weeks to 3-4 months postpartum predicted by mothers’ positive perception of own baby at 2-4 weeks postpartum
Predicting Maternal Sensitivity at 3-4 months with neural response to infant cries (Kim, Feldman, Leckman, Mayes, and Swain, 2011, JCPP).

- Maternal sensitivity at 3-4 months postpartum positively correlated with activations in right superior frontal gyrus ($r=.62$, $p<.01$), and right lateral globus pallidus/amygdala ($r=.53$, $p<.05$) at 2-4 weeks postpartum to own versus other cries.
Parents and Non-Parents fMRI Response to Low and High-Distress Cries (Montoya, et al, in press)

- In Hi vs Lo Distress Cry Contrast, mothers show greater activation of post-central gyrus, implicated in motoric responses, and less PCC activation implicated in stress responsiveness
  
  - Compared to women who are not parents, mothers may be primed to initiate motoric responses and show less of a stress response to high-distress cries

Hi vs Lo Moms Vs Non-Moms

\[ p_{\text{voxel}} < 0.01 \quad p_{\text{cluster}} < 0.05 \]
Sources of Individual Differences in Transition to Parenting
Differential Response to Infant Affect by Attachment Profile (Strathearn, et al, 2010)
Moms (17) and Non-moms (12); Viewed happy, sad, and neutral infant faces – no group effect and no modulation of the N170 amplitude by emotion.

Pearson's $r(29) = -.48$, $p = .008^{**}$
Reduced Sensitivity to Infant Faces in Substance Using Mothers

Rutherford, et al., in preparation

BG $F(1,52) = 6.08, p = .017$

Slower N170 Latency

Rutherford, et al, under review
Key Points

• Consistent differences with parents vs non – parents in patterns of neural activation

• Activate components of reward circuitry (and parallel change in attentional focus, e.g., preoccupation)

• Own infant especially salient & motivating

• Negative cues such as cries activate both reward as well as stress systems

• May be consolidation/changes in connectivity in circuitry over time with exposure to infant

• Individual differences and challenges to neural shift, e.g., substance abuse, depression
MATERNAL DEPRESSION
MATERNAL DEPRESSION

“I can’t quite describe it but something is different in me since she came into our lives. She is center of nearly every waking moment, my thoughts, my plans – and when I wake up at night, she’s the first thought in my head. Everything I thought was important before has slipped down the list… Not only have I centered around her but somehow she has made me a different person….and I only want to be with her and attend to her every need”

New mother 2011

“I started to experience a sick sensation in my stomach; it was as it a vise were tightening around my chest. Instead of the nervous anxiety that often accompanies panic, a feeling of devastation overcame me. I hardly moved. Sitting on my bed, I let out a deep, slow, guttural wail. I wasn’t simply emotional or weepy, like I had been told I might be. This was something quite different. This was sadness of a shockingly different magnitude. It felt as if it would never go away.”

from “Down Came the Rain: My Journey Through Postpartum Depression” (Brooke Shields)
Depression in Adulthood

- Highly prevalent (15-25% in men/women)
- Highly debilitating
  - Leading cause of suicide and suicide attempts
  - MDD and bipolar disorder first and fifth leading cause of years lived with disability
  - Second most serious disorder with respect to global disease burden
- High relapse rates (20-30% to 70-80%)
- High risk for intergenerational transmission

Epidemiology of Depression Among Women

- In U.S. twice as many women (12.3%) as men (6.7%) are affected each year
  - 12.4M women and 6.4M men
- For low-income women, the estimated prevalence doubles to 25%
- Most prevalent among women of child-bearing and child-rearing age (16 to 53)
- After childbirth, depression is the 2nd major reason for women being hospitalized in the U.S.

webcast.hrsa.gov/conferences/mchb/.../PPT/F4.sct_amchpv5.ppt
Epidemiology of Depression Among Mothers

- Estimated rates of depression among pregnant and postpartum women range from 8 to 20%.
- For low-income women with young children, prevalence rates are commonly estimated at approximately 40%.
  - Early Head Start mothers: rates as high as 48% at enrollment
  - Teen moms at community pediatric health centers: 40%
  - Women participating in state welfare-to-work programs: 35-58%

webcast.hrsa.gov/conferences/mchb/.../PPT/F4.sct_amchpv5.ppt
What is Perinatal Depression?

• “Perinatal Depression” is related to childbearing

• Includes prenatal depression, postpartum blues, postpartum depression, and postpartum psychosis
  – Postpartum blues are experienced within 10 days of giving birth by 50-80% of all mothers – normative (Seifer and Dickstein (2000))
  – Postpartum depression in general population 8% to 20% (Munk-Olsen, Laursen, Pedersen, Mors, & Mortensen, 2006)
  – Postpartum psychosis is the most rare form of maternal depression (estimated incidence 1.1 to 4.0 cases per 1,000 deliveries), and seems to be correlated with a personal or family history of bipolar or schizoaffective disorder

• Postpartum depression may turn into a chronic disorder in a subgroup of mothers (e.g. Campbell, Morgan-Lopez, Cox, & McLoyd, 2009)
Mothers had on average 2 episodes of MDD during follow-up and 20% was hospitalized at least once

Almost 70% of the children received some kind of professional help

Currently depressed mothers sought more professional help for their child, but there was less continuity in parental care (31% vs. 92%)

Currently depressed mothers experienced more significant negative life events

There were clear signs for continuing impairments in emotional availability

Caregiver Depression

- Overall male depression is estimated at 6%; but
  - Community samples have found prevalence rates ranging up to 25% for fathers.
- Grandparents raising grandchildren frequently suffer from depression:
  - A Head Start study found that of grandparents raising grandchildren 10% were moderately depressed and 17% were severely depressed.
- Caregivers in low-income and non-subsidized care centers more likely to suffer from depression than the average US female population.

webcast.hrsa.gov/conferences/mchb/.../PPT/F4.sct_amchpv5.ppt
## Associated Risk Factors

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<thead>
<tr>
<th>Personal factors</th>
<th>Social risk factors</th>
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<tr>
<td>Prior or family history of depression</td>
<td>Poverty/lack of material resources (e.g. food insecurity, poor housing conditions, lack of financial supports)</td>
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<td>Loss of one’s own mother before the age of 11</td>
<td>Absence of social supports (a community network and/or a close relationship)</td>
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<td>Childhood trauma or abuse</td>
<td>High levels of life change</td>
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<td>Domestic or intimate partner violence</td>
<td>High levels of chronic stress</td>
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<td>Sexual violence or coercion</td>
<td>Absence of a job outside the home</td>
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<td>Single motherhood</td>
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<td>Substance abuse</td>
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<td>The presence of three or more children under 15 years of age living in the house</td>
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Sources of Toxic Stress in Young Children

- Maltreatment: 75 (per 1,000)
- Parental Substance Abuse: 98
- Postpartum Depression: 130

Source: Finkelhor et al. (2005), Source: SAMHSA (2002), Source: O’Hara & Swain (1996)
- Chapman et al. (2004): adverse childhood events are responsible for
  • 35% life time depression
  • 40% recent depression
- Dube et al. (2001, 2003): adverse childhood events are responsible for
  • 67% life time suicide attempts
  • 80% child/adolescent suicide attempts
  • 64% adult suicide attempts
  • 56% life time drug problems
  • 63% illicit drug use
  • 64% intravenous drug use
Cumulative Early Stress and Later Outcomes

Impact on Child

- Well documented association between maternal depression and adverse outcomes in offspring (Downey & Coyne, 1990; Weismann et al., 2006)
  - Poorer cognitive development
  - More limited language skills
  - Fewer social interaction skills
  - Difficulty in appropriately engaging adults

- Adverse effects are particularly pronounced in mothers that suffer from chronic depression (e.g., Ashman, Dawson, & Panagiotides, 2008; Moehler et al., 2007)

- May be the severity and chronicity of the depression rather than its diagnosis per se that relate children's negative outcomes (e.g., exposure to chronic stress; Brennan et al., 2000).
CLINICAL FEATURES OF MATERNAL DEPRESSION

- Mood predominantly depressed, despondent, anhedonic
- Sleep disturbance, fatigue, irritability
- Loss of appetite
- Feelings of inadequacy/self-criticism
- Difficulty concentrating, greater distractibility
- Increased negative attribution
- Difficulty making decisions
- Greater emotional lability and sensitivity to stress
Attitudes toward Infant:
- Infants perceived to be more bothersome
- Make harsh judgments of infants
- Feelings of guilt, resentment, & ambivalence toward infant
- Increased risk for abuse
- Ego dystonic thoughts of harming the baby

(Miller, 2002)
Leckman et al., 1999
“I sat holding my newborn and could not avoid the image of her flying through the air and hitting the wall in front of me. I had no desire to hurt my baby and didn’t see myself as the one throwing her, thank God, but the wall morphed into a video game, and in it her little body smacked the surface and slid down onto the floor. I was horrified, and although I knew deep in my soul that I would not harm her, the image all but destroyed me.”

From “Down Came the Rain: My Journey Through Postpartum Depression”, Brooke Shields, 2005
CLINICAL FEATURES OF PARENTING IN MATERNAL DEPRESSION

• Behaviors with Infant:
  • Gaze less at infant
  • Take longer to respond to infant’s utterances
  • Show fewer positive facial expressions
  • Lack awareness of infant’s cues
  • Alternate between flat affect, low activity level, & lack of contingent responding or alternating disengagement and intrusiveness
UNDERSTANDING HOW ALTERED COGNITION OF DEPRESSION IMPACTS PARENTING
Attachment and Emotional Regulation

A Common Attachment & Parenting Story
The Attachment “Cycle”

DISTRESS/FEAR

Down Regulation of Emotions

Activation of attachment

Comfort seeking

Opening up the “Blue Box”

WHAT IS MENTALIZATION?

- Mentalization or Reflective Functioning = ability to think about others and oneself in terms of mental states
- Ability that allows individuals to perceive behaviors in terms of mental state constructs, thereby making them meaningful, explicable and predictable.
- Effective mentalization acquired in the context of secure attachment relationships (Allen, Fonagy & Bateman, 2008; Fonagy, Target, & Gergely, 2007; Sadler, Slade, & Mayes, 2006; Sharp & Fonagy, 2008; Sharp, Fonagy, & Goodyer, 2008; Slade, 2005)
Examples of Parental Mentalization

Attributing intentions and feelings to self and the baby

“He feels sad and he misses me, and so he clings to me and begs me to stay. That makes me want to hold him forever.”

Or

“He’s so bad, he just cries to irritate me.”

Intrinsic to emotional regulation

“Oh poor baby, you’re so sad; mommy feels sad when you are unhappy; you want mommy to…."

Or

“Stop crying…. I don’t know what do do with you…”
Components of Mentalization

“Signal detection” and “top down” mentalization processes
MENTALIZATION CIRCUITRY

- Mentalizing “functions” localized to superior temporal sulcus and temporal pole (Frith and Frith, 2003) especially in response to sensory signals that provide clues to mental states -- “Signal detection”

- Connected to medial prefrontal cortex -- ? Interpretation of mental state clues

- “Top Down” component of mentalization circuit
Early Parenting and Mentalizing—Salience of Cues

- Infant cues (e.g., cries, smiles) activate parts of “mentalizing circuitry” that give clues to infants’ mental states (“signal detection” component)
- Enhanced parental attention to infant cues = increased activation in superior temporal regions (e.g., enhanced signal detection)
“Top down” aspects of mentalization circuitry come into play with experience with infant (increasing connectivity between components of circuitry)
Mother's “Mentalization” Predicts Infant Secure Attachment 1 year

Fonagy, et. al., 2007

P < .0001

“Mentalization” ratings

Attachment classification at 12 months

- Avoidant
- Resistant
- Secure

0% 20% 40% 60% 80% 100%
MOTHERS WITH HIGHER “MINDFULNESS” SKILLS PERSIST LONGER COMFORTING A “SIMULATED” BABY

Simulator Performance

- Positive correlation between persistence times and total parental reflectiveness score
- Also seen for high-low subscale, $r(15) = .53, p = .043$

Rutherford, et. al., 2012, under review
Threats to Intact Mentalization Circuitry

Impact of parental depression, substance abuse, and other conditions when reward circuitry dampened or co-opted

- Dampened “signal detection” components of mentalization circuit that is sensitive to “mental state” cues

Impact of early deprivation/neglect with heightened stress reactivity

- Infant cues such as cries are stressful
- Less effective “top down” processing of mental state cues
Mentalization & Depression

- Compare female inpatients with MDD (n=46) to Healthy Controls (n=20)

- Assess mentalization capacities using Adult Attachment Interview

- Severe impairment in depressed female inpatients’ ability to identify and interpret mental states of self and others

- Significantly related to other cognitive deficits assessing cognitive flexibility

- Mentalizing deficits not depression specific

Depressed Mood and Mentalizing

- Depressed mood impairs mentalizing: “I can’t think, there’s a fog, a black fog in my mind”
  - Others with mother experience impairment in mentalizing as is “being sucked into a black hole”

- Depressed mood distorts mentalizing: re-emergence of non-mentalizing ways of experiencing the world that antedate full mentalizing
EARLIER MODES OF MENTALIZING

• What is thought is felt as real (self-criticism is reality)

• Everything becomes too real (e.g., thoughts, feelings, baby’s sad face, crying, feelings of shame, guilt) and hence very stressful

• Concreteness of thought: Rejection literally hurts (Eisenberger et al., 2003)

• No room for “pretend”, “play”, symbolization, or inner security of mental exploration
• Psychological pain means bodily pain, worries feel like a painful weight on one’s shoulders, and depressive thoughts literally “de-press” the self.
• Disturbance in the experience of time (eg. Ey, 1953)
• Risk of fundamental “mis-understanding”, that can be interpreted as unresponsive, rejecting (e.g., baby doesn’t like me)
• Particularly true in traumatized patients
Parenting Side of Attachment Response

- Infant Cue
  - Parent “Signal Detection”
    - Parental Interpretation of Infants’ Needs
      - Parental Behavior
        - Parental Emotional Response
          - Anticipating Infant’s Response
How Depression Disrupts Parental Responding

Stress and Anxiety

Anticipating Infant’s Response

Parental Emotional Response

Parental Interpretation of Infants’ Needs

Parental Behavior

Infant Cue

Parent “Signal Detection”

Turn Away from Infant
INTERVENTION APPROACH

• Impairments and distortions in mentalizing are both CAUSE and RESULT of mood disorders, thus exacerbate symptoms and need to be addressed.

• Focus on adult’s needs as a parent & communicate a sense of control over what seems uncontrollable.

• Focus changes from “what baby needs” to how demands of caring for infant are stressful and impact understanding infant's needs, how parent perceives and experiences infant’s cues.
INTERVENTION APPROACH

• Education about depressive states and making depression an object that can reflect upon ("your depression, not you, that is speaking")

• Focus on increasing adults’ distress tolerance/capacity to maintain decision making in face of stress/ remain mindful of own and child’s emotional states

• Combine work with mother as parent with parent-child work to address the mother’s representations about their baby to enhance their understanding of a parent and baby as a person.
Parenting as an Adult Developmental Stage

• Transition to parenthood is a key adult developmental phase; and an adult’s development as a parent is key to healthy child development

• Transition to parenthood involves key changes in mental economy (preoccupation), in perceptual sensitivity, and in neural reward and stress systems

• Depression impacts change in attentional focus key to parenting and ability to mentalize about self and child

• Interventions with depressed mothers need to focus on parental mentalization abilities as step toward development as parent

• Integration of services for adults as parents with services for children offers the opportunity to impact multiple generations and especially the parenting by those children when they are adults
Collaborators and Support for Parenting Research Program

- Mayes Lab: Helena Rutherford, Michael Crowley, Kara Holcomb, Max Gregor-Moser, Jia Wu, Sarah Nicholls, Marion Mayes, Rebecca Hommer, Emily Simpson, Laura Noll, Amanda Ng, Ann Thomasson, Kara Holcomb, Scott McCreary, Julia Blood, Kathy Armstrong, Patricia Miller, Eliza Sholtz
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- Baylor: Lane Strathearn and Thomas Kosten
- U. Illinois: David Bridgett
- U. Maryland: Carl Lejuez
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