Intrapsychic and Interpersonal Correlates of Diurnal HPA Activity in First-Time Expectant Mothers

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Intergenerational transmission of stress

Mechanisms and timing.

Mechanisms: Parents

Timing: prenatal period, really the earliest that one can explore is the prenatal period. Transition to parenthood is extremely important. Prenatal period is a critical point in the transition to parenthood.
Parenting behaviors are multidetermined and emerge from a coordinated psychobiological caregiving system: Operates at *multiple levels*
Mechanism:

Maternal HPA axis regulation associated with parenting behaviors

• in the immediate postpartum (Fleming et al., 1997; Stallings et al., 2001)
• in the later postpartum:
  • 3 months (Krpan et al., 2005),
  • 6 months (Mills-Koonce et al., 2009)
  • 7-24 months (Finegood et al., 2016)
• Hypothalamic-pituitary-adrenal (HPA) axis
  • Cortisol – glucocorticoid hormone that is end product of the

• Various ways to measure HPA activity with cortisol
  • Diurnal rhythm, response/recovery to stress, single samples during day
Timing:

- Prenatal period
  - The earliest that one can explore questions regarding intergenerational transmission of stress
  - A critical point in the transition to parenthood.
HPA axis has been studied during pregnancy

- Cortisol steadily increases during pregnancy ~ around 25 weeks gestation and circadian rhythm is detectable during pregnancy (Allolio, 1990; Magiakou, 1996)

- CAR is observed during pregnancy

(de Weerth & Buitelaar, 2005, *Psychoneuroendocrinology*)
Prenatal programming

- Prenatal maternal psychosocial stress
  - infant cognition
    - Stressful life events (Bergman et al., 2007)
    - Pregnancy-specific anxiety (Davis & Sandman, 2010)
  - Infant behavioral reactivity and recovery
    - Perceived stress, anxiety, and depression (Davis et al., 2011)
Prenatal programming

- **Prenatal maternal stress** $\rightarrow$ infant cognition (Bergman et al., 2007)

- **Prenatal Maternal cortisol levels** $\rightarrow$ infant cognition (Davis & Sandman, 2010), infant cortisol response (Davis et al., 2011)

- **Amniotic fluid cortisol levels** $\rightarrow$ infant cognition (Bergman et al., 2010), infant cortisol response to stress (O’Connor et al., 2012)

- **However, the link between maternal psychosocial stress and prenatal maternal cortisol levels is less clear**
Prenatal programming

- **Prenatal maternal stress** → infant cognition (Bergman et al., 2007)

- **Prenatal Maternal cortisol levels** → infant cognition (Davis & Sandman, 2010), infant cortisol response (Davis et al., 2011)
  - uncorrelated w/ Anxiety, Depression, Pregnancy-specific anxiety; r = -.21 for perceived stress

- **Amniotic fluid cortisol levels** → infant cognition (Bergman et al., 2010)
  infant cortisol response to stress (O’Connor et al., 2012) uncorrelated w/ prenatal anxiety

- However, the link between maternal psychosocial stress and prenatal maternal cortisol levels is less clear
Predictors of maternal prenatal cortisol

- Depression not associated with CAR (Hellgren et al., 2013; Shea et al., 2007)
• **Stressors during prenatal period**

• **Intimate partner violence (IPV)** Alhusen et al., 2015, *J. Women’s Health*
  
  • 3%-9% of women experience abuse during pregnancy
  • Associated with
    
    • *Health behaviors*: substance use including alcohol, smoking, and illicit drug use during pregnancy (Bailey & Daugherty, 2007)
    
    • *Maternal mental health*: depression (Connelly et al., 2013) and maternal suicidality (Palladino et al., 2011)
    
    • Neonatal outcomes – low birth weight and preterm birth *(Shah et al., 2010)*

• **Couple satisfaction**
  
  • Close intimate relationships and marital quality are associated with health and wellbeing (Robles et al., 2014; Stadler et al., 2012)
  
  • Also with HPA axis regulation (mixed evidence)

• **Self-efficacy in nurturing role** [not sure yet how to introduce this]
• 128 expectant couples were seen at home visits at approximately 36 months gestation

• Recruited from OB-GYN clinics and pregnancy classes at a hospital in lower Manhattan.
• Primary caregiver descriptives:
  • $\text{Age}_{\text{mean}}$ 31 years; $\text{Age}_{\text{SD}} = 7$ years [change this to reflect newfams sample]
  • Primary language – 65% Spanish; 35% English [change this to reflect newfams sample]

  • Income
  • Race(s)
Measures

• State anxiety (STAI-6) Marteau & Bekker, 1992
  • 6 items 4 point scale; “I am tense”; $\alpha = .78$

• Depression (CESD) Radloff, 1977
  • 20 items 5 point scale; “I was bothered by things that don’t usually bother me” $\alpha = .76$

• Conflict Tactics Scale (Straus & Douglas, 2004)
  • 5-item 5-point scale; “My partner or I pushed shoved or slapped each other” $\alpha = 0.58$

• Couple satisfaction index (Funk & Rogge, 2007)
  • 16-item 6 point scale; “Our relationship is strong”; $\alpha = .95$

• Self-efficacy in the nurturing role (Pedersen et al., 1989)
  • 16-item 7-point scale; “I feel I can catch on quickly to the basic skills of caring for my child”
  • $\alpha = 0.84$
Measures – Saliva samples – Diurnal Cortisol

• 3 samples per day ~ 2 consecutive weekdays
  • Sample 1: Waking  (within 10 mins. of waking)
  • Sample 2: Waking +30mins  (20-40mins from waking)
  • Sample 3: evening  (within 10 minutes of bedtime)
• Samples collected via cotton swab
• Averaged samples across two days
  or used data from a single compliant day
• 86 mothers had useable data
Dependent variables

• Cortisol Awakening Response (CAR)
• Evening cortisol levels
## Results

<table>
<thead>
<tr>
<th></th>
<th>Anx</th>
<th>Dep</th>
<th>CSI</th>
<th>IPC</th>
<th>SENR</th>
<th>Mean (SD)</th>
<th>Cutoff</th>
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</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10.6 (2.9)</td>
<td>&gt;=12</td>
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<tr>
<td>Depression</td>
<td>.42**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>9.4 (5.3)</td>
<td>&gt;=16</td>
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<tr>
<td>Couple satisfaction</td>
<td>-.06</td>
<td>-.26*</td>
<td>1</td>
<td></td>
<td></td>
<td>71.7 (8.7)</td>
<td>&lt; 51.5</td>
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<tr>
<td>Intimate partner conflict</td>
<td>.15</td>
<td>.10</td>
<td>-.39**</td>
<td>1</td>
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<td></td>
<td></td>
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<tr>
<td>Self-efficacy in nurturing</td>
<td>-.32**</td>
<td>-.41**</td>
<td>.09</td>
<td>-.17</td>
<td>1</td>
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Normative CAR pattern. Repeated measures ANOVA. No between-subject effect
### Depression

<table>
<thead>
<tr>
<th></th>
<th>Low Conflict M(SE)</th>
<th>High Conflict M(SE)</th>
<th>Test statistic</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waking cort, µg/dl</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+30mins cort</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedtime cort</td>
<td>-</td>
<td>-</td>
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### Anxiety

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<td>-</td>
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# Intimate Partner Conflict

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<tbody>
<tr>
<td>Waking cort, µg/dl</td>
<td>0.47(.01)</td>
<td>0.47(.02)</td>
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<tr>
<td>+30mins cort</td>
<td>0.63(.02)</td>
<td>0.53(.03)</td>
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<tr>
<td>Bedtime cort</td>
<td>-</td>
<td>-</td>
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![Graph showing cortisol levels](image_url)

- **Low intimate partner conflict**
- **High intimate partner conflict**
## Couple Satisfaction

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<th>High Satisfaction M(SE)</th>
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<th>Test statistic</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waking cort, µg/dl</td>
<td>0.48(.02)</td>
<td>0.45(.02)</td>
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<tr>
<td>+30mins cort</td>
<td>0.66(.02)</td>
<td>0.54(.02)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedtime cort</td>
<td>-</td>
<td>-</td>
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![Graph](chart.png)

- **High couple satisfaction**
- **Low couple satisfaction**
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Funders

NYU Neuroscience and Education Lab
http://steinhardt.nyu.edu/ihdsc/neuroscience_lab

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