

# Graduate Research Day 2013

## Florida Atlantic University

**Charles E. Schmidt College of Science**

### **Cardiac patterns during another infant's cry sound for neonates of depressed mothers**

Joseph Cotler, Dr. Nancy Aaron Jones

Psychology; Florida Atlantic University

Past research indicates there is a link between physiological responses and adaptive social responses to another individual's distress. Scholars have theorized that humans may be genetically predisposed, both physiologically and behaviorally to responding to others, especially those who are in distress. Maternal depression has been associated with dysregulated emotional development and may possibly affect the physiological and behavioral responses of a neonate. The present research will examine the relationship between neonates' physiological and behavioral responses to naturally-generated (compared to artificial) stimuli of other neonates, as well as the role of maternal depression in the responses. Newborns born to depressed mothers showed a decrease in heart rate when presented with the cry of another infant, as compared to the heart rates of newborns born to depressed mothers. In addition, mothers who bottle fed their newborns had significantly higher base heart rates than newborns of mothers who breast-fed.

# Cardiac Patterns During Another Infant's Cry Sound In Neonates of Depressed Mothers

Joseph Cotler

## Introduction

- Newborns of depressed mothers are more likely to demonstrate negative affect and be less discriminating and less distressed in response to the cries of other newborns (Field, Diego, Hernandez-Reif, & Fernandez, 2007; Jones, 2012).
- This behavior predicts a lack of empathy in children (Jones et al., 2000).
- Sympathetic and parasympathetic responses to another's distress may be the structural foundation.
- Heart period is the inter-beat interval (the interval between heart beats).
- HPV (Heart Period Variability) is the frequency range of the mean heart periods
- Low HPV has been shown to be a reliable measure of distress and pain (Yeragani, 2000; Papa et al., 2010; Roy, Boucher & Comtois, 2009).
- Calkins and her colleagues (2006) demonstrated that children who are at risk for behavioral problems experience high frequency heart period variability during difficult tasks as opposed to children who are not at risk.

## Purpose

- The purpose of this study is to examine whether newborns are biologically predisposed to respond to other infants in duress, a sign of social responsiveness.

## Hypotheses

- I hypothesized that newborns of depressed mothers would vocalize less, spend less time in high agitated states and close their eyes or avert their gaze away from the stimulus during the natural cry condition than newborns of non-depressed mothers.
- I hypothesized newborns of non-depressed mothers would show greater distress when hearing another infant crying and therefore respond with lower heart period variability during the natural cry condition.

## Method

- This study used data collected in 2001. In total, 88 mothers and their newborns participated in the behavioral portion of this study, 39 mothers were classified as depressed and 49 mothers were classified as non-depressed. Forty-one mothers and their newborns participated in both the behavioral and the heart-rate acquisition portion of this study, 21 mothers were classified as depressed and 20 mothers were classified as non-depressed.
- Initial interviews were conducted privately in mothers' hospital rooms.
- Each recording lasted 4 min. and was followed by a 1 min. inter-stimulus interval.
- ECG activity was recorded in a subsample of infants (N=41) by placing three disposable electrodes on the infant's chest in a triangular arrangement.
- A three to four minute baseline heart rate signal was recorded.
- Heart rate data were used to calculate mean heart period across the entire session.
- The Center for Epidemiological Studies-Depression Scale is a 20-item self-report questionnaire for assessing depressive symptomatology.
- A score of 16 or greater has been shown to differentiate clinically depressed and non-depressed participants. A score of 12 or less was classified as non-depressed.
- The two auditory sounds consisted of an infant's pain cry (negative emotional valence) and a digitized sound (neutral stimulus).
- Behavioral responses to the audio stimuli were recorded and coded, including newborn's state (scale of 1 - 7), vocal distress (scale of 1 - 6), self-soothing behaviors (1-4) and direction of gaze (1-4).
- The frequency of newborn-initiated regulatory behaviors were tallied, including hand swipes, hand/finger insertions, facial distress without vocalizations,

## Results

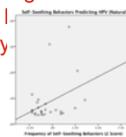
- Newborns of depressed mothers spent a greater percent of time with their eyes closed ( $M=73.51$ ,  $SD=34.82$ ) during the natural cry condition than newborns of non-depressed mothers ( $M=49.19$ ,  $SD=33.80$ ).
- There was a significant interaction between depression group and newborn state  $F(6, 78)=3.33$ ,  $p=.006$

Depression Group	State	Mean	SD	Non-Depressed Mean	Non-Depressed SD	F	p
Depressed	Asleep	42.58	30.79	35.02	27.02	0.03	0.874
	Awake	31.93	22.08	14.80	8.86	1.63	0.017
Non-Depressed	Asleep	28.34	23.44	23.00	21.88	4.61	0.032
	Awake	18.50	13.47	34.19	13.07	76	0.001

- Newborns of depressed mothers vocalized less ( $M=93.70$ ,  $SD=15.15$ ) than newborns of non-depressed mothers ( $M=79.19$ ,  $SD=31.02$ ) during the natural cry

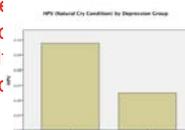
Depression Group	Mo Cry	Fatherly Cry	Whisper Cry	Full Cry	Scream Cry	Wail/Howl Cry
Depressed	M	93.70	7.26	2.57	3.9	30
	SD	15.15	14.00	2.82	7.5	30
Non-Depressed	M	79.19	11.28	3.24	3.80	2.24
	SD	31.02	18.21	6.82	9.84	9.93

- Self-soothing behaviors significantly predicted heart period variability during the natural cry condition ( $\beta=3.87$ ,  $p=.06$ ,  $R^2_{adj}=.10$ ).



- When controlling for self-soothing behaviors, newborns of depressed mothers had lower basal heart period variability ( $M=.06$ ,  $SD=.03$ ) than newborns of non-depressed mothers ( $M=.08$ ,  $SD=.03$ ).

- There was also marginally significant difference in heart period variability during the cry condition when self-soothing behaviors were controlled for ( $F(1, 38)=3.14$ ,  $p=.09$ ).



## Discussion

- These findings are congruent with previous research that suggests newborns of depressed mothers respond with less vocalized crying, averted gaze, and less agitation to the cries of another infant than their non-depressed mothers counterparts (Jones, 2012).
- When controlling for self-soothing behaviors, infants of depressed mothers have lower base heart period variability than newborns of non-depressed mothers. Additionally, when hearing another infant cry, newborns of non-depressed mothers will have lower heart period variability than newborns of depressed mothers.
- The findings suggest that the drop in heart period variability in healthy newborns during the natural cry-condition is a distress/pain response to the cry of the other infant.
- These findings provide support for the theory that infants are predisposed to empathetically respond to the distress of another infants. However, infants of depressed mothers are dysregulated in this process and are at risk for behavioral problems and lack-of-empathy later in life.
- Previous research indicates that newborns engage in self-soothing behaviors as a coping mechanism for distress (Kopp, 1989; Stifter & Braungary, 1995).
- One theory as to why these self-soothing behaviors allow newborns to cope with distress is that skin-to-skin contact releases oxytocin.
- The study suggests that newborns are using their own skin-to-skin contact to cope with distress in the absence of another individual.
- Further, as Brazelton-motor scores increase in newborns, the change in heart period decreases. Higher motor scores are associated with greater control of motor behaviors, a prerequisite for self-soothing behaviors.

