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**THE INFLUENCE OF INFANT TEMPERAMENT ON  
MATERNAL SENSITIVITY IN PRETERM INFANTS**

**by**

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M.A., PSYCHOLOGY, STONY BROOK UNIVERSITY, 2016**

THESIS

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**ABSTRACT**

Infants who experience sensitive caregiving are at lower risk for numerous adverse outcomes. This is especially true for infants born preterm, leading them to be more susceptible to risks associated with poorer quality caregiving. Some research suggests that preterm and full term infants differ on in temperament, which may contribute to findings that caregivers of preterm infants are often found to display less sensitive responding to their infants. To investigate the associations between term status, infant temperament, and maternal behavior, videotaped play interactions and a measure of temperament, the Infant Behavior Questionnaire were coded for samples of preterm and full term infants at nine months (corrected) age. Results suggest that mothers of preterm and full term infants do differ significantly in responding to their infants but that these results cannot be explained by infant temperament. Preterm status and sociodemographic risk emerged as consistently associated with domains of maternal behavior.

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## **Chapter 1**

### **Introduction**

#### **Maternal Sensitivity**

Maternal sensitivity is the ability to detect infant cues, interpret them accurately, and respond in a prompt and appropriate manner (Ainsworth, Blehar, Waters, & Wall, 2015). Maternal sensitivity has been found to be a key predictor of secure attachment in infants, which is linked to numerous positive outcomes (Verhage et al., 2016). High maternal sensitivity can act as a buffer against the possible adverse effects of many high-risk situations. Children born preterm who experienced sensitive caregiving showed greater academic success than preterm children who did not experience the same degree of sensitive caregiving (Wolke, Jaekel, Hall, & Baumann, 2013). Children who have experienced sensitive caregiving have been found to show greater social and emotional competence as well as higher academic achievement (Leerkes, Nayena Blankson, & O'Brien, 2009; Raby, Roisman, Fraley, & Simpson, 2015).

Maternal sensitivity also has been found to have a positive impact on physiological domains, including self-regulation and health (Conradt et al., 2016; Anderson, Gooze, Lemeshow, & Whitaker, 2012). Greater caregiver sensitivity in childhood can buffer children in high stress environments from experiencing stress related health complications in adulthood (Farrell, Simpson, Carlson, Englund, & Sung, 2017). A number of factors have been found to influence parenting behaviors and maternal sensitivity. Financial strain or lower socioeconomic status has been linked with more negative parenting practices (Conger, Conger, & Martin, 2010; Sturge-Apple,



Jones, & Suor, 2017). Lower maternal education levels have also been linked with a lower degree of maternal sensitivity (Neuhauser, 2018; Pederson et al., 1990).

### **Preterm Infants**

Parenting a preterm infant poses additional challenges that are not typically faced by parents of healthy full term infants, above and beyond the initial stress of the hospital or NICU stay. These challenges may include feeding difficulties, developmental delays, or medical needs. Preterm birth and low birth weight are a significant source of infant morbidity and mortality and can place a large financial as well as emotional strain on families (Petrou, 2006; Henderson, Carson, & Redshaw, 2016; Singer, Salvator, & Guo, 1999). Even at a year post delivery, mothers of preterm infants report significantly more parenting stress than mothers of full term infants, reflecting the unique challenges of caring for a preterm infant (Gray, Edwards, O'Callaghan, Cuskelly, & Gibbons 2013). High parenting stress has been linked with adverse child outcomes, including greater externalizing behaviors and poorer coping skills (Moreland, Felton, Hanson, & Jackson 2016).

### **Maternal Sensitivity with Preterm Infants**

Preterm infants often display atypical behaviors, which may lead to different patterns of interaction between preterm dyads as compared to full term dyads. Infants born preterm or very low birth weight are often less alert and active, less responsive, and less organized in interactions (Beckwith & Cohen, 1978; Crnic, Ragozin, Greendberg, Robinson, & Basham, 1983; Field, 1987). The presence of sensitive caregiving may be especially important to infants born preterm. Research suggests that preterm or very low birth weight infants are especially at risk for the adverse outcomes associated with poorer

caregiving, but sensitive caregiving can buffer them from these risks (Poehlmann et al., 2012; Gueron-Sela, Atzaba-Poria, Meiri, & Marks, 2016).

Just as preterm infants may display behaviors atypical of full term infants, the caregivers of preterm infants also may show behavioral differences from the caregivers of full term infants. Mothers of preterm infants may display a greater degree of intrusive behaviors in interactions with their infants than mothers of full term infants (Neri, Agostini, Salvatori, Biasini, & Monti, 2015; Agostini, Neri, Dellabartola, Biasini, & Monti, 2014, Muller-Nix et al., 2004; Feldman & Eidelman, 2006; Monte Cassiano & Martins Linhares, 2015). Intrusive behaviors interfere with a child's autonomy and high degrees of intrusiveness are linked with adverse outcomes (Ainsworth et al., 2015). Higher levels of maternal intrusiveness have been linked with greater child negativity, poorer expressive communication skills, lower inhibitory control, social and behavioral problems in school, and lower intellectual functioning (Ispa et. al., 2004; Clincy & Mills-Koonce, 2013; Egeland, Pianta, & O'Brien, 1993).

Mothers of preterm infants may also display less positive affect in interactions than mothers of full term infants (Crnic et al., 1983). A lower degree of maternal positive affect during infancy has been associated with poorer outcomes for children, including lower childhood IQ scores, a more negative self-perception, and cortisol dysregulation (Brooker, Davidson, & Goldsmith, 2015; Goodvin, Meyer, Thompson, & Hayes, 2008; Sheinkopf et al., 2017). The literature is mixed, however, with some studies describing no significant differences in parent child interactions between preterm and full term dyads (Hall et al., 2015; Montiroso, Borgatti, Trojan, Zanini, & Tronick, 2010) and other

studies finding greater maternal responsiveness or higher quality interactions between preterm dyads (Bozette, 2007; Korja et al., 2008).

### **Infant Temperament**

Infant temperament has been conceptualized as an individual difference displayed by infants in terms of their reactivity to stimuli and their ability to self-regulate (Rothbart, 1981). Research suggests that temperament in infancy is linked with personality and social development in adulthood (Gartstein & Rothbart, 2003). Infants with difficult temperaments are at greater risk for behavior problems later on in childhood (Mertesacker, Bade, Haverkock, & Pauli-Pott, 2004).

### **Temperament of Preterm Infants**

Infants born preterm or low birth weight may have an underdeveloped autonomic nervous system, leading to difficulties in regulation and a reliance on their caregivers for external regulation. In other words, they can't self-soothe as easily so they rely on their caregiver to provide emotion regulation and soothe them in distressing situations. This interplay can lead the caregivers to rate their preterm infants as displaying a higher degree of negative emotionality (Gueron-Sela, Atzaba-Poria, Meiri, & Marks, 2016). Preterm infants are generally rated as having a more difficult temperament than full term infants (Case-Smith, Butcher, & Reed, 1998; Gennaro, Medoff-Cooper, & Lotas, 1992; Hughes, Shults, McGrath, & Medoff-Cooper, 2002; Gennaro, Tulman, & Fawcett, 1990; Washington, Minde, & Goldberg, 1986; Langkamp, Kim, & Pascoe, 1998). Studies have also found preterm infants to be more negative in emotionality than full term infants (Garcia-Coll et al., 1988; Langerock et al., 2013; Voegtline & Stifter, 2010). Preterm infants are rated as less attentive, active, and cuddly than full term infants (Sanjaniemi,

Salokorpi, & von Wendt, 1998; Klein, Rocha, Martinez, Putnam, & Linhares, 2013; Consentino-Rocha, Klein, & Linhares, 2014; Kerestes, 2005). However, some studies examining temperament find no differences between preterm and full term samples (Olafsen et al., 2008; Gray, Edwards, O’Callaghan, Cuskelly, & Gibbons, 2013; Oberklaid, Prior, Nolan, Smith, & Flavell, 1985; Hara, Mitsuishi, & Yamaguchi, 1990; Weiss, St. John-Seed, & Wilson, 2004).

### **Maternal Sensitivity and Infant Temperament**

Maternal perception of infant characteristics and temperament can influence the way that they interpret and respond to their infant’s cues. The differences in temperament between preterm and full term infants may influence maternal sensitivity displayed by mothers in interactions with their preterm or full term infants. Infants with higher levels of negative emotionality may show more reliance on caregivers responding in a sensitive way to help them regulate emotions, thus suffering more negative outcomes when they have an insensitive caregiver (Leerkes & Zhou, 2018). In fact, if infants with higher degrees of negative emotionality do not receive sensitive caregiving, there is a higher likelihood they will display emotion dysregulation in childhood (Thomas, Letourneau, Campbell, Tomfohr-Madsen, & Giesbrecht, 2017).

Although research is limited regarding the influence of infant temperament on maternal sensitivity, there have been reports that mothers of children rated as having a more difficult temperament display lower levels of maternal sensitivity or responsiveness (Feldman, Greenbaum, Mayes, & Erlich, 1997; Kiang, Moreno, & Robinson, 2004; Belsky, 1984). Specifically, a higher level of infant negative affect was associated with maladaptive parent child interactions during feeding, higher levels of maternal

intrusiveness in interactions, and lower levels of maternal sensitivity (Cerniglia, Cimino, & Ballarotto, 2014; Perry, Dollar, Calkins, & Bell, 2018; Mills-Koonce et al., 2007).

Easily frustrated or angered infants tend to experience lower quality mother-infant bonding and have mothers who are less sensitive and more intrusive (Nolvi et al., 2016; Braungart-Rieker, Hill-Soderlund, & Karass, 2010; Calkins, Hungerford, & Dedmon, 2004; Koenig, Barry, & Kochanska, 2010). Higher maternal intrusiveness has also been found when infants were less soothable (Szabo et al., 2008). Lower maternal sensitivity has been linked with infants that were more socially withdrawn or less responsive (Puura et al., 2013). However, it has also been found that mothers are more sensitive to infants that are lower in surgency (Planalp, Braungart-Rieker, Lickenbrock, & Zentall, 2013). Further, there have been studies to find no association between infant temperament and parenting behavior or maternal sensitivity (Park, 2001; Aktar, Colonnese, de Vente, Majdandzic, & Bogels, 2017).

The association between difficult temperament and lower maternal sensitivity may be magnified in more stressful parenting situations, such as when the mother is experiencing depression or anxiety or has a lower degree of social support (Mertesacker, Bade, Haverkock, & Pauli-Pott, 2004). This finding may be extended to the stress associated with lower socioeconomic status, lower maternal education levels, or the difficulties associated with having a preterm infant (Neuhauser, 2018; Booth, Macdonald, & Youssef, 2018).

### **The Influence of Infant Gender**

Some limited research suggests that female infants have more difficult temperaments than male infants, being more difficult to soothe, displaying more

irritability and intensity, as well as having less socially desirable temperament ratings (Martin, Wisenbaker, Baker, & Huttunen, 1997; Riese, 1986; Huang, Ma, & Li, 2009). However, other studies, as well as meta-analytic evidence, suggest that the sex of the infant has no influence on temperamental traits (Huang, Su, & Li, 2005; Kerestes, 2006; Persson-Blennow & McNeil, 1988; Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006; Feiring & Lewis, 1980; Weiss, St John-Seed, & Wilson, 2004).

Male preterm infants not only tend to have higher levels of mortality, but they also show consistently worse health outcomes and poorer postnatal neurodevelopment than female preterm infants (Roy, Kumar, Kaur, & Faridi, 2014; O'Driscoll, McGovern, Greene, Molloy, 2018; Frondas-Chauty et al., 2014). Parenting a higher risk preterm infant can contribute to a greater degree of parenting stress (Singer et al., 2010). Therefore, mothers of male preterm infants may experience greater stress, which could negatively influence their parenting practices (Lutz et al., 2012).

### **Preterm Illness Severity**

Infants born preterm can have differing degrees of medical needs. Infants born earlier or with lower birth weights have higher degrees of lung immaturity and many require mechanical ventilation (Aly, Hammad, Essers, & Wung, 2012). Many studies examining morbidity and mortality in preterm samples have used days on ventilation as a proxy measure for preterm infant illness severity or medical risk (Gladstone, Oliver, & Van den Broek, 2015). Research has shown that illness severity can influence temperament characteristics in preterm samples (Klein, Gaspardo, Martinez, Grunau, & Linhares, 2009; Spungen & Farran, 1986).

Lower infant birth weight is related to more illness severity and studies have also found lower birth weight and younger gestational age to be related to greater maternal anxiety (Zelkowitz, Bardin, & Papageorgiou, 2007). Further, mothers of preterm infants with greater levels of anxiety show fewer sensitive behaviors in interactions with their infants (Feeley, Gottlieb, & Zelkowitz, 2005; Zelkowitz, Papageorgiou, Bardin, & Wang, 2009).

### **Current Study**

The literature examining associations between preterm status, maternal sensitivity, and infant temperament is mixed. There is a trend in the literature finding that mothers of preterm infants display less optimal caregiving behaviors, including lower levels of sensitive responding and positive affect and increased levels of intrusiveness (Muller-Nix et al., 2004; Crnic et al., 1983; Neri, Agostini, Salvatori, Biasini, & Monti, 2015). In contrast, some studies report no significant differences or even higher quality interactive behavior displayed by mothers of preterm infants as compared to mothers of full term infants (Montirosso, Borgatti, Trojan, Zanini, & Tronick, 2010; Bozette, 2007).

Similarly, results from the temperament literature examining differences between preterm and full term infants and looking at associations between maternal sensitivity and infant temperament do not show consistent results. There is a trend in the literature suggesting that infants born preterm or very low birth weight display more difficult temperaments than infants born full term, but there are also studies that find no associations between gestational age and temperament (Hughes, Shults, McGrath, & Medoff-Cooper, 2002; Langkamp, Kim, & Pascoe, 1998; Olafsen et al., 2008; Gray, Edwards, O'Callaghan, Cuskelly, & Gibbons, 2013). Many studies find that mothers of

infants rated as having more difficult temperaments display poorer quality caregiving behaviors with their infants (Feldman, Greenbaum, Mayes, & Erlich, 1997; Kiang, Moreno, & Robinson, 2004). However, other studies report no such association (Park, 2001; Aktar, Colonnese, de Vente, Majdandzic, & Bogels, 2017).

Very few studies have been published examining the associations between maternal sensitivity, infant temperament, and preterm status (Monte Cassiano & Linhares, 2015). The majority of studies only examine two of these variables. This study will fill this gap in the literature by examining associations between preterm status, infant temperament, and maternal sensitivity. This may help clarify the mixed results present in the literature at this time.

### **Hypotheses and Analyses**

As a preliminary analysis, a series of independent samples t-tests were conducted to analyze any difference in temperament between male and female infants (across the preterm and full term samples). The influence of illness severity on infant temperament was also investigated by analyzing the relationship between days on ventilation for preterm infants and each subscale of infant temperament. If preliminary analyses of the influence of sex or illness severity showed significant results, the significant variable(s) would be added to subsequent analyses to control for this variable(s).

I first hypothesized that preterm infants would have a higher degree of difficult temperament, as assessed with the Infant Behavior Questionnaire – Revised Very Short Form (IB-R-VSF) (Putnam, Helbig, Gartstein, Rothbart, & Leerkes, 2014). A more difficult temperament would be indicated by lower scores for positive affectivity/surgency (PAS) and orienting/regulatory capacity (ORC), and higher scores



for negative emotionality (NEG). In order to examine this hypothesis, a series of independent samples t-tests was conducted to analyze the differences in temperament (from IBQ-R-VSF) between preterm and full term infants. The t-tests analyze differences in positive affectivity/surgency, negative emotionality, and orienting/regulatory capacity between these two samples.

A second hypothesis was that mothers of preterm infants would have a lower degree of maternal sensitivity, as evidenced by lower scores on responsiveness to non-distress, a higher degree of intrusiveness, and lower positive regard, than mothers of full term infants. A series of 3 independent samples t-tests was conducted to analyze the differences in maternal responsiveness to non-distress, intrusiveness, and positive regard between the preterm and full term groups.

A third hypothesis is that when controlling for sociodemographic risk, as determined by a composite variable of maternal education and household income, preterm status and difficult infant temperament would be negatively associated with aspects of maternal sensitivity independently, such that mothers of preterm infants and mothers of infants with difficult temperaments will both display lower levels of maternal sensitivity. This would be shown by lower levels of maternal responsiveness to non-distress, lower maternal positive affect, and higher levels of intrusive behaviors among mothers of preterm infants and mothers of difficult infants in play interactions with their infants. A series of regression analyses was conducted to predict aspects of maternal sensitivity (responsivity to non-distress, intrusiveness, and positive regard) based on gestational age (preterm vs full term) and infant temperament (PAS, NEG, ORC). Maternal sociodemographic risk was controlled for in this analysis.

Finally, I hypothesized that infant temperament would moderate the relationship between gestational age group (preterm vs full term) and aspects of maternal sensitivity (responsivity to non-distress, intrusiveness, and positive regard), such that mothers of preterm infants with difficult temperaments would show the lowest levels of maternal sensitivity in the sample, evidenced by lower responsivity to non-distress, higher intrusiveness, and lower positive regard. Mothers of full term infants with easy temperaments, as evidenced by higher scores on the IBQ-R-VSF for positive affectivity/surgency and orienting/regulatory capacity, and lower scores for negative emotionality, would show the highest levels of maternal sensitivity, evidenced by higher responsivity to non-distress, lower intrusiveness, and higher positive regard. Moderation analyses was conducted with aspects of maternal sensitivity (responsivity to non-distress, intrusiveness, and positive regard) as the dependent variables, gestational age (pre term vs full term) as the predictor, and the subscales of temperament (IBQ-R-VSF) as the moderators.

## **Chapter 2**

### **Method**

#### **Procedure**

This study involved the analysis of data collected in two separate studies of mothers with their 9 month old (corrected age) infants. Participants completed a variety of questionnaires as well as a videotaped play interaction with their infants at 9 months corrected age. These interactions took place in the home or in the lab. A demographic variable was created to control for sociodemographic risk due to the finding that it is a

predictor of maternal sensitivity to non-distress (Leerkes et al., 2012). This variable is a composite score of maternal education level and annual household income.

## **Participants**

**Preterm Sample.** The mothers of preterm infants were drawn from a pilot study examining a parenting intervention on parenting and infant stress reactivity. There were 18 infants born preterm, defined by birth prior to 32 weeks gestation in this study ( $M = 30.2$  weeks). Infants were excluded from this study if they experienced a significant neurological impairment, were exposed to drugs or alcohol, or were small for gestational age.

**Full Term Sample.** The mothers of full term infants were drawn from a study examining cognitive and neurological development over the first year of life. Forty-four infants were born full term, or after 36 weeks gestation ( $M = 39$  weeks). Full term infants were not included if they had experienced significant medical conditions, neurological abnormalities, or developmental delays.

## **Measures**

**Infant Behavior Questionnaire- Revised Very Short Form (IBQ-R-VSF).** The Infant Behavior Questionnaire revised very short form (IBQ-R-VSF) measures 3 broad components of temperament, including Negative Emotionality, Positive Affectivity/Surgency, and Orienting/Regulatory Capacity (Putnam, Helbig, Gartstein, Rothbart, & Leerkes, 2014). Negative emotionality (NEG) is linked to neuroticism in adults and includes sadness, distress to limitations, fear, and falling reactivity. Positive Affectivity/Surgency (PAS) is linked to extraversion in adults and includes approach, vocal reactivity, high intensity pleasure, smiling/laughing, activity level, and perceptual

sensitivity. Orienting/Regulatory Capacity (ORC) predicts effortful control and is linked to conscientiousness in adults. It includes duration of orienting, low intensity pleasure, cuddliness, and soothability.

**Maternal Sensitivity to Non-Distress.** The first 5 minutes of videotaped non structured play interactions between mothers and their infants were coded for 3 domains of maternal sensitivity using the NICHD coding system for maternal sensitivity to non-distress (NICHD Early Child Care Research Network, 2003). This coding system has been used to code interactions between mothers and children ranging from 6-36 months of age. Three mother codes, responsivity to non-distress, intrusiveness, and positive regard were coded on a 5 point scale. Responsivity to non-distress evaluates the mothers' "following the lead" behaviors. This is a measure of how the mother is able to interpret and respond to the child's cues in a prompt and sensitive manner, keeping the interaction child-centered. Intrusiveness measures the degree to which the mother imposes their own agenda upon the child rather than keeping the interaction child-centered. Intrusiveness can be both physical or psychological and is evaluated from the perspective of the child. Positive regard for the child, or delight, measures the degree of positive affect that the mother displays in interaction with their child.

**Sociodemographic Risk.** Given findings that lower socioeconomic status and lower maternal education have both been shown to contribute to lower quality caregiving, a sociodemographic risk variable was created to control for these influences (Conger, Conger, & Martin, 2010; Sturge-Apple, Jones, & Suor, 2017; Neuhauser, 2018; Pederson et al., 1990). Information on household income was collected using the same scale for each sample, such that 0 was the lowest income bracket (under \$10,000 annual income)

and 7 was the highest income bracket (over \$70,000 annual income). Similarly, maternal education used the same scale in each sample such that 0 was the lowest education level and 7 was the highest. A sociodemographic risk variable was created as a composite of these two measures such that the highest maternal education level and highest household income level would be indicated by a 14 and the lowest would be indicated by a 0.

### Chapter 3

#### Results

Dyads were excluded from analyses if there was any missing data for the Infant Behavior Questionnaire or the mother-infant play interaction. This resulted in the exclusion of one preterm dyad and 7 full term dyads. Demographic information can be found in Table 1.

TABLE 1  
Demographic Characteristics

Demographic Variable	Preterm Sample	Full Term Sample
Sex	N (%)	N (%)
Male	13 (72.2)	25 (56.8)
Female	5 (27.8)	19 (43.2)
Ethnicity		
African American	1 (5.6)	1 (2.3)
Caucasian	3 (16.7)	10 (22.7)
Native American	1 (5.6)	5 (11.4)
Hispanic/Latino	11 (61.1)	21 (47.7)
Multiple/Other	2 (11.1)	7 (15.9)
Annual Household Income		
Under \$10,000	2 (11.1)	8 (18.2)
\$10,000-20,000	2 (11.1)	10 (22.7)
\$20,000-30,000	5 (27.8)	7 (15.9)
\$30,000-40,000	3 (16.7)	1 (2.3)
\$40,000-50,000	1 (5.6)	5 (11.4)
\$50,000-60,000	1 (5.6)	2 (4.5)
\$60,000-70,000	1 (5.6)	4 (9.1)
Over \$70,000	3 (16.7)	7 (15.9)

*Note.* For preterm sample,  $n = 18$  and for full term sample,  $n = 44$ . Mean gestational age was 30.2 weeks ( $SD = 2.62$ ) for preterm infants and 39 weeks ( $SD = 1.41$ ) for the full

term sample. Mean maternal age was 33.17 years ( $SD = 3.09$ ) for the preterm sample and 27.3 years ( $SD = 6.59$ ) for the full term sample.

### Preliminary Analysis

No significant differences were found between male and female infants on any of the IBQ subscales. This held true for positive affectivity/surgency ( $t = -.857, d = -.224$ ), negative emotionality ( $t = .038, d = .01$ ), and orienting/regulatory capacity ( $t = -.719, d = -.187$ ). Illness severity (days ventilation) for preterm infants was not significantly correlated with positive affectivity/surgency ( $r = .051$ ), negative emotionality ( $r = -.128$ ), or orienting/regulatory capacity ( $r = .433$ ). Due to the lack of association between infant sex or preterm illness severity and aspects of infant temperament, neither of these variables were controlled for in subsequent analyses. Descriptive statistics for the study variables can be found in Table 2.

TABLE 2  
Descriptive Statistics for Study Variables

Study Variable	Preterm Sample <i>M (SD)</i>	Full Term Sample <i>M (SD)</i>
Sociodemographic Risk	4.83 (3.97)	5.30 (4.16)
IBQ-R-VSF Subscales		
Surgency	5.70 (.88)	5.76 (.47)
Negative Emotionality	3.71 (.94)*	4.48 (.90)*
Orienting/Regulatory Capacity	5.71 (.86)	5.52 (.62)
Maternal Sensitivity		
Responsivity to Non-Distress	2.03 (.76)*	2.55 (.93)*
Intrusiveness	3.33 (.89)*	2.58 (1.31)*
Positive Regard	3.08 (.75)*	3.63 (.79)*

*Note.* For preterm sample,  $n = 18$  and for full term sample  $n = 44$ . Asterisks indicate significant difference ( $p < .05$ ).

### Primary Analyses

**Term Status Group Differences.** Differences in temperament between preterm and full term infants were examined through the use of independent samples t-tests. No significant differences were found between the preterm and full term infants on positive affectivity/surgency ( $t = .267, p = .792, d = .095$ ) or orienting/regulatory capacity ( $t = -.963, p = .34, d = -.269$ ). However, the full term infants showed significantly greater negative emotionality than preterm infants ( $t = 3.005, p = .004, d = .841$ ). Levene's test was conducted to determine if this result was due to unequal variances but the test was not significant ( $F = .04, p = .841$ ).

Differences in maternal behaviors during play interactions between the preterm and full term groups were examined through independent samples t-tests for maternal responsiveness to non-distress, intrusiveness, and positive regard. The mothers of full term infants showed significantly more sensitive behaviors on all three scales during play interactions with their infants. Mothers of full term infants ( $N = 44$ ) showed significantly greater levels of maternal responsiveness to non-distress ( $M = 2.55$ ) than mothers of preterm infants ( $N = 18, M = 2.03$ ) ( $t = 2.09, p = .041, d = .584$ ). Mothers of preterm infants were significantly more intrusive ( $M = 3.33$ ) than mothers of full term infants ( $M = 2.58$ ) ( $t = -2.23, p = .029, d = -.624$ ). Finally, mothers of full term infants showed significantly more positive regard ( $M = 3.63$ ) than mothers of preterm infants ( $M = 3.08$ ) ( $t = 2.48, p = .016, d = .693$ ).

**Predicting Maternal Interactive Behavior.** A multiple linear regression was conducted to predict maternal responsiveness to non-distress based on gestational age (preterm vs full term) and infant temperament (positive affectivity/surgency [PAS], negative emotionality [NEG], and orienting and regulatory capacity [ORC]) while

controlling for maternal sociodemographic risk. The results of the regression indicated that the model explained  $R^2 = 42.8\%$  of the variance and three of the predictors were a significant predictor of maternal responsiveness to non-distress,  $F(5,56) = 8.37, p < .001, \eta_p^2 = .428$ . Preterm status contributed significantly to the model ( $B = -.618, p = .007, \eta_p^2 = .123$ ) as did negative emotionality ( $B = -.237, p = .03, \eta_p^2 = .08$ ) and sociodemographic risk ( $B = .113, p < .001, \eta_p^2 = .281$ ), indicating that the full term mothers displayed greater responsiveness, as well as mothers with lower sociodemographic risk and of infants with lower negative emotionality. Neither positive affectivity/surgency nor orienting and regulatory capacity contributed significantly to the model ( $B = .099, p = .581, \eta_p^2 = .005$  and  $B = -.125, p = .43, \eta_p^2 = .011$ , respectively). Results of this regression can be found in Table 3. Interaction terms of preterm status and each aspect of infant temperament (PAS, NEG, ORC) were added to the model to test for moderation effects. None of the interaction terms contributed significantly to the model ( $F = .261, p = .612, \eta_p^2 = .005; F = .065, p = .8, \eta_p^2 = .001; F = .024, p = .878, \eta_p^2 = .00$ , respectively).

TABLE 3  
Regression Analysis with Responsivity to Non-Distress as the Dependent Variable

Predictor	B	SE	$\beta$	<i>t</i>	<i>p</i>
(Intercept)	3.13	1.07		2.91	.005*
IBQ PAS	.10	.18	.07	.56	.58
IBQ NEG	-.24	.11	-.25	-2.20	.03*
IBQ ORC	-.13	.16	-.10	-.80	.43
Preterm Status	-.62	.22	-.31	-2.81	.007*
Sociodemographic Risk	.11	.02	.51	4.68	.000*

Note. Asterisks (\*) indicate significant p-values ( $p < .05$ ).

A second multiple linear regression was conducted to predict maternal intrusiveness based on preterm status and infant temperament (PAS, NEG, ORC) while controlling for sociodemographic risk. The results indicated that the model explained  $R^2$



= 31.8% of the variance and that the model was a significant predictor of intrusiveness,  $F(5,56) = 5.22, p < .001, \eta_p^2 = .318$ . Preterm status contributed significantly to the model ( $B = .931, p = .006, \eta_p^2 = .125$ ) as did the sociodemographic risk variable ( $B = -.117, p = .002, \eta_p^2 = .157$ ). However, positive affectivity/surgency, negative emotionality, and regulatory capacity all did not significantly contribute to the model ( $B = -.01, p = .97, \eta_p^2 = .00$ ;  $B = .298, p = .07, \eta_p^2 = .058$ ;  $B = -.02, p = .93, \eta_p^2 = .000$ , respectively). Results of this regression can be found in Table 4. Interaction terms of preterm status and each aspect of infant temperament (PAS, NEG, ORC) were added to the model to test for moderation effects. None of the interaction terms contributed significantly to the model ( $F = 1.809, p = .184, \eta_p^2 = .033$ ;  $F = .447, p = .507, \eta_p^2 = .008$ ;  $F = .022, p = .882, \eta_p^2 = .000$ , respectively).

TABLE 4  
Regression Analysis with Intrusiveness as the Dependent Variable

Predictor	B	SE	$\beta$	<i>t</i>	<i>p</i>
(Intercept)	2.03	1.61		1.26	.21
IBQ PAS	-.01	.27	-.01	-.04	.97
IBQ NEG	.30	.16	.23	1.85	.07
IBQ ORC	-.02	.23	-.01	-.08	.93
Preterm Status	.93	.33	.34	2.83	.006*
Sociodemographic Risk	-.12	.04	-.38	-3.22	.002*

Note. Asterisks (\*) indicate significant p-values ( $p < .05$ ).

A final multiple linear regression was conducted to predict maternal positive regard based on preterm status and infant temperament (PAS, NEG, ORC) while controlling for sociodemographic risk. The results indicated that the model explained  $R^2 = 27.4\%$  of the variance and that the model was a significant predictor of positive regard,  $F(5,56) = 4.23, p = .002, \eta_p^2 = .274$ . Preterm status contributed significantly to the model ( $B = -.532, p = .02, \eta_p^2 = .093$ ) as did sociodemographic risk ( $B = .082, p = .001, \eta_p^2 =$

.166). Positive affectivity/surgency, negative emotionality, and orienting/regulatory capacity all did not contribute significantly to the model ( $B = .03, p = .87, \eta_p^2 = .001$ ;  $B = -.063, p = .57, \eta_p^2 = .006$ ;  $B = -.097, p = .54, \eta_p^2 = .007$ , respectively). Results for this regression analysis can be found in Table 5. Interaction terms of preterm status and each aspect of infant temperament (PAS, NEG, ORC) were added to the model to test for moderation effects. None of the interaction terms contributed significantly to the model ( $F = .179, p = .674, \eta_p^2 = .003$ ;  $F = 1.239, p = .271, \eta_p^2 = .023$ ;  $F = .011, p = .917, \eta_p^2 = .000$ , respectively).

TABLE 5  
Regression Analysis with Positive Regard as the Dependent Variable

Predictor	B	SE	$\beta$	<i>t</i>	<i>p</i>
(Intercept)	3.91	1.09		3.59	.001*
IBQ PAS	.01	.18	.01	.08	.94
IBQ NEG	-.06	.11	-.08	-.59	.56
IBQ ORC	-.10	.16	-.08	-.60	.55
Preterm Status	-.52	.22	-.29	-2.33	.02*
Sociodemographic Risk	.08	.02	.41	3.37	.001*

Note. Asterisks (\*) indicate significant p-values ( $p < .05$ ).

## Chapter 4

### Discussion

A series of regression analyses revealed that the three aspects of infant temperament measured by the infant behavior questionnaire (positive affectivity/surgency, negative emotionality, and orienting/regulatory capacity) were not significant predictors of maternal intrusiveness or positive regard. Only negative emotionality was found to be a significant predictor of maternal responsiveness to non-distress. This study provides a contribution to the literature by confirming that infant temperament has a limited but significant impact on maternal behavior, providing partial

support for my third hypotheses that infants with more difficult temperaments would have mothers who displayed lower levels of maternal sensitivity. These analyses also revealed that preterm status was a significant and unique predictor of maternal responsiveness to non-distress, intrusiveness, and positive regard.

In the regression analyses examining aspects of maternal sensitivity (responsivity to non-distress, intrusiveness, and positive regard), term status consistently emerged as a strong predictor of maternal behavior. This was further confirmed by a series of independent samples t-tests examining differences in aspects of maternal behavior between the preterm and full term samples. The mothers of full term infants displayed greater sensitivity to their infants in all aspects measured. The mothers of full term infants showed higher levels of responsiveness to non-distress, lower levels of intrusive behavior, and higher levels of positive regard. Although it was found that negative emotionality was a significant predictor of responsiveness to non-distress and the full term sample displayed greater levels of negative emotionality, term status turned out to be a stronger predictor of maternal behavior such that full term mothers were more responsive to their infants cues in play regardless of the higher degree of negative emotionality rated in the full term sample. These findings support my second hypothesis that preterm mothers would display lower levels of maternal sensitivity than full term mothers, evidenced by lower responsiveness to non-distress, higher levels of intrusiveness, and lower positive regard for their infants during play interaction.

Previous studies have found that mothers of infants with more difficult temperaments, specifically with more negative emotionality, display lower levels of maternal sensitivity (Feldman, Greenbaum, Mayes, & Erlich, 1997; Kiang, Moreno, &

Robinson, 2004; Belsky, 1984; Mills-Koonce et al., 2007). These findings were supported by results of this study such that mothers of infants with higher ratings for negative emotionality displayed less responsiveness to non-distress when playing with their infants. Evidence of the impact of other aspects of infant temperament, such as positive affectivity/surgency or orienting/regulatory capacity, on maternal behavior is limited. The lack of evidence in the literature, in addition to the lack of significant findings in this study, point to the possibility that positive affectivity/surgency and orienting/regulatory capacity are independent of behaviors displayed by mothers during play interactions with their infants.

Interestingly, the findings for differences in temperament between preterm and full term infants with these samples differed from the results predicted based on the literature. Many studies suggest that preterm infants display more negative emotionality than full term infants (Garcia-Coll et al., 1988; Langerock et al., 2013; Voegtline & Stifter, 2010). There is also a trend in the literature suggesting that preterm infants display a more difficult temperament in general as compared to full term infants (Case-Smith, Butcher, & Reed, 1998; Gennaro, Medoff-Cooper, & Lotas, 1992; Hughes, Shults, McGrath, & Medoff-Cooper, 2002; Gennaro, Tulman, & Fawcett, 1990; Washington, Minde, & Goldberg, 1986; Langkamp, Kim, & Pascoe, 1998). The preterm and full term infants in this sample did not display any significant differences on either positive affectivity/surgency or orienting/regulatory capacity. This supports literature that contests the findings that preterm infants are more difficult or negative in temperament, instead suggesting that preterm and full term infants do not differ from each other in temperament (Olafsen et al., 2008; Gray, Edwards, O'Callaghan, Cuskelly, & Gibbons,

2013; Oberklaid, Prior, Nolan, Smith, & Flavell, 1985; Hara, Mitsuishi, & Yamaguchi, 1990; Weiss, St. John-Seed, & Wilson, 2004).

However, in contrast with the literature, this study found that full term infants displayed a greater degree of negative emotionality than preterm infants. Overall these findings fail to support my first hypothesis that preterm infants would be rated as having more difficult temperaments than full term infants. The finding that the full term infants displayed greater negative emotionality than preterm infants in this sample was not due to differences in distributions of scores between the two samples or due to outliers in either sample. However, given the small sample size it is possible that this finding is not representative for overall populations of preterm and full term infants. The finding here is based on a self-report of temperament completed by parents. Future studies could examine parent report as well as observational measures of temperament to gain a clearer understanding of how preterm and full term infants may differ.

None of the interaction terms added in to any of the regression analyses to test for moderation effects were significant, failing to support my fourth hypotheses that infant temperament would moderate the relationship between term status and aspects of maternal sensitivity. Given the strength of term status as a predictor of maternal behavior and the limited findings for associations between term status and temperament, as well as temperament and maternal behavior, this finding is not surprising. This study suggests that preterm status influences maternal behavior through mechanisms independent of infant temperament. Future research should examine the variables unique to parenting a preterm infant that may hinder mothers from responding in a more sensitive and positive and less intrusive manner to their infants.

In the regression analyses, sociodemographic risk, as measured by a composite variable of household income and maternal education, emerged as a significant predictor of all aspects of maternal sensitivity, including maternal responsiveness to non-distress, intrusiveness, and positive regard. This finding aligns with literature suggesting that lower socioeconomic status and lower maternal education levels have been linked with more negative parenting practices or lower levels of maternal sensitivity (Conger, Conger, & Martin, 2010; Sturge-Apple, Jones, & Suor, 2017; Neuhauser, 2018; Pederson et al., 1990). Socioeconomic status has also been linked specifically with maternal sensitivity to non-distress including maternal responsiveness to non-distress, intrusiveness, and positive regard (Leerkes et al., 2012). This study further confirms the importance of considering the socioeconomic status of caregivers when evaluating their interactions with their infants. It also points to the importance of intervention work that can support caregivers in developing and using positive parenting practices, regardless of their socioeconomic status.

In line with previous research in the field, no differences were found between male and female infants on any of the aspects of infant temperament analyzed in this study (Huang, Su, & Li, 2005; Kerestes, 2006; Persson-Blennow & McNeil, 1988; Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006; Feiring & Lewis, 1980; Weiss, St John-Seed, & Wilson, 2004). Despite research suggesting that preterm illness severity may influence infant temperament, no significant associations were found between the two variables in this study (Klein, Gaspardo, Martinez, Grunau, & Linhares, 2009; Spungen & Farran, 1986). However, based on use in the literature, days of ventilation was used as a proxy for illness severity and this data was only available for 16 of the preterm infants

in the sample (Gladstone, Oliver, & Van den Broek, 2015). Of the infants for which data on days ventilation was available, half of the infants ( $N = 8$ ) experiences zero days on ventilation. The other eight infants ranged from 1 day to 31 days of ventilation with six of these infants experiencing four or fewer days of ventilation ( $M = 7.88$  days). The low variability in this sample could have contributed to the lack of a significant association between days of ventilation and infant temperament.

The results of this study have limited application due to the small sample sizes and sample size difference between the preterm and full term groups. However, the results are an important contribution to the field not only in the examination of multiple variables compared between same age preterm and full term infants, but also due to the diversity of the samples. Both samples were approximately half Hispanic or Latino, with Native American, Caucasian, African American, and infants of multiple races or ethnicities (or ethnicities not listed here) making up the remainder of each sample. The samples were also highly diverse in socioeconomic status. Previous literature includes relatively homogeneous samples in comparison to the current samples.

This study involved measures of infant temperament and a videotaped play interaction at 9 months of (corrected) age. The findings may be limited by the single time point assessment of both constructs. Future studies may benefit by looking at infant temperament over time as well as multiple measurements of maternal behavior. Variables outside of experimental control may have influenced maternal behavior during this particular play interaction, thereby limiting the generalizability of the findings. Examining maternal behavior on more than one occasion as well as multiple settings or situations, such as in lab and at home, or during unstructured play as well as structured

interactions, such as feeding or bath time, could give a clearer picture of how mothers behave with their infant in day to day interactions.

This study provides important information regarding the influence of term status on maternal behavior. Future studies could further examine specifically what aspects of parenting a preterm infant interfere with the ability of caregivers to provide sensitive care to their infants. Regardless, these results support the notion that preterm infant and mother dyads are a particularly vulnerable group. Given preterm infants susceptibility to negative outcomes associated with lower quality caregiving, they may be an especially important group to be targeted with interventions designed to improve maternal sensitivity and buffer infants from the risks of these adverse outcomes (Poehlmann et al., 2012; Gueron-Sela, Atzaba-Poria, Meiri, & Marks, 2016).



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