DISPOSITIONAL EMPATHY AND PHYSIOLOGICAL REACTIVITY: JOINT CONTRIBUTIONS TO MATERNAL SENSITIVITY WITH TODDLER-AGED CHILDREN

BY

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THESIS

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Abstract

The present study investigated maternal dispositional empathy and skin conductance level (SCL) reactivity in response to infant emotional cues as joint predictors of maternal sensitive behavior with their toddler-aged children. Sixty-four mother-toddler dyads (31 boys) were observed during a series of interaction tasks during a laboratory visit, and maternal sensitivity was assessed from approximately 55 minutes of observation per family. Maternal SCL reactivity to infant cues using a cry-laugh audio paradigm (Groh & Roisman, 2009) was assessed in a second mother-only laboratory visit. Mothers reported on their dispositional empathy via a questionnaire. Greater dispositional empathy was related to greater sensitivity at low, but not high, levels of SCL reactivity. Parallel analyses examining self-reported negative emotion during the cry-laugh paradigm as the moderator further supported the finding that dispositional empathy emerged as a significant predictor of sensitivity when mothers’ experienced low, rather than high, reactivity. Results are discussed in terms of specificity to type of sensitivity (distress and non-distress) and by reactivity measure.
Acknowledgments

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Chapter 1: Introduction

Empathy is the affective response to, and understanding of, another’s emotional state, particularly their distress. As such, empathy involves both emotional and cognitive dimensions (Davis, 1980, 1983a; Hoffman, 1984; Strayer, 1987). Affectively, the empathic individual feels and expresses warmth and compassion for the other person (Batson, 1991; Davis, 1983a, 1994). Cognitively, the empathic individual takes the perspective of the other person to better understand their thoughts, motivations and feelings (Davis, 1994; Hoffman, 1984; Hogan, 1969). Together in varying degrees, the cognitive and affective components of empathy may motivate the individual to act toward others in a prosocial manner, particularly helping those in distress (Batson, 1991; Eisenberg & Miller, 1987). Although situational factors may be important to experiencing empathy, individual differences in propensity to experience empathy across situations, generally referred to as dispositional or trait empathy, has been theorized to play an important role in predisposing people to experience and act on empathy (Davis, 1980, 1994; Hogan, 1969; Mehrabian & Epstein, 1972; Mehrabian, Young, & Sato, 1988). Considering individual differences in empathy may aid our understanding of functioning in interpersonal domains like parenting, and may best be understood in the context of other parental affective responses to children, such as negative emotional and physiological arousal in response to child’s emotion cues (Dix, 1991). Thus, we examined dispositional empathy as a predictor of observed maternal sensitive behavior, and tested maternal physiological reactivity as a moderator of empathy-sensitivity associations.

Maternal sensitivity has long been identified as an important precursor to positive developmental outcomes for children, including secure child-mother attachment (Ainsworth, Blehar, Waters, & Wall, 1978; De Wolff & van IJzendoorn, 1997), socio-emotional competence (NICHD Early Child Care Research Network [ECCRN], 1998), and advanced cognitive functioning (Bornstein & Tamis-LeMonda, 1997), making understanding the predictors of sensitivity important. More than three decades ago, Ainsworth (1969) highlighted the importance of empathy in promoting mothers’ sensitive parenting:

The mother must be able to empathize with her baby’s feelings and wishes before she can respond with sensitivity. That is, a mother might be quite aware of and understand accurately the baby’s behavior and the circumstances leading to her baby’s distress or demands, but because she is unable to empathize with him- unable to see things from the
baby’s point of view—she may tease him back in to good humor, mock him, laugh at him, or just ignore him. The mother’s egocentricity and lack of empathy may also lead to detached, intellectual responses to the baby rather than to warm, sensitive interactions with the baby. (p. 2)

Likewise, Dix (1992) posited a central role of empathy in parent’s sensitive responsiveness via promotion of child-oriented motivations and goals that prioritize the child’s experiences, perspectives and emotions. The theoretical importance of empathy to sensitive responsiveness makes understanding more fully how and when empathy relates to sensitivity an important task within the literature.

Of the few past studies that have examined parental empathy as a predictor of sensitive parenting behavior, findings have generally supported the theorized importance of empathy to sensitive parenting (Coyne, Low, Miller, Seifer, & Dickstein, 2007; Koren-Karie, Oppenheim, Dolev, Sher, & Etzion-Carasso, 2002; Leerkes, 2010; Leerkes, Crockenberg, & Burrous, 2004). One line of research from Leerkes and colleagues has focused on the role of empathic emotions, defined by their child-centered nature, as a predictor of sensitivity. Greater maternal empathic emotion in response to videotaped infant distress was related to greater observed sensitivity to distress with mothers’ own 6-month old infant, although this was only found for levels of empathic emotions assessed in response to videotapes of her own infant rather than another infant (Leerkes, 2010). A study using a similar empathy assessment method did not find that empathic emotions alone predicted sensitivity, but did find that empathy interacted with maternal emotional accuracy and efficacy in predicting observed sensitivity to infant distress and self-reported sensitivity to toddler anger, respectively (Leerkes et al., 2004). Other lines of research have found support that cognitive, perspective-taking aspects of empathy positively relate to maternal sensitivity, by examining mothers’ empathic insightfulness into the mental and emotional state of her child during a video-feedback task of recorded mother-child interactions (Koren-Karie et al., 2002; Oppenheim, Koren-Karie, & Sagi, 2001). Greater maternal empathic insightfulness during the feedback task was related to greater observed sensitivity with her infant (Koren-Karie et al., 2002). Using a similar video-feedback methodology, greater maternal empathic understanding during feedback was related to greater sensitivity with toddler-aged children (Coyne et al., 2007). In sum, evidence suggests that mothers’ empathic emotions and
cognitions about their own child, specifically, are significantly related to sensitive parenting for both infants and toddlers.

Less is known about how individual differences in dispositional empathy relate to sensitive parenting. Theoretically, parents who are higher in dispositional empathy should be more oriented towards and responsive to their children’s emotional signals because of a heightened orientation to these kinds of cues generally. Individual differences in dispositional empathy have been linked to more other-oriented, altruistic responses to those in distress (Davis, 1983b; Eisenberg et al., 1989), suggesting that parents with greater dispositional empathy may respond more readily and with more child-orientation to children’s distress, a hallmark of sensitive parenting. Only one study to date has indirectly linked general, dispositional empathy to observed maternal sensitivity by showing a modest correlation between general empathic concern and measured empathic emotions to infant cues, which themselves predicted maternal sensitivity to distress (Leerkes et al., 2004)- although the study did not examine general empathy as a predictor of sensitivity. Though not directly measuring the link between empathy and sensitivity in an observational context, research on emotional reactions to infant distress, which is viewed as an important facet of sensitive responsiveness, has found some evidence that parents with higher dispositional empathy expressed more sympathy in response to videotaped infant cries (Zeifman, 2003). Sympathetic emotions, characterized by their other-person orientation, motivate more prosocial responding (Eisenberg & Fabes, 1990), indirectly suggesting that greater dispositional empathy may lead to affective responses to child distress signals that facilitate child-centered responding. One study (Leerkes, Parade, & Burney, 2010) failed to find that parental dispositional empathy predicted beliefs about infant crying, also believed to be important to responding to infant distress sensitively. This past study, however, did not examine in the moment emotional reactions to infant cues, which may be where differences in responding based on dispositional empathy emerge most strongly. While promising, more information is needed on how and when individual differences in dispositional empathy influence sensitive parenting, particularly in linking dispositional empathy to observed parent-child interactions.

Although the literature supports a move to further examine parental empathy as a predictor of sensitive parenting, it may not be enough to consider empathy alone. Several theorists have urged a more interactive understanding of the parental-level factors that predict sensitive, responsive parenting (Belsky, 1984; Dix, 1991). In his affective model of parenting,
Dix (1991) highlighted the parent’s need to manage competing goals and demands to promote responsive parenting. Parents must have child-focused goals, motivations, and emotions (like empathy) to promote responsiveness, but also must have well regulated negative emotions, particularly in challenging parenting situations. Parental negative or distress emotions may compete with parental mental and emotional resources and interfere with the perception of and prioritization of child signals, resulting in less sensitive, parent-centered behavior (Dix, 1991). Thus, despite having orientations that might promote sensitive responsiveness, such as a general empathic orientation towards others, experiencing heightened levels of negative emotional arousal during parenting may interfere with empathy translating to empathic behavior.

Parents’ propensity to experience negative emotional reactions is especially important to consider in combination with empathy, as theory has highlighted a motivational distinction between individuals’ empathic responses and their personal distress in response to others’ emotions (Batson, 1991; Davis, 1983b; Eisenberg & Fabes, 1990). Although some emotional arousal in response to others' emotions may be normative to empathic responding (Eisenberg & Strayer, 1987), a personal distress reaction is distinguished by its high intensity of negative emotional arousal and self (versus other) focus, which motivates self-focused behavior to alleviate one’s own distress, rather than responding which prioritizes the other person (Batson, Fultz, & Schoenrade, 1987a, 1987b; Eisenberg & Fabes, 1990). Thus, experiencing heightened negative arousal, particularly that indicative of personal distress, in response to others’ emotions may put parents at risk for insensitive responding, and needs to be considered alongside parental dispositional empathy. The combination of deficits in empathy and high personal distress in response to others’ distress has especially been theorized to contribute to extremely insensitive parenting, such as child abuse and neglect (Feshbach, 1987, 1989; Letourneau, 1981). Research does suggest that parents at-risk for abusing have deficits in empathic perspective-taking (de Paul, Perez-Albeniz, Guibert, Asla, & Ormaechea, 2008; Wiehe, 2003), and/or empathic concern (Perez-Albeniz & de Paul, 2003; Wiehe, 2003), in combination with elevated personal distress. Although this literature suggests that it is important to attend to both parental empathy and levels of personal distress, less is known about how these factors relate to parenting in non-at-risk, community samples. Given the importance of reacting to child emotional cues in everyday interactions, parents’ empathy and propensity to exhibit negative emotional arousal (especially
that indicative of personal distress) in the face of child signals are important to investigate as joint predictors of sensitive behavior.

Differences in physiological reactivity in response to child cues may be important to consider as measures of mothers’ propensity to become negatively aroused in the face of intense child emotion. Although physiological systems are complex and interlinked, skin conductance (an index of electrodermal responding) may be a suitable measure of negative reactivity to consider in combination with dispositional empathy, as it may better capture levels of personal distress in response to emotional stimuli than empathic responses (Eisenberg & Fabes, 1990; Eisenberg et al., 1991). Electrodermal responding is theorized to tap into the behavioral inhibition system (BIS), which governs autonomic response to aversive circumstances or stimuli (Fowles, 1980). Elevated electrodermal responding has been linked to heightened anxiety (Gray, 1982), and more arousal and need to inhibit behavior in response to negative emotional stimuli (Balconi, Falbo, & Conte, 2012; Fowles, 2000). Although enduring patterns of extremely low electrodermal responding have been linked to psychopathy and aggression (reviewed in Lorber, 2004), as well as disinhibition (Fowles, 2000), such physiological patterns tend to emerge among at-risk or clinical samples. In contrast, high levels of electrodermal responding to emotional stimuli, particularly child cues, may represent high personal distress and dysregulation that puts parents at risk for insensitive parenting (see McCanne & Hagstrom, 1996). Parents at risk for abusive parenting have shown greater skin conductance reactivity in response to both child crying and laughter cues, as well as diminished desire to engage with the infant (Frodi & Lamb, 1980), and even individuals who were not parents but scored high on a risk assessment for child abuse showed heightened reactivity to child cries (Crowe & Zeskind, 1992). Greater skin conductance change in response to infant cry has also been correlated with more self-reported levels of irritation, annoyance and distress in a general sample as well (Frodi, Lamb, Leavitt, & Donovan, 1978). Thus, elevated rates of skin conductance reactivity in the face of child emotional cues may undermine sensitive responsiveness, although less is known about how skin conductance reactivity translates to observed behavior, either alone or in combination with other parental factors.

In the current study, we aimed to extend prior literature on the correlates of maternal sensitivity by examining maternal dispositional empathy and skin conductance reactivity as joint predictors of maternal sensitivity. To this end, we observed maternal sensitivity during a series
of mother-toddler interaction tasks during a laboratory visit lasting approximately one hour. Mothers reported on their dispositional empathy, and maternal physiological reactivity in response to infant emotion cues was assessed in a second “mother-only” laboratory visit. We used an auditory cry-laugh paradigm (Groh & Roisman, 2009), in which the mother listened to audiotapes of infant crying and infant laughter, to assess changes in skin conductance level (SCL) as a measure of maternal reactivity to child emotional cues.

We examined SCL reactivity as a moderator of the association between mother-reported dispositional empathy and her observed sensitivity during interactions with her toddler-aged child. High SCL reactivity signals high levels of aversion, anxiety or personal distress to a stimulus (or high need to inhibit reactions; Fowles, 1980), whereas low levels may signal less distress and less need to inhibit negative reactions. Given that high negative arousal and distress may undermine empathic responding, we hypothesized that dispositional empathy would be related to greater sensitivity at low and moderate levels of SCL reactivity in response to infant cues, but not at high levels. Although we measured reactivity in two contexts (to infant crying and infant laughter), we predicted that moderating effects of SCL reactivity would be stronger when assessed in response to the infant cry (versus laugh) condition because infant crying is more likely to be highly emotionally-arousing, and thus, potentially disruptive to sensitive responding.

Additionally, as evidence grows for the need to distinguish between sensitivity to distress and sensitivity to non-distress as they relate to child development (Leerkes, Blankson, & O’Brien, 2009; McElwain & Booth-LaForce, 2006), we wished to extend the research on the joint and unique predictors of maternal sensitivity to distress and sensitivity to non-distress. We thus examined sensitivity to distress and sensitivity to non-distress as separate outcomes in our models. Because of the strong conceptual tie of empathy to reactions to others’ distress, we hypothesized that (a) dispositional empathy would be a stronger predictor of sensitivity to distress than sensitivity to non-distress and (b) the interaction between reactivity to infant crying and dispositional empathy would be a stronger predictor of sensitivity to distress versus non-distress, as high reactivity to child cues of distress may be particularly detrimental to responding sensitively in observed child distress contexts.

Finally, to corroborate results that emerged for SCL reactivity, we also examined mothers’ self-reported negative emotions in response to infant cues in the cry-laugh paradigm as a
moderator of the empathy-sensitivity association. Negative, self-focused emotions in response to child distress cues have been found to negatively relate to observed sensitivity (Leerkes, 2010; Leerkes et al., 2004). Paralleling the above hypotheses for SCL reactivity, we predicted that mothers’ dispositional empathy would predict more sensitive parenting when self-reported negative emotion reactivity was low (versus high) and that this moderating effect would be especially strong for reactivity to infant cry (versus laugh) as the moderator and sensitivity to distress (versus non-distress) as the outcome.
Chapter 2: Method

Participants

Sixty-six mother-child dyads participated in a study on parenting in toddlerhood. Families were recruited via informational flyers distributed through local organizations and child care centers, as well as through online announcements. Families were eligible to participate if they had a toddler-aged child who was in nonmaternal care for at least 10 hours per week. Because two mothers were missing all data for the mother-only laboratory visit, the sample for this report consists of 64 mother-child dyads. Children (31 boys; 33 girls) ranged between 18 and 37 months of age ($M = 27.20$ months, $SD = 5.18$). Mothers were on average 32.13 years of age ($SD = 3.99$). With respect to race, mothers were 80% Caucasian, 5% Black or African American, 8% Asian, 3% Hispanic, 2% Native American and 2% Mixed/Other. Ninety-two percent of mothers were married, and the median annual family income was between $81,000 to $90,000 (range: $10,000 to over $100,000). In terms of maternal education, 3% of mothers had a 2-year or technical degree, 14% had completed some college, 36% had Bachelor’s degrees and 47% had an advanced degree.

Procedure

Mother-child visit. Mother-child dyads participated in a 90-minute visit to a university laboratory that resembled a home environment (e.g., living room, dining area, and functional kitchen). Dyads were observed during a series of interactive tasks, including a 15-minute semi-structured play session, a five-minute clean-up session, an open-ended snack session ($M = 15.44$ minutes, $SD = 3.75$), and an open-ended wordless picture book task ($M = 5.55$ minutes, $SD = 1.98$). Children were also observed in four situations that were adapted from the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley, & Prescott, 1999). The Lab-TAB situations were interspersed throughout the mother-child visit and included (a) a one-minute separation from mother followed by a brief reunion, (b) a two-minute approach by a remote-operated mechanical dog that moved and barked unpredictably, (c) a four-minute locked box episode, in which the child briefly played with a new attractive toy that was then locked in a transparent box; the child was given a non-working key to attempt to open the box and retrieve the toy, and (d) a 2-minute popping bubbles games in which the experimenter showed the child how to operate a bubble gun and engaged the child in a game to pop bubbles. Except for the separation episode, the mother was present and seated approximately three feet
from the child during the Lab-TAB episodes. Observations of mother-child interaction across all tasks lasted, on average, 55 minutes ($SD = 4.97$ minutes). Following the mother-child tasks, the experimenter interviewed the mother about her perceptions of the child and his/her child care arrangements, while a research assistant administered social-cognitive and language assessments to the child. Only observations of mother-child interaction were utilized in this report.

**Mother-only visit.** Approximate 3 weeks ($M = 2.95$ weeks, $SD = 2.99$) after the mother-child visit, mothers participated in a 90-minute mother-only visit to a second laboratory. At this visit, maternal physiological reactivity was assessed during the cry-laugh paradigm (Groh & Roisman, 2009), in which mothers listened to audio recordings of infant crying and laughter via headphones and were asked to imagine how they would respond if the infant was their child. Each recording was 2 minutes, and the presentation of the cry and laugh recordings was counterbalanced across participants. The average fundamental frequency of the infant crying and laughter vocalizations was 360.06 Hz ($SD = 58.41$) and 215.96 Hz ($SD = 119.69$), respectively. The amplitude of the infant vocalizations was approximately equated across vocalizations and participants by holding the volume of the audio recordings constant. On average, peak amplitude of each cry equaled 89.51 decibels ($SD = 1.85$) and peak amplitude of each laugh equaled 91.25 decibels ($SD = 3.00$).

To assess skin conductance level (SCL) in response to the infant cry and laugh conditions, mothers had sensors attached to fingers on their non-dominant hand. With a constant-voltage device, a small voltage was passed between electrodes attached to the palmar surface of the last phalanx of the second and fourth digits. SCL was continuously measured (in microsiemens) during baseline and while listening to the audio recordings via a system consisting of two Pentium computers, Snapmaster Data Acquisition System (2000), and bioamplifiers (James Long, Inc., Caroga Lake, NY). During baseline, mothers were instructed to rest completely and to empty their mind of thoughts and emotions for 3 minutes. In addition to the physiological assessments, mothers completed the Emotional Experience Questionnaire after resting baseline and after listening to each audio recording to assess the mother’s current emotional state. The audio-recordings of infant crying and laughter used here have been unanimously viewed by research assistants as prototypical expressions of infant distress and happiness and have elicited expected skin conductance changes among college-aged participants (see Groh & Roisman, 2009).
**Questionnaires.** Prior to the mother-only visit, mothers completed a series of questionnaires, including an assessment of dispositional empathy (Davis, 1980). Mothers completed the questionnaires either online or via paper copy.

**Measures**

**Maternal sensitivity.** Maternal and child behaviors were coded from digital recordings of the mother-child interaction tasks (described above) that lasted approximately 55 minutes (i.e., play session through popping bubbles game). Behaviors were coded in 60-second intervals by two teams of coders focused exclusively on either maternal or child behavior; coders were blind to one another’s ratings. For the purposes of this report, we examined the maternal sensitivity and intrusiveness ratings, which were based on prior work (e.g., see NICHD ECCRN, 1999).

*Sensitivity to distress* was coded only for intervals in which the child showed non-fleeting distress and captured the extent to which the mother responded to the child in a timely manner, acknowledged the child’s distress, and made efforts to understand and address the source of distress and/or soothe the child. *Sensitivity to non-distress* captured the extent to which the mother appropriately responded in a child-centered manner to the child’s non-distress signals, interests, and social gestures and included the mother’s contingent vocalizations, picking up on the child’s interests and signals in a well-paced manner, and guiding the child during transitions to new activities as needed. *Intrusiveness* captured the extent to which the mother acted in a controlling, adult-centered manner, including physically and/or verbally interfering with the child’s activity (e.g., taking a toys out of the child’s hand during play, directing the child’s behavior during play in ways that did not appear consistent with the child’s interests).

Six of the 64 mothers did not receive a rating for sensitivity to distress because the child did not exhibit non-fleeting distress. All mothers were coded on sensitivity to non-distress and intrusiveness. Inter-rater reliability was assessed throughout the coding process, and 20% of the tapes were double-coded. Intraclass correlations (ICC), calculated on the separate 60-second intervals, were .74 for sensitivity to distress, .62 for sensitivity to non-distress and .74 for intrusiveness. ICCs were also computed on the ratings averaged across all coded intervals and were .74 for sensitivity to distress, .79 for sensitivity to non-distress, and .92 for intrusiveness. A composite for sensitivity to distress was calculated by subtracting the mean level of intrusiveness during intervals in which sensitivity to distress occurred from the mean rating of sensitivity to distress. A composite for sensitivity to non-distress was calculated by subtracting the mean level
of intrusiveness during intervals in which only sensitivity to non-distress occurred from the mean rating of sensitivity to non-distress during those intervals. Composites were used in all analyses.

**Maternal skin conductance level (SCL).** Skin conductance level was sampled during resting baseline and while participants listened to the audio recordings of infant vocalizations. Change in SCL for a given condition (i.e., infant laughter and infant crying, with presentation order counterbalanced across participants) was calculated by subtracting mean levels of skin conductance during the 3-min baseline period from mean levels while participants listened to the audio recording. Positive change scores reflect greater SCL reactivity to the infant audio recording (compared with baseline), whereas negative change scores reflect less SCL reactivity to the infant audio recording (compared with baseline). Because of a malfunction with the equipment, one mother was missing SCL data, reducing the sample size for SCL analyses \( N = 63 \).

**Maternal self-reported negative emotion (NEG).** The Emotional Experience Questionnaire assessed the mother’s emotional state at rest and after listening to the each of the audio recordings. Mothers rated 25 different emotions on a 9-point Likert scale from 0 (not at all) to 8 (the most emotion you have felt in your life). Ratings of thirteen items (i.e., anger, anxious, arousal, confusion, contempt, disgust, embarrassment, fear, pain, sadness, shame, surprise, and tension) were averaged within each condition (baseline, crying, and laughter). This negative emotion composite was reliable for baseline \( (\alpha = .88) \), crying \( (\alpha = .86) \), and laughter \( (\alpha = .71) \) conditions. To assess change in self-reported negative emotion in response to infant crying and laughter, the negative emotion composite during baseline was subtracted from the negative emotion composite during crying and laughter, respectively. Positive change scores reflect more negative emotion in response to the infant audio condition than during baseline, whereas negative change scores reflect less negative emotion in response to the infant audio condition than during baseline.

**Maternal empathy.** Dispositional empathy was measured using two subscales of the Interpersonal Reactivity Index (Davis, 1980). Empathic concern (7 items, \( \alpha = .85 \)) measures the tendency to feel tenderness, concern, sympathy and compassion for others in response to their distress (e.g. “I often have tender, concerned feelings of sympathy for people less fortunate than me”). Perspective taking (7 items, \( \alpha = .85 \)) measures the tendency to adopt the psychological viewpoint of another person in everyday life (e.g. “I sometimes try to understand my friends
better by imagining how things look from their perspectives”). Mothers rated each item on a 5-point scale from 0 (does not describe me well) to 4 (describes me very well), and ratings were averaged within subscale. The empathic concern and perspective taking subscales scores showed a strong, positive correlation ($r = .50$) and were averaged to create a composite of maternal empathy. The Interpersonal Reactivity Index subscales have shown adequate test-retest reliability (Davis, 1980) and convergent and discriminant validity (Davis, 1983a).

**Data Analytic Plan**

We used Mplus 6.0 (Muthen & Muthen, 1998-2010) to test a series of path models in which maternal empathy, reactivity, and the Empathy x Reactivity interaction were predictors of observed sensitivity. A separate model was tested for each reactivity measure (e.g. SCL-cry, SCL-laugh, NEG-cry, NEG-laugh) and each sensitivity outcome (i.e., sensitivity to distress and sensitivity to non-distress), resulting in eight model tests. Empathy and reactivity scores were centered (raw score minus the mean), and centered scores were used in the models. Because centered scores reduce multicollinearity between lower and higher-order terms (see Aiken & West, 1991), we tested the main effects for maternal empathy and maternal reactivity and the Empathy x Reactivity interactions simultaneously. (We note that all main effects reported in Table 3 were identical in significance level to models tested without the interaction term.)

Covariance parameters between empathy and reactivity were estimated in each model, and in follow-up analyses. Missing data were minimal ($n = 1$ for SCL reactivity; $n = 6$ for sensitivity to distress, as described in the Method section) and were handled using full-information maximum likelihood estimation (FIML). FIML offers less biased estimates than other methods, such as listwise deletion (see Schafer & Graham, 2002).

In follow-up analyses, we first examined whether the significant interactions that emerged in the main models differed as a function of the reactivity context (i.e., cry versus laugh conditions). Main effects and interactions for SCL reactivity (or NEG reactivity) in the cry and laugh conditions were entered together as predictors of sensitivity to distress (or sensitivity to non-distress). Paths were then constrained for the Empathy x SCL-cry and Empathy x SCL-laugh interaction terms, for instance, and the Wald test of parameter constraints was used to assess whether the paths significantly differed in magnitude in predicting the sensitivity outcome. Next, to examine whether the interaction effects from the main models differed by type of sensitivity, we tested both sensitivity outcomes in a given reactivity model (i.e., SCL-cry, SCL-
laugh, NEG-cry, NEG-laugh, respectively). For example, empathy, SCL-cry reactivity, and the Empathy x SCL-cry interaction were examined as predictors of sensitivity to distress and non-distress simultaneously, and the Wald test of parameter constraints was used to assess whether a given predictor significantly differed in magnitude across the two sensitivity outcomes.
Chapter 3: Results

Preliminary Analyses

Descriptive data on skin conductance levels (SCL) and self-reported negative emotions during baseline and the infant crying and laughter conditions are presented in Table 1. Baseline SCL was consistent with established adult norms (Stern, Ray, & Quigley, 2001). Paired t-tests revealed that SCL during the crying and laughter conditions were significantly higher than baseline levels ($t_{[62]} = 6.04$, $p < .001$, and $t_{[62]} = 8.35$, $p < .001$, respectively), indicating that the infant crying and laughter conditions had an effect on mothers’ physiological responding. SCL during the crying and laughter conditions, however, did not significantly differ from one another ($t_{[62]} = .75$, $p = .45$). For self-reported negative emotions (NEG), paired t-tests revealed that NEG during the crying condition was higher than at baseline ($t_{[63]} = 5.89$, $p < .001$), and that NEG during laughter was lower than at baseline ($t_{[63]} = -5.58$, $p < .001$), indicating that both conditions had a significant effect on mother self-reported emotions. Paired t-tests also revealed that NEG during the crying condition was significantly higher than NEG during the laughter condition ($t_{[63]} = 12.97$, $p < .001$).

Table 1

<table>
<thead>
<tr>
<th>Condition</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
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<tbody>
<tr>
<td>Skin Conductance</td>
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<tr>
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<td>12.14</td>
<td>5.25</td>
<td>64</td>
<td>.87</td>
<td>.87</td>
</tr>
<tr>
<td>Crying</td>
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<td>13.64</td>
<td>5.95</td>
<td>64</td>
<td>1.58</td>
<td>.97</td>
</tr>
<tr>
<td>Laughter</td>
<td>63</td>
<td>13.85</td>
<td>5.68</td>
<td>64</td>
<td>.34</td>
<td>.43</td>
</tr>
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Note. Skin conductance reported in microsiemens (μS).

Family demographic variables (e.g. mother age, family income, mother education level) were examined as potential covariates, and no significant associations emerged with the outcome measures. Next, we examined child gender and age. Mothers were more sensitive to distress for girls ($M = 1.47$, $SD = .85$) compared with boys ($M = .95$, $SD = .92$) ($t_{[56]} = -2.26$, $p = .03$), although there was not a significant gender difference for sensitivity to non-distress (girls: $M = 1.70$, $SD = .39$; boys: $M = 1.65$, $SD = .49$) ($t_{[62]} = -.47$, $p = .64$). Controlling for child gender, we also found that child age was marginally associated with the sensitivity outcomes ($r = .23$, $p = .09$ distress; $r = .12$, $p = .38$ non-distress). Thus, child gender and age were retained as
covariates in all analyses. The number of 60-second intervals in which maternal sensitivity to
distress was coded differed widely due to frequency of child distress \( M = 4.67, SD = 3.64 \), and
we examined the number of intervals coded as a potential covariate. Mothers who had more
intervals in which sensitivity to distress was coded were rated as less sensitive to their child’s
distress \( r = -.44, p = .001 \) and non-distress \( r = -.45, p < .001 \). We therefore retained this
variable (distress count) in all analyses as a covariate. Correlations and descriptive statistics for
the main study measures are reported in Table 2.
Table 2

*Intercorrelations and Descriptive Statistics for the Study Measures*

<table>
<thead>
<tr>
<th>Study measures</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
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<tbody>
<tr>
<td>1. Maternal empathy</td>
<td>---</td>
<td>.18</td>
<td>.06</td>
<td>.10</td>
<td>.24</td>
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<td>2. SCL-change, cry</td>
<td>---</td>
<td>---</td>
<td>.28*</td>
<td>.39**</td>
<td>.33**</td>
<td>.02</td>
<td>.04</td>
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<tr>
<td>3. SCL-change, laugh</td>
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<td>---</td>
<td>.00</td>
<td>.04</td>
<td>.07</td>
<td>.02</td>
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<td>4. NEG-change, cry</td>
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<td>.24</td>
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<td>5. NEG-change, laugh</td>
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<td>.15</td>
<td>-.01</td>
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<td>6. Sensitivity to distress</td>
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<td></td>
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<td>.53***</td>
</tr>
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<td>7. Sensitivity to non-distress</td>
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<tr>
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<td>SD</td>
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<td>1.97</td>
<td>1.62</td>
<td>.95</td>
<td>.77</td>
<td>.91</td>
<td>.44</td>
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*Note. SCL = Skin conductance level; NEG = self-reported negative emotions.*

* p < .05, ** p < .01, *** p < .001
Skin Conductance (SCL) Reactivity as a Moderator of Dispositional Empathy

Main models. Four path models examined (a) empathy and SCL-cry, and (b) empathy and SCL-laugh, as predictors of sensitivity to distress and non-distress, respectively. For the models predicting sensitivity to non-distress, the main effects of empathy and SCL were non-significant, although the Empathy x SCL-cry and Empathy x SCL-laugh interactions were significant (see Table 3). To probe each interaction, we conducted simple slopes tests (Aiken & West, 1991) and plotted the association between empathy and sensitivity to non-distress at low (1 SD below the mean), Mean, and high (1 SD above the mean) levels of SCL reactivity.

Empathy was related to greater sensitivity to non-distress when SCL-cry reactivity was low ($B = .35, SE = .12, p = .01$), but not high ($B = -.25, SE = .15, p = .14$) (see Figure 1a). A similar pattern emerged for SCL-laugh: empathy was related to greater sensitivity to non-distress when SCL-laugh reactivity was low ($B = .33, SE = .13, p = .02$), but not high ($B = -.19, SE = .16, p = .27$) (see Figure 1b). For the models predicting maternal sensitivity to distress, the empathy and SCL main effects, as well as the Empathy x SCL interactions, were non-significant (see Table 3).

Path constraints. To assess the specificity of the above interaction effects, we next examined a series of path constraints. First, we entered the SCL-cry and SCL-laugh main effects and interactions into the same model as predictors of sensitivity to non-distress to examine whether these effects differed significantly by reactivity context (infant cry versus laugh). We included a covariance parameter between the error terms of the reactivity measures in the model. A test of the path constraint for the Empathy x SCL-cry and Empathy x SCL-laugh interactions was non-significant, Wald test ($df = 1) = .04, p = .84$, indicating that SCL moderation did not significantly differ depending on the reactivity context in which SCL was assessed.

Next, to test whether the Empathy x SCL interaction paths significantly differed in magnitude by type of sensitivity, we examined the sensitivity to distress and non-distress outcomes in the same model. For these analyses, the SCL-cry and SCL-laugh predictors were examined separately, and a covariance parameter between the error terms of the sensitivity outcomes was estimated. For each model, the test of the path constraints for the Empathy x SCL interaction predicting sensitivity to distress and non-distress was non-significant: Wald test ($df = 1) = .001, p = .97$, for the Empathy x SCL-cry interaction, and Wald test ($df = 1) = .02, p = .88,$
for Empathy x SCL-laugh interaction. The findings indicate that the Empathy x SCL interaction did not differ significantly in predicting sensitivity to distress versus non-distress.
Table 3
Unstandardized and Standardized Path Coefficients for the Models Predicting Sensitivity to Distress and Sensitivity to Non-Distress from Skin Conductance Level (SCL) During Infant Crying and Infant Laughter

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity to distress</th>
<th>Sensitivity to non-distress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$ (S.E.)</td>
<td>$\beta$</td>
</tr>
<tr>
<td><strong>Crying condition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (0=Male)</td>
<td>.56 (.21)</td>
<td>.30**</td>
</tr>
<tr>
<td>Child age</td>
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<td>.20†</td>
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<tr>
<td>Distress count</td>
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<td>-.40***</td>
</tr>
<tr>
<td>Empathy</td>
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<td>.12</td>
</tr>
<tr>
<td>SCL change</td>
<td>.02 (.06)</td>
<td>.05</td>
</tr>
<tr>
<td>Empathy x SCL change</td>
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<td>-.14</td>
</tr>
<tr>
<td><strong>Laughter condition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (0=Male)</td>
<td>.57 (.21)</td>
<td>.31**</td>
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<tr>
<td>Child age</td>
<td>.04 (.02)</td>
<td>.19†</td>
</tr>
<tr>
<td>Distress count</td>
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<td>-.38***</td>
</tr>
<tr>
<td>Empathy</td>
<td>.21 (.18)</td>
<td>.13</td>
</tr>
<tr>
<td>SCL change</td>
<td>.04 (.06)</td>
<td>.07</td>
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<tr>
<td>Empathy X SCL change</td>
<td>-.14 (.12)</td>
<td>-.12</td>
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</table>

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$
**Figure 1.** Maternal sensitivity to non-distress as a function of mother dispositional empathy and skin conductance level (SCL) change from baseline (a) assessed during crying condition and (b) assessed during laughter condition. The path estimates shown here are standardized. *p < .05.
Self-Reported Negative Emotion (NEG) Reactivity as a Moderator of Dispositional Empathy

Main models. Four path models examined (a) empathy and NEG-cry, and (b) empathy and NEG-laugh, as predictors of sensitivity to distress and non-distress, respectively. For the two models predicting sensitivity to distress, the main effects of empathy and NEG were non-significant, although the Empathy x NEG-cry and the Empathy x NEG-laugh interactions were significant (see Table 4). To probe each interaction, we conducted simple slopes tests (Aiken & West, 1991) and plotted the association between empathy and sensitivity to distress at low (1 SD below the mean), Mean, and high (1 SD above the mean) levels of NEG reactivity. Empathy was related to greater sensitivity to distress when NEG-cry reactivity was low ($B = .34, SE = .12, p = .02$), but not high ($B = -.06, SE = .13, p = .65$) (see Figure 2a). A similar pattern emerged for NEG-laugh: empathy was related to greater sensitivity to distress when NEG-laugh reactivity was low ($B = .24, SE = .12, p = .05$), but not high ($B = -.08, SE = .14, p = .60$) (see Figure 2b). For the two models predicting maternal sensitivity to non-distress, the main effects of empathy, NEG-cry, and NEG-laugh, and the Empathy x NEG-cry interaction were non-significant; however, the Empathy x SCL-laugh interaction was significant (see Table 4). As shown in Figure 3, empathy was related to greater sensitivity to non-distress when NEG-laugh was low ($B = .24, SE = .12, p = .06$), but not high ($B = -.09, SE = .14, p = .55$).

Path constraints. We tested the NEG-cry and NEG-laugh predictors (main effects and interaction terms) in the same models as predictors of sensitivity to distress and sensitivity to non-distress, respectively, to examine whether the interaction differed by reactivity context (infant cry versus laugh). We included a covariance parameter between the error terms of the reactivity measures in the models. The test of the path constraint for the model predicting sensitivity to distress was non-significant, Wald test ($df = 1$) = .10, $p = .75$, indicating that the moderating role of NEG in the empathy-sensitivity to distress association did not differ as a function of NEG reactivity context. In contrast, the test of the path constraints for the model predicting sensitivity to non-distress was marginally significant, Wald test ($df = 1$) = 2.97, $p = .09$, indicating that the Empathy x NEG-laugh interaction (versus Empathy x NEG-cry) was a stronger predictor of sensitivity to non-distress (see Table 4 for parameter estimate).

Next, we examined the sensitivity to distress and non-distress outcomes in the same model to test whether the Empathy x NEG interaction paths significantly differed in magnitude.
by type of sensitivity. For these analyses, the NEG-cry and NEG-laugh predictors were examined in separate models, and a covariance parameter between the error terms of the sensitivity outcomes was estimated. The test of the path constraints for the Empathy x NEG-cry interaction predicting sensitivity to distress and non-distress was significant, Wald test \((df = 1) = 5.92, p = .02\), indicating that the Empathy x NEG-cry interaction significantly differed in predicting sensitivity to distress and sensitivity to non-distress. In line with the above main models, the Empathy x NEG-cry interaction was a significant predictor of sensitivity to distress only. The test of the path constraints for the Empathy x NEG-laugh interaction was not significant, Wald test \((df = 1) = 1.30, p = .25\), indicating that the interaction did not differ significantly in predicting sensitivity to distress and non-distress.
Table 4

Unstandardized and Standardized Betas for Models Predicting Sensitivity to Distress and Sensitivity to Non-Distress from Self-Reported Negative Emotion (NEG) in Response to Infant Crying and Laughter

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity to distress</th>
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<th>Sensitivity to non-distress</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
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<td>B (S.E.)</td>
<td>β</td>
<td>R²</td>
<td>B (S.E.)</td>
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<td>Crying condition</td>
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</tr>
<tr>
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<td>.25*</td>
<td>.42***</td>
<td>.07 (.10)</td>
</tr>
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<td>Child age</td>
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<td>.14</td>
<td>.01 (01)</td>
<td>.04 (.10)</td>
</tr>
<tr>
<td>Distress count</td>
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<td>-.05 (.01)</td>
<td>-.42***</td>
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<td>.08 (08)</td>
<td>.08</td>
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<tr>
<td>NEG change</td>
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<td>-.05</td>
</tr>
<tr>
<td>Empathy x NEG change</td>
<td>-.35 (.15)</td>
<td>-.25*</td>
<td>-.03 (08)</td>
<td>-.04</td>
</tr>
<tr>
<td>Laughter condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (0=Male)</td>
<td>.46 (.20)</td>
<td>.25*</td>
<td>.38 ***</td>
<td>.04 (.10)</td>
</tr>
<tr>
<td>Child age</td>
<td>.04 (.02)</td>
<td>.20†</td>
<td>.01 (.01)</td>
<td>.08</td>
</tr>
<tr>
<td>Distress count</td>
<td>-.12 (.03)</td>
<td>-.46***</td>
<td>-.06 (.01)</td>
<td>-.47***</td>
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<tr>
<td>Empathy</td>
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<td>.08</td>
<td>.06 (08)</td>
<td>.08</td>
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<tr>
<td>NEG change</td>
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<td>-.11</td>
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<tr>
<td>Empathy x NEG change</td>
<td>-.33 (.16)</td>
<td>-.23*</td>
<td>-.16 (08)</td>
<td>-.24*</td>
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</table>

† p < .10, * p < .05, ** p < .01, *** p < .001
Figure 2. Maternal sensitivity to distress as a function of mother dispositional empathy and self-reported negative emotion (NEG) change from baseline (a) assessed after crying condition and (b) assessed after laughter condition. The path estimates shown here are standardized. *p < .05.
Figure 3. Maternal sensitivity to non-distress as a function of mother self-reported negative emotion (NEG) change from baseline to laughter condition. The path estimates shown here are standardized. † $p < .10$. 
Chapter 4: Discussion

The present study is one of only a few studies, to date, that has investigated associations between either maternal dispositional empathy or reactivity and observed mother-child interactions, and the only one to examine these as joint contributors to maternal behavior. As hypothesized, we found that the empathy-sensitivity association emerged at low, but not high, levels of maternal reactivity to infant cues in models using skin conductance (SCL), as well as in models using self-reported negative emotion (NEG), as the measure of reactivity. Notably, the moderating effects mainly held across reactivity context (cry/laugh), although results varied in some instances by sensitivity outcome (sensitivity to distress versus non-distress). We begin by discussing the joint contribution of empathy and reactivity to maternal sensitivity.

Dispositional Empathy Predicts Greater Sensitivity at Low Reactivity to Infant Cues

In line with our hypothesis, mothers’ greater dispositional empathy was related to greater observed sensitivity with their toddler-aged child at low levels of skin conductance change in response to audiotaped infant vocalizations. Although we had predicted that the Empathy x Reactivity interaction would emerge when using reactivity to infant crying as the moderator in predicting maternal sensitivity to distress, we found no evidence of such specificity. Instead, the interaction was significant in models testing both SCL-cry and SCL-laugh reactivity as moderators, and follow-up analyses showed no significant difference in the moderating effect by reactivity context. Further, although the Empathy x SCL reactivity interaction emerged only for sensitivity to non-distress in our main models, follow-up path constraints across sensitivity outcomes indicated that the interaction did not differ significantly when predicting sensitivity to distress versus non-distress. In sum, the role of SCL reactivity in moderating the association between maternal dispositional empathy and sensitive parenting appears to be robust across the contexts in which SCL reactivity was assessed and across the type of sensitive parenting being predicted.

We interpret these findings in light of Dix’s (1991) theorizing that sensitive parenting requires the parent to have both positive traits (like empathy) and to experience low (or effectively managed) negative emotional arousal during parenting tasks, because high levels of reactivity are expected to interfere with responding in a child-centered, sensitive manner. Given that elevated electrodermal reactivity may represent a state of anxiety (Gray, 1982), or activation of the inhibition system in response to negative, aversive stimuli (Fowles, 1980), low levels of
SCL reactivity exhibited in the cry-laugh audio paradigm may signal generally limited physiological-level signs of anxiety or distress in response to child emotions or signals that may interfere with sensitive responsiveness. Thus, under lower reactivity conditions, parenting may become more driven and differentiated by the mothers’ level of dispositional empathy. Mothers high in empathy who experience low SCL reactivity may be better able to act on their empathic tendencies and attend to, and perceive, their child’s cues in a way that promotes sensitive responsiveness, across both distress and non-distress contexts.

Corroborating our results for SCL reactivity, we found that dispositional empathy predicted greater sensitivity for mothers who reported low, but not high, levels of negative emotion in response to infant cues (crying or laughter). Although in contrast with the SCL results, follow-up analyses for self-reported negative emotion indicated that in some cases the moderating effect was specific to reactivity context or type of sensitivity (see discussion of specificity below). Nonetheless, the convergence in the overarching pattern of results for models examining SCL and self-reported negative emotion as moderators of the empathy-sensitivity association is notable and increases confidence in our above interpretation that the moderating effect of SCL reactivity at low levels of reactivity is because these mothers experienced less negative arousal or aversion in response to infant cues.

**High Levels of SCL Reactivity versus Mother-Reported Negative Emotions**

For all models tested, the association between empathy and sensitivity at high levels of reactivity (SCL or NEG) was non-significant. However, the interaction plots revealed a different pattern of results for high SCL versus high NEG reactivity that we believe merits brief discussion. At high levels of skin conductance reactivity, greater empathy was related to less sensitivity (see Figure 1). Although these negative slopes did not reach statistical significance, they bear mentioning. Mothers high on SCL reactivity and dispositional empathy may experience high amounts of reactivity to others’ emotion signals (including empathy), but also may more readily experience heightened personal distress (Eisenberg & Fabes, 1990), characterized by intense, self-focused negative emotions (Batson et al., 1987b; Davis, 1983). The tendency to experience personal distress reactions may interfere with the mother’s ability to act in a truly child-centered manner despite her high empathy and may result in over-compensating, intrusive behavior with her child in an effort to manage her own emotions.
In contrast to the SCL results, mothers high on self-reported negative emotions in response to infant cues were relatively high on sensitivity to distress, regardless of their dispositional empathy. This pattern was unexpected given our conceptualization of high levels of negative emotional reactivity as detrimental to sensitive parenting. Unlike assessments of SCL reactivity, maternal reports of negative emotions require the mother to identify and label her own emotional state and, thus, may tap conscious processing of emotions. Being able to recognize when a stimulus is aversive may be an essential step in managing the effect of negative emotions on one’s behavior. Thus, mothers who acknowledge experiencing negative emotions in response to potentially aversive child cues (infant crying in particular) may be better at managing these emotions and may be more motivated to act in a sensitive manner, regardless of empathy, compared with mothers who do not acknowledge negative emotions. Such conscious understanding, in turn, may be important for reacting sensitively to children’s distress, in particular (see specificity discussion below).

The unexpected pattern of the NEG results may also stem from our method of collecting emotional state data. Past research (Dix, Gershoff, Meunier, & Miller, 2004; Leerkes, 2010; Leerkes et al., 2004) suggests that understanding mothers’ reasons for having negative emotions in response to child cues may importantly differentiate them as self- versus other-focused (i.e., experiencing personal sadness or sadness because you feel for the infant). Given the generalized method of collecting data on emotional states, we cannot know more specifically the nature of the negative emotions reported, although mothers were given specific instructions to focus on their own negative emotions. Future research should be careful to differentiate between other- and self-focused negative emotions when examining their relationship to observed sensitivity and empathy.

**Specificity of Associations**

Because infant crying may be more aversive and arousing than infant laughter (Frodi et al., 1978), and because empathy may be especially salient in response to child distress (Leerkes, 2010), we hypothesized that the interaction between empathy and reactivity to infant cues would be significant when reactivity to infant crying (versus laughter) was the moderator and when sensitivity to child distress (versus non-distress) was the outcome. However, as noted above, SCL-cry and SCL-laugh reactivity showed a similar pattern of moderation and the Empathy x SCL interaction did not differ significantly across sensitivity to distress and non-distress. While
the lack of SCL moderation specificity was unexpected, past research suggests that low SCL reactivity to laughter is normative (Frodi et al., 1978), while high reactivity may be characteristic of at-risk, insensitive mothers (see McCanne & Hagstrom, 1996). Parents may need to have generally low negative emotion arousal and personal distress in the face of negative and positive child signals to act in accordance with their empathic tendencies. However, more research is warranted to explore this supposition further, especially in light of the unexpectedly similar level of SCL reactivity to infant crying and laughter found in our sample. Nevertheless, the similar findings across type of sensitivity indicate that dispositional empathy may be important to parenting sensitivity generally, rather than only during sensitivity to distress.

For self-reported negative emotion (NEG), a somewhat different pattern emerged. NEG-cry moderated the association between empathy and sensitivity to distress, and follow-up path tests indicated that the association was specific to sensitivity to distress. In contrast, NEG-laugh moderated the association between empathy and both sensitivity outcomes, with follow-up analyses indicating no specificity across sensitivity outcomes. Such specificity for NEG-cry partially supports our hypothesis that reactivity to crying would be most relevant to sensitivity to distress. However, finding similar moderation of the empathy-sensitivity to distress association by NEG-laugh does not fit with our initial hypothesis about sensitivity to distress, although it does suggest that mothers’ general self-reported emotional reactivity, rather than cue (cry/laugh) specific reactivity, may be important to sensitive responding to distress in particular. Moderation of the empathy-sensitivity to non-distress association by only NEG-laugh parallels the NEG-cry finding, and suggests that emotional reactivity to cues similar to those likely to be experienced during the different sensitivity contexts (i.e., crying during distress, laughter during non-distress) are particularly important to sensitivity, at least when using self-report measures. In general, the significant findings for NEG-laugh (and SCL-laugh) suggest that emotional arousal in response to multiple types of child emotional cues may be influential to parental sensitive responding, particularly when considered in combination with other parental characteristics like dispositional empathy. Future research should continue to explore the link between reactions to a variety of child emotional cues and sensitivity.

In considering the specificity of effects that emerged for mother-reported negative emotions, compared with the more general pattern found for SCL reactivity, we consider a key difference in our two measures of reactivity. SCL reactivity taps more non-conscious emotional
processes that may have more general and non-specific negative influences on maternal perceptions and behavior, undermining responding sensitively to a variety of child cues across contexts. In contrast, and as noted above, maternal reports of negative emotions may capture more conscious processing of emotions, which in turn may influence behavior somewhat differently than physiological reactivity. Consciously processing emotions in response to different infant emotion-salient signals (i.e. crying or laughter) may bear more distinct relationships to the different types of sensitivity (distress and non-distress). However, such an interpretation is tentative, and future research should continue to explore how physiological and self-report factors relate to sensitivity to distress and sensitivity to non-distress to further clarify these different patterns of association.

**Limitations and Contributions**

Several limitations of this study are acknowledged. First, we assessed maternal physiological reactivity in a brief laboratory situation. Although such laboratory situations provide important controls, the degree to which physiological reactivity in the laboratory corresponds to reactivity in more naturalistic settings is still theoretical, although promising. Further research should more fully examine the linkages between reactivity to child signals in the laboratory and physiological reactivity to children in an interactive context. Doing so may clarify how lower reactivity profiles and empathy interact to predict sensitive behavior. Second, during the mother-only lab visit, we utilized emotion-salient audio recordings of non-familiar infants, rather than clips from the mothers’ own child. Past research has suggested that physiological reactions such as electrodermal reactivity may be lower in response to unfamiliar infants than one’s own infant (Wiesenfeld & Klorman, 1978). That we found physiological effects even using audio clips from non-familiar infants suggests that there might be more robust findings using recordings of mothers’ own child, although more research is needed. Third, children in our sample were toddler-aged ($M = 27.20$ months, $SD = 5.18$), whereas the audio-recordings were of an infant. Mothers in this sample were past the stage where they would be responding to infant-type distress cues from the target child. While crying is a generally emotionally and physiologically evocative stimulus, there is some evidence that parental status may impact responses to infant distress cues (Boukydis & Burgess, 1982). Research is thus needed on the link between reactivity to toddler-specific emotional cues and sensitive parenting, which may be particularly fruitful given the new demands and challenges of parenting toddlers.
Some caution should also be used in generalizing the current findings, especially given the small sample size. The small sample size limited the statistical power to detect small statistical differences or effects that may exist. Additionally, the sample of mothers participating in this study was more racially homogenous (80% White) and tended to have higher incomes and levels of education than the larger population. Thus, future research should examine if the findings would replicate in a more diverse sample of mothers. Further, we only examined mothers in the laboratory visits, limiting our ability to know whether such trends extend to fathers or other attachment figures. Indeed, in the literature there has been less examination of the factors that influence observed paternal sensitivity with their children. Future research should examine the factors such as empathy and emotional reactivity that may influence paternal sensitivity as well.

Despite these limitations, there were advantages to our study design, including our sampling of sensitive behavior and our examination of the joint contribution of factors that predict sensitive parenting. Mother-child dyads were observed and coded for an extended period within the laboratory, on average 55 minutes, and we had a variety of tasks that the mother-child dyads performed in the lab, designed to elicit a range of emotions. While there may be some concerns about how representative laboratory visits are of parenting outside of the lab, the range of activities and length of the stay should be seen as a strength within this type of observational method. Overall, the current study contributes to the literature on sensitive parenting by expanding our understanding of how and when empathy predicts sensitive parenting, which has long been posited within the sensitive parenting literature (Ainsworth, 1969). Our study represents one of the first to more directly link dispositional empathy to sensitive parenting behavior, and to do so within a more complex framework than understanding main effects. Given the importance of understanding the predictors of sensitive behavior, future research should continue to explore the interactions between parental affective reactions to children as an important predictor of sensitive parenting.
References


