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Maternal Dispositional Empathy and Electrodermal Reactivity: Interactive Contributions to Maternal Sensitivity with Toddler-Aged Children

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Abstract

The present study investigated maternal dispositional empathy and skin conductance level (SCL) reactivity to infant emotional cues as joint predictors of maternal sensitivity. Sixty-four mother-toddler dyads (31 boys) were observed across a series of interaction tasks during a laboratory visit, and maternal sensitivity was coded from approximately 55 minutes of observation per family. In a second, mother-only laboratory visit, maternal SCL reactivity to infant cues was assessed using a cry-laugh audio paradigm. Mothers reported on their dispositional empathy via a questionnaire. As hypothesized, mothers with greater dispositional empathy exhibited more sensitive behavior at low, but not high, levels of SCL reactivity to infant cues. Analyses examining self-reported emotional reactivity to the cry-laugh audio paradigm yielded a similar finding: dispositional empathy was related to greater sensitivity when mothers reported low, but not high, negative emotional reactivity. Results provide support for Dix's (1991) affective model of parenting that underscores the combined contribution of the parent's empathic tendencies and his/her own emotional experience in response to child emotions. Specificity of the Empathy × Reactivity interaction is discussed with respect to the context in which reactivity was assessed (infant cry versus laugh) and the type of sensitivity examined (sensitivity to the child's distress versus non-distress).

Keywords

maternal sensitivity; maternal empathy; electrodermal reactivity; infant crying; infant laughing

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Empathy is the affective response to and understanding of another's emotional state, particularly their distress. Affectively, the empathic individual attunes to the other's emotional state and responds with warmth and feelings of concern for the other person (Batson, 1991; Davis, 1983a, 1994). Cognitively, the empathic individual takes the perspective of the other person to better understand his/her thoughts, motivations and feelings (Davis, 1994; Hogan, 1969). Together, the affective and cognitive components of empathy may motivate prosocial behavior, particularly towards helping those displaying distress (Batson, 1991; Eisenberg & Miller, 1987). Although situational factors are important to experiencing empathy, individuals differ in their propensity to experience empathy regularly across situations and people, which has been referred to as dispositional or trait empathy (Davis, 1980, 1994; Mehrabian & Epstein, 1972). Considering individual differences in dispositional empathy might aid our understanding of functioning in interpersonal domains, such as parenting, and may best be understood in the context of other parental factors, such as the parent's degree of negative emotional arousal in response to child emotions (Dix, 1991). In the present study, therefore, we examined mothers' dispositional empathy as a predictor of observed maternal sensitivity, and we tested mothers' electrodermal reactivity as a moderator of empathy-sensitivity associations.

Dispositional Empathy and Maternal Sensitivity

Maternal sensitivity (defined here as timely, child-centered behavioral responses to child cues) has long been identified as an important precursor to positive outcomes for children, including secure mother-child attachment (Ainsworth, Blehar, Waters, & Wall, 1978; De Wolff & van IJzendoorn, 1997), socio-emotional competence (NICHD Early Child Care Research Network [ECCRN], 1998), and cognitive functioning (Bornstein & Tamis-LeMonda, 1997). Thus, understanding maternal factors that promote sensitive parenting is important. More than three decades ago, Ainsworth (1969) highlighted the unique role of empathy in motivating sensitive responding: "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 … she may tease him back in to good humor, mock him, laugh at him, or just ignore him" (p. 2). Dix (1991; 1992) also posited a central role of empathy in parents' sensitive responsiveness via its promotion of child-oriented motivations and goals that prioritize the child's experiences, perspectives, and emotions.

Despite the theoretical emphasis on the contribution of empathy to sensitive parenting, empirical investigations have been relatively sparse. Of the few studies to examine parental empathy as a predictor of parenting behavior, evidence suggests that the mother's empathic emotions and cognitions about her own child are related to her sensitive parenting. For instance, mothers who showed greater empathic emotion in response to videos of her infant's distress were more sensitive to distress during mother-infant interactions when infants were six months of age (Leerkes, 2010). Further, mothers' empathic insightfulness into the mental and emotional state of her child during a video-feedback task of recorded mother-child interactions was related to greater observed sensitivity with infants (Koren-

Karie, Oppenheim, Dolev, Sher, & Etzion-Carasso, 2002) and toddler-aged children (Coyne, Low, Miller, Seifer, & Dickstein, 2007).

Less is known about whether mothers' more general *dispositional* empathy is a significant correlate of sensitive parenting. Dispositional empathy, which may be a partially heritable trait (Davis, Luce, & Kraus, 1994; Knafo, Zahn-Waxler, van Hulle, Robinson, & Rhee, 2008), predisposes individuals to attune to and intrapersonally respond to others' emotional states, particularly their distress, with empathy (i.e., other-oriented concern and attempts to understand). Higher dispositional empathy has been associated with a range of positive interpersonal behaviors, including increased helping of unknown distressed others (Davis, 1983b; Eisenberg et al., 1989) and greater competence with peers and romantic partners (Davis, 1994; Eisenberg, 2005). Mothers who have greater dispositional empathy may, therefore, be more oriented towards and responsive to their children's emotional signals because of a heightened orientation to these kinds of cues generally and may experience more empathy-related emotions and cognitions that promote sensitive behavioral responses. Evidence suggests that parents with higher dispositional empathy express more sympathy (Zeifman, 2003) and other-oriented emotion (Leerkes, Crockenberg, & Burrous, 2004) in response to infant distress cues. Further, low levels of dispositional empathy have been found to characterize abusive parents (Perez-Albeniz & de Paul, 2003). However, studies have not directly examined how dispositional empathy influences observed parenting behaviors. Understanding if and when mothers' dispositional empathy predicts sensitive parenting will help clarify whether maternal traits (independent of the mother-child dyad) relate to sensitive parenting, or whether dyad-based processes primarily drive empathy-sensitivity associations.

Empathy-Sensitivity Associations: The Moderating Role of Maternal Negative Reactivity

In considering dispositional empathy as a predictor of parenting, it may not be enough to consider empathy alone. Theorists have urged a more complex understanding of parental-level factors that predict sensitive, responsive parenting (e.g., Belsky, 1984; Dix, 1991). In his affective model of parenting, Dix (1991) highlighted the parent's child-focused goals, motivations, and emotions (such as empathy) as key to responsive parenting, while at the same time stressing that parents must be able to regulate their own negative emotions, particularly in challenging parenting situations. High levels of parental distress in response to child emotions may compete with the parent's mental and emotional resources and interfere with perceiving and prioritizing the child's signals, resulting in less sensitive parenting. In other words, experiencing heightened levels of negative emotional arousal (i.e., being highly reactive) in response to child emotions may limit the extent to which the parent's empathic disposition translates to sensitive behavior. Theory (Feshbach, 1989; Letourneau, 1981) and research (Perez-Albeniz & de Paul, 2003) highlight the importance of considering parental empathy and distress together, as lower levels of empathy and elevated self-focused distress are characteristic of at-risk, abusive parents. It remains less clear how dispositional empathy and negative emotional arousal interact to predict parenting in lower-risk, community samples, as such parents are less likely to experience stressors (e.g., economic stress) that may lead to dampened levels of empathy or heightened negative emotional arousal during parenting tasks.

Physiological reactivity – and electrodermal response (as indexed by skin conductance levels, SCL), in particular – may be a useful indicator of mothers' propensity to become distressed or overly emotionally aroused in response to children's emotional cues. Fowles (1980) theorized that electrodermal responding reflects the activation of the behavioral inhibition system (BIS), which governs autonomic response to aversive circumstances or stimuli. In support of this proposition, elevated electrodermal responding has been linked to heightened anxiety (Gray, 1982) and more arousal in response to negative emotional stimuli (Balconi, Falbo, & Conte, 2012). Alternatively, some research suggests that SCL may reflect more general arousal in response to sufficiently intense emotionally evocative stimuli, such that electrodermal reactivity may be found in response to both negatively and positively valenced stimuli (Bradley & Lang, 2000; Greenwald, Cook & Lang, 1989). Notably, SCL reactivity has been linked to the more self-involved reactions (i.e., personal distress) that inhibit prosocial responding, rather than to other-oriented emotional responding (e.g., Eisenberg & Fabes, 1990), making it a useful index of the kind of emotional arousal that could interfere with sensitive responding.

Associations between SCL reactivity (an index of emotional arousal) and parenting have emerged in the literature, such that high levels of SCL reactivity to emotional stimuli (particularly child cues) appear to place individuals at risk for insensitive parenting (see McCanne & Hagstrom, 1996). For instance, greater SCL reactivity to infant cries has been found among non-parents who scored high on a risk assessment for child abuse (Crowe & Zeskind, 1992) and has been associated with more self-reported irritation, annoyance and distress in a community sample of mothers and fathers (Frodi, Lamb, Leavitt, & Donovan, 1978). Greater SCL reactivity to both child crying and laughter has also been found for parents at risk for abusive parenting (Frodi & Lamb, 1980). Thus, elevated SCL reactivity to child emotional cues may undermine sensitive responses, although less is known about how SCL reactivity relates to *observed* parenting behavior, either alone or in combination with other parental factors.

The Current Study

Our main objective was twofold. First, we examined whether maternal dispositional empathy significantly predicted maternal sensitivity. Second, we investigated maternal skin conductance reactivity as a moderator of the association between mothers' dispositional empathy and sensitive parenting. We observed maternal sensitivity across a series of mother-toddler interaction tasks during a laboratory visit lasting approximately one hour. Mothers reported on their dispositional empathy, and maternal skin conductance (SCL) reactivity was assessed from an infant cry-laugh audio paradigm during a second, "mother-only" laboratory visit. We hypothesized that greater maternal empathy would predict higher levels of maternal sensitivity. Further, because high arousal and distress in response to child emotional cues may undermine the extent to which the mother's general empathic orientation promotes sensitive responding, we hypothesized an Empathy × Reactivity interaction, such that higher levels of dispositional empathy would be related to greater sensitivity at low versus high levels of SCL reactivity.

A secondary objective was to assess the specificity of the Empathy × Reactivity moderating effect, and we did so in two ways. First, we measured SCL reactivity in two contexts (infant crying and laughter). Because infant crying is more likely to arouse high levels of emotion and distress, and thus may be more disruptive to sensitive responding, we expected that the moderating effect of SCL reactivity would be stronger when assessed in the infant cry (versus laugh) condition. Second, as evidence grows for the need to distinguish between sensitivity to distress and sensitivity to non-distress as they relate to children's social-emotional development (Leerkes, Blankson, & O'Brien, 2009; McElwain & Booth-LaForce, 2006), we examined sensitivity to distress and non-distress as separate outcomes. We hypothesized that the Empathy × Reactivity interaction (i.e., empathy associated with greater sensitivity for mothers low on reactivity) would be a stronger predictor of sensitivity to distress versus non-distress because distress evokes empathy while also eliciting competing negative arousal. Thus, mothers may show greater differentiation in sensitive behavior based on their propensity to experience these competing factors when faced with their child's distress versus non-distress cues.

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. Paralleling the SCL hypotheses, we predicted that mothers' dispositional empathy would predict more sensitive parenting when self-reported negative emotional 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.

Method

Participants

Sixty-six mother-child dyads participated in a study on parenting and child care arrangements during the toddler period. Families were eligible to participate if they had a toddler-aged child who was in non-parental 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 averaged 32.13 years of age (*SD* = 3.99) and were 80% White, non-Hispanic, 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 and $90,000 (range: $10,000 to over $100,000). Three percent of mothers had a 2-year or technical degree, 14% had completed some college, 36% had a Bachelor's degree 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 semi-structured play session (*M* = 15.44 minutes, *SD* = .61), a clean-up session (*M* = 5.13 minutes, *SD* = 1.86), an open-ended snack session (*M* = 15.46 minutes, *SD* = 3.73), and an open-ended wordless picture book task (*M* = 5.52 minutes, *SD* = 1.97). 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 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 game with the experimenter. 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* = 6 minutes).

Mother-only visit—Approximately 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 a cry-laugh paradigm (Groh & Roisman, 2009), in which mothers listened to audio recordings of infant crying and laughter via headphones. While listening to the audio-recordings, mothers were asked to imagine how they would respond if the infant was their own. Each recording was 3 minutes, and presentation of the cry and laugh recordings was counterbalanced across participants. Average fundamental frequency of the crying and laughter vocalizations was 360.06 Hz (*SD* = 58.41) and 215.96 Hz (*SD* = 119.69), respectively. The amplitude was approximately equated across vocalizations (peak amplitude averaged 89.51 decibels for each cry [*SD* = 1.85] and 91.25 decibels for each laugh [*SD* = 3.00]) and across participants by holding the volume of recordings constant.

To assess skin conductance level (SCL) in response to the infant cry and laughter conditions, mothers had sensors attached to fingers on their non-dominant hand. Using a constant-voltage device, a small voltage was passed between electrodes attached to the palmar surface of the last phalanxes of the second and fourth digits. SCL was continuously measured (in microsiemens) during a 4-minute resting, no-audio baseline and while listening to each 3-minute audio recording (of infant crying or laughter) 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 empty their mind of thoughts, feelings, and emotions. Mothers also completed the Emotional Experience Questionnaire after each condition (baseline, crying, laughter) to assess changes in emotional state. The audio-recordings 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 (Groh & Roisman, 2009).

Questionnaires—Following the mother-child visit and 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 in 60-second intervals from digital recordings of the mother-child interaction tasks (described above). Different teams of coders focused exclusively on either maternal or child behavior, and coders were blind to one another's ratings. For the purposes of this report, we examined maternal sensitivity and intrusiveness ratings, which were based on a well-established and validated coding system of maternal behavior (e.g., see NICHD ECCRN, 1999). *Sensitivity to distress* 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. Each behavior was coded on a 4-point Likert scale (1 = *not at all characteristic*, 4 = *highly characteristic*) during each 60-second interval.

Sensitivity to distress was coded only for intervals in which the child showed non-fleeting distress (i.e., distress cues of an intensity or duration greater than fleeting distress, which was defined as brief, 1-2 second, very low-intensity negative facial expression or vocalization unlikely to warrant a response), and six of the 64 mothers did not receive any ratings for sensitivity to distress because the child did not exhibit non-fleeting distress during the 55-minute observational period. All mothers received ratings of sensitivity to non-distress and intrusiveness (i.e., both behaviors were rated in most or all 60-second intervals). 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 (within participants) 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.

Maternal skin conductance level (SCL)—Change in SCL for a given condition (i.e., crying and laughter, with presentation order counterbalanced across participants) was calculated by subtracting mean SCL during the first 3 minutes of resting baseline from mean SCL during the first 2 minutes of the audio condition.[1] Positive change scores reflect greater SCL reactivity to the audio recording (compared with baseline), whereas negative change scores reflect less SCL reactivity to the audio recording (compared with baseline). One mother had hyperhidrosis (i.e., excessive sweating disorder) and another mother's data was not useable because of an equipment malfunction, reducing the sample size for SCL (N = 62).

Maternal self-reported negative emotion (NEG)—Mothers reported their emotional state at rest and after listening to the each of the audio recordings using the Emotional Experience Questionnaire, which assesses positive and negative emotional states. Mothers rated 25 different emotions on a 9-point Likert scale (0 = *not at all*; 8 = *the most emotion you have felt in your life*). Ratings of the thirteen items capturing negative emotion (i.e., anger, anxiety, 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 (NEG) was reliable for baseline (α = .88), crying (α = .86), and laughter (α = .71) conditions. To assess change in NEG in response to infant crying and laughter, baseline NEG was subtracted from NEG during crying and laughter, respectively. Positive change scores reflect more negative emotion in response to the audio recording than during baseline; negative change scores reflect less negative emotion in response to the audio recording than during baseline. Past research using this measure has found that the self-rated emotion terms reduce to reliable positive and negative emotion factors and are related in expected ways to emotional reactions during the Adult Attachment Interview (e.g., Roisman, Tsai, & Chiang, 2004).

Maternal empathy—Dispositional empathy was measured using two subscales of the Interpersonal Reactivity Index (Davis, 1980). Empathic concern (7 items, α = .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, α = .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 showed a moderate, positive correlation (r = .50, p < .001) and were averaged to create a composite of *maternal empathy*. The IRI subscales have

[1]Other sensors, including measures of brain activity (EEG), were also attached to the participants during the cry-laugh paradigm. To provide adequate EEG sampling time, the duration of the resting baseline (4 minutes) and each audio condition (3 minutes) in the present study were slightly longer than those used in previous studies (i.e., 3 minutes for baseline, and 2 minutes per audio condition; Groh & Roisman, 2009). To be consistent with measures of SCL reactivity examined by Groh and Roisman (2009), mean SCL scores from the first 3 minutes of baseline and the first 2 minutes of each audio condition (cry or laugh) were used to compute the SCL change scores. Notably, we also calculated SCL change scores using the full 4-min baseline and 3-min audio data. These scores were very highly correlated with the SCL change scores based on the shortened epoch data (r = .995 for crying; r = .989 for laughing). Further, we recomputed the main path models using the SCL change scores based on the longer epoch data, and results were identical to those reported in Table 2.

shown adequate test-retest reliability (Davis, 1980), convergent validity with other measures of empathy and concern for others (Davis, 1983a), and positive associations with prosocial responding to distressed others (Davis, 1983b).

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 × Reactivity interaction were predictors of observed sensitivity. A separate model was tested for each reactivity measure (SCL-cry, SCL-laugh, NEG-cry, NEG-laugh) and each sensitivity outcome (sensitivity to distress and sensitivity to non-distress), resulting in eight model tests. All models were saturated. 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 × Reactivity interactions simultaneously. All main effects reported in Table 2 and 3, however, were identical in significance level to models tested without the interaction term. Missing data were minimal ($n = 2$ for SCL reactivity; $n = 6$ for sensitivity to distress) and were handled using full-information maximum likelihood estimation (FIML), which offers less biased estimates than other methods (see Schafer & Graham, 2002).

In a series of follow-up analyses, we tested the specificity of the Empathy × Reactivity moderating effect via tests of path constraints. First, we 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). Second, we examined whether the Empathy × Reactivity interaction differed by type of sensitivity (i.e., sensitivity to distress versus non-distress).

Results

Preliminary Analyses

Skin conductance level (SCL; measured in microsiemens [μS]) and self-reported negative emotion (NEG) during the cry-laugh paradigm were examined first. Baseline SCL (M = 11.94, SD = 5.04) was consistent with established adult norms (Stern, Ray, & Quigley, 2001). Paired t-tests revealed that SCL during the crying (M = 13.34, SD = 5.50) and laughter (M = 13.61, SD = 5.39) conditions were significantly higher than baseline levels ($t[61] = 6.10$, $p < .001$, $d = .27$, and $t[61] = 8.19$, $p < .001$, $d = .32$, 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 ($t[61] = .99$, $p = .33$, $d = .05$). For NEG, paired t-tests revealed that NEG during crying (M = 1.58, SD = .97) was higher than at baseline (M = .87, SD = .87; $t[63] = 5.89$, $p < .001$, $d = .77$), and that NEG during laughter (M = .34, SD = .43) was lower than at baseline ($t[63] = -5.58$, $p < .001$, $d = .77$), indicating that both conditions had a significant, albeit different, effect on mothers' self-reported negative emotions. Paired t-tests also revealed that NEG during the crying condition was significantly higher than NEG during the laughter condition ($t[63] = 12.97$, $p < .001$, $d = 1.65$).

Family demographic variables (i.e., 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, d = .59), 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, d = .11). Controlling for child gender, child age was marginally associated with maternal sensitivity to distress (partial r = .23, p = .09; partial r = .12, p = .38, for sensitivity to non-distress). Lastly, the number of 60-second intervals in which maternal sensitivity to distress was coded varied due to frequency of child distress (M = 4.67 intervals, SD = 3.64), and we also examined this variable (i.e., "distress count") 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). In sum, we retained distress count, child age, and child gender as covariates. Correlations and descriptive statistics for the study measures are reported in Table 1.

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 × SCL-cry and Empathy × SCL-laugh interactions were significant (see Table 2). 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) and high (1 SD above the mean) levels of SCL reactivity. Standardized coefficients are reported below and in the figures. Empathy was related to greater sensitivity to non-distress when SCL-cry reactivity was low (B = .38, SE = .15, p = .01), but not high (B = −.26, SE = .17, p = .13; 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 = .36, SE = .16, p = .02), but not high (B = −.21, SE = .18, p = .23; see Figure 1b). For the models predicting maternal sensitivity to distress, the empathy and SCL main effects, as well as the Empathy × SCL interactions, were non-significant (see Table 2).

Path constraints—To assess the specificity of the above interaction effects, we examined a series of path constraints. First, we tested the SCL-cry and SCL-laugh main effects and interactions together in the same model as predictors of sensitivity to non-distress to examine whether the Empathy × SCL interaction differed significantly by SCL context (infant cry versus laugh). A test of the path constraint was non-significant, Wald test (df = 1) = .14, p = .71, indicating that the Empathy × SCL interactions as predictors of sensitivity to non-distress did not significantly differ depending on the context in which SCL reactivity was assessed.

Next, to test whether the Empathy × 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 × SCL interaction predicting sensitivity to distress and non-distress was non-significant: Wald test (df = 1) = .00, p = .96, for the Empathy × SCL-cry interaction, and Wald test (df = 1) = .01, p = .93, for Empathy × SCL-laugh interaction. These findings indicate that the Empathy × SCL interaction did not differ significantly in predicting sensitivity to distress versus non-distress.

Self-Reported Negative Emotion (NEG) 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 models predicting sensitivity to distress, the empathy and NEG main effects were non-significant, although the Empathy × NEG-cry and the Empathy × NEG-laugh interactions were significant (see Table 3). Simple slopes tests indicated that empathy was related to greater sensitivity to distress when NEG-cry reactivity was low (B = .37, SE = .15, 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 = .25, SE = .13, p = .05), but not high (B = −.08, SE = .14, p = .60). For the models predicting maternal sensitivity to non-distress, the main effects of empathy, NEG-cry, and NEG-laugh, and the Empathy × NEG-cry interaction were non-significant; however, the Empathy × NEG-laugh interaction was significant (see Table 3). As shown in Figure 2b, empathy was related to greater sensitivity to non-distress when NEG-laugh was low (B = .25, SE = .13, p = .06), but not high (B = −.09, SE = .15, 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 non-distress, respectively, to examine whether the interaction differed by reactivity context (infant cry versus laugh). The test of path constraints for the model predicting sensitivity to distress was non-significant, Wald test (df = 1) = .10, p = .75, indicating that the Empathy × NEG interaction did not differ as a function of NEG reactivity context. In contrast, the test of path constraints for the model predicting sensitivity to non-distress was marginally significant, Wald test (df = 1) = 2.97, p = .09, suggesting that the Empathy × NEG-laugh interaction (versus Empathy × NEG-cry) was a stronger predictor of sensitivity to non-distress (see Table 3 for parameter estimates).

Next, we examined sensitivity to distress and non-distress in the same model to test whether the Empathy × NEG interaction significantly differed by type of sensitivity. 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 path constraints for the Empathy × NEG-cry interaction was significant, Wald test (df = 1) = 5.92, p = .02, suggesting that the Empathy × NEG-cry interaction was a significant predictor of sensitivity to distress only. The test of path constraints for the Empathy × NEG-laugh interaction was not significant, Wald test (df = 1) = 1.30, p = .25, indicating that this interaction did not differ significantly in predicting sensitivity to distress and non-distress.

Discussion

The present study is one of only a few studies, to date, to investigate associations between either maternal dispositional empathy or reactivity to infant cues and observed mother-child interactions, and the only one to examine these as interactive contributors to maternal behavior. As hypothesized, we found that the empathy-sensitivity association emerged at low levels of maternal reactivity to infant cues in models using skin conductance levels (SCL), as well as in models using self-reported negative emotion (NEG), as the measure of emotional reactivity (i.e., emotional arousal). 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). In contrast to expectations, however, we did not find a significant main effect of dispositional empathy on maternal sensitivity, although partial correlations were in the expected direction (see Table 1). It may be that we lacked sufficient power to detect a relatively small effect of empathy on sensitivity. In accordance with this possibility, maternal dispositional empathy (assessed via the same IRI subscales used in this report) was significantly correlated with maternal sensitivity in a larger sample of mothers and toddlers (see McElwain, Holland, Engle & Wong, 2012, for a description of the sample and assessment of maternal sensitivity). Notably, this correlation ($r[122] = .19$, $p = .04$) was almost identical in size to the partial correlations found in the current sample. This relatively weak association suggests that dispositional empathy alone may play a limited role in promoting sensitive parenting. Instead, other intra-individual (e.g., negative arousal, as examined here) and contextual (e.g., economic stress) factors may moderate the extent to which dispositional empathy is either experienced or acted upon in the course of parent-child interactions.

As hypothesized, mothers' dispositional empathy was related to greater observed sensitivity with their toddler-aged child at low levels of electrodermal reactivity to audiotaped infant vocalizations. This pattern emerged for sensitivity to non-distress, rather than sensitivity to distress as originally expected. Although we predicted that the Empathy × Reactivity interaction would emerge when testing reactivity to infant *crying* (versus laughter), we found no evidence of such specificity. Instead, the interaction emerged in models testing both SCL-cry and SCL-laugh reactivity as the moderator. In sum, the moderating role of SCL reactivity to infant cues appeared to be robust across the contexts in which SCL reactivity was assessed.

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 emotional overarousal during parenting tasks, because high levels of reactivity are expected to interfere with responding in a child-centered, sensitive manner. Notably, some prior research suggests that elevated electrodermal reactivity may represent a state of anxiety (Gray, 1982) or activation of the inhibition system in response to negative, aversive stimuli (Balconi et al., 2012; Fowles, 1980). Other researchers, however, have presented evidence that electrodermal response may be an indicator of more general emotional arousal (Bradley & Lang, 2000). Low levels of SCL reactivity in the cry-laugh audio paradigm examined here, therefore, may signal limited maternal anxiety or distress in response to child emotions and/or relative emotional evenness in the face of child emotion signals. Given the similar pattern of results for SCL-cry and SCL-laugh, it appears that general reactivity to emotion signals may be important to the empathy-sensitivity association. When reactivity is low, parenting may become more driven and differentiated by the mothers' level of dispositional empathy because of fewer competing cognitive and emotional demands. Mothers high in empathy who experience low versus high physiological arousal (as indexed by SCL reactivity) may be better able to act on their empathic tendencies and attend to their child's cues in a way that promotes sensitive responsiveness.

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 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 arousal in response to infant cues.

A secondary objective was to investigate the specificity of associations as a function of reactivity context (cry versus laugh) and type of maternal sensitivity (distress versus non-distress). We hypothesized that the Empathy × Reactivity interaction 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. As noted above, the expected pattern of specificity did not emerge for SCL as the moderator, although specificity did emerge for mother-reported negative emotions. Namely, in follow-up path constraints with sensitivity to distress and non-distress examined together as outcomes, negative emotion in response to cry moderated the association between empathy and sensitivity to distress, specifically. In considering the specificity of effects that emerged for negative emotion in response to cry, compared with the more general pattern found for SCL reactivity, we note a key difference in our two measures of reactivity. SCL reactivity may tap more non-conscious emotional processes that have more general and non-specific influences on maternal perceptions and behavior. In contrast, maternal reports of negative emotions may capture more conscious processing of emotions, which in turn may influence behavior somewhat differently than physiological reactivity. Conscious processing of emotions in response to infant crying versus laughter may bear more distinct relations to specific parenting situations (e.g., responding to child's distress versus non-distress). Such an interpretation is tentative, and future research should continue to explore how physiological and self-report factors may differentially predict sensitivity.

Lastly, negative emotion in response to laugh moderated the association between empathy and both sensitivity to distress and non-distress. Further, negative emotion in response to laugh specifically emerged as the moderator of the association between empathy and sensitivity to non-distress. These findings were somewhat unexpected and need to be considered in the context of the descriptive data. That is, on average, mother-reported negative emotions in response to infant laughter significantly *decreased* from baseline.

Thus, high levels of “positive reactivity” appear to reflect a *lack of decrease* in negative emotion (and possibly a parallel lack of increase in positive emotions) in response to infant laughter. Further inquiry is needed into the specificity of maternal correlates of parenting, especially with regard to maternal negative and positive emotional response to child negative and positive emotional cues.

We acknowledge several limitations of this study. First, we assessed maternal physiological reactivity in a brief laboratory situation. Such laboratory situations provide important controls, yet the degree to which physiological reactivity in the laboratory corresponds to reactivity in more naturalistic settings is still largely unknown and warrants investigation. Second, children in our sample were toddler-aged, whereas the audio-recordings were of an infant. Although crying is a generally emotionally and physiologically evocative stimulus, parental status (non-parent, primparous and multiparous) may attenuate responses to infant distress cues (Boukydis & Burgess, 1982). Research linking maternal reactivity to toddler-specific emotional cues and sensitive parenting is needed, particularly given the unique demands and challenges of parenting toddlers. Finally, we note issues with the generalizability of our findings. Our sample of mothers was racially homogenous (80% White) and tended to have high family incomes. Additionally, mothers averaged high levels of educational attainment, which likely influenced their knowledge of child development and cognitive flexibility that they could draw upon during parenting tasks. Future research examining the hypothesized associations among empathy, physiological arousal, and parenting in a more diverse sample of mothers is needed. It is conceivable that mothers with lower levels of socioeconomic resources may be at risk for higher levels of stress and, thus, may show more pronounced effects of physiological arousal on empathy-sensitivity associations. Despite this limitation, however, we note that past research on dispositional empathy has largely focused on at-risk parents. Our investigation of a low-risk community sample adds to the literature by suggesting that maternal empathy and negative emotional reactivity are also important for parents who have greater socioeconomic resources, and points to a need to consider these factors in a wider range of parent populations.

Despite these limitations, our study is one of the first to attempt to directly examine the association between dispositional empathy and sensitive parenting behavior and is the only one to do so within a more complex framework using multiple methodologies (i.e., observational, physiological, and self-report assessments). Given the importance of sensitive parenting for children’s social-emotional well-being and development, a fundamental objective is to understand how parental characteristics predict sensitive parenting. Our assessment of maternal empathy and reactivity outside the context of the specific mother child-dyad provides support for the notion that dispositional characteristics of the mother play an important part in maternal sensitive responding. Although more research is needed to clarify the associations further, the current findings indicate greater maternal empathy in combination with low levels of reactivity promote sensitive responding.

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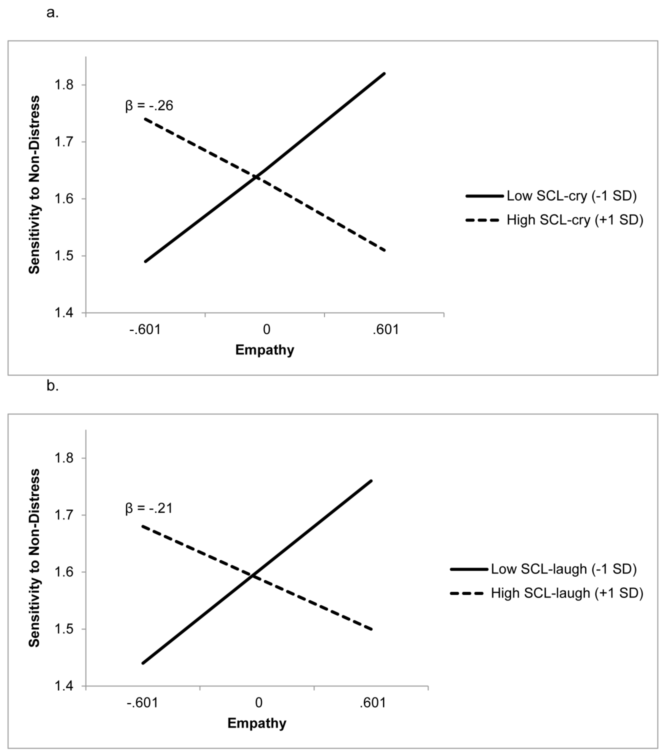

Figure 1.

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. *$p < .05$.

a.

b.

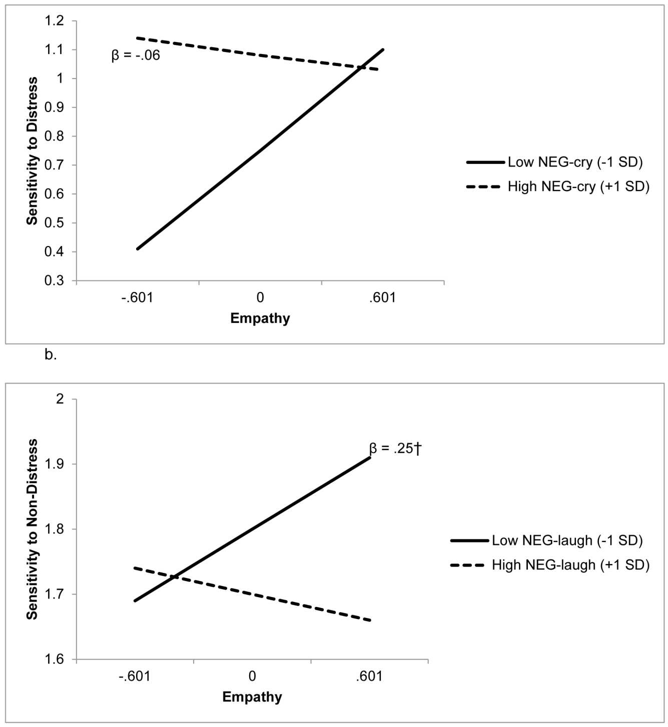

Figure 2.

(a) Maternal sensitivity to distress as a function of mother dispositional empathy and self-reported negative emotion (NEG) change from baseline to crying condition. (b) 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. † $p < .10$, *$p < .05$.

Table 1

Intercorrelations and Descriptive Statistics for the Study Measures

Study measures	1.	2.	3.	4.	5.	6.	7.
1. Maternal empathy	---	.18	.05	.10	.24†	.09	.09
2. SCL-change, cry	.15	---	.22†	.34**	.36**	.02	−.04
3. SCL-change, laugh	.05	.22†	---	−.04	.04	.07	−.02
4. NEG-change, cry	.09	.34**	−.05	---	.63***	.24†	−.02
5. NEG-change, laugh	.20	.34**	.05	.64***	---	.15	−.01
6. Sensitivity to distress	.15	.10	.12	.28*	.16	---	.53***
7. Sensitivity to non-distress	.11	−.02	−.02	−.05	−.04	.41***	---
N	64	62	62	64	64	58	64
Mean	2.88	1.39	1.67	.70	−.53	1.23	1.68
SD	.60	1.81	1.60	.95	.77	.91	.44

Note. Bivariate intercorrelations are displayed above the diagonal; partial correlations controlling for child age, child gender and distress count are displayed below the diagonal. SCL = Skin conductance level; NEG = Self-reported negative emotion.

† $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 2

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

	Sensitivity to distress			Sensitivity to non-distress		
	***B* (*S.E.*)**	**β**	**R^2**	***B* (*S.E.*)**	**β**	**R^2**
Crying condition						
Gender (0=Male)	.56 (.21)	.30**	.34**	.07 (.10)	.08	.30**
Child age	.04 (.02)	.20†		.01 (.01)	.11	
Distress count	−.10 (.03)	−.41***		−.05 (.01)	−.42***	
Empathy	.20 (.18)	.13		.04 (.08)	.06	
SCL change	.02 (.06)	.04		−.01 (.03)	−.03	
Empathy × SCL change	−.12 (.10)	−.13		−.13 (.05)	−.30**	
Laughter condition						
Gender (0=Male)	.57 (.21)	.31**	.33**	.06 (.10)	.07	.28**
Child age	.04 (.02)	.20†		.01 (.01)	.12	
Distress count	−.10 (.03)	−.39**		−.05 (.01)	−.40**	
Empathy	.21 (.17)	.14		.05 (.08)	.07	
SCL change	.04 (.06)	.07		.00 (.03)	−.02	
Empathy × SCL change	−.14 (.12)	−.12		−.13 (.06)	−.25*	

† $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 3

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

	Sensitivity to distress			Sensitivity to non-distress		
	B (S.E.)	β	R^2	*B (S.E.)*	β	R^2
Crying condition						
Gender (0=Male)	.46 (.20)	.25*	.41***	.07 (.10)	.08	.22*
Child age	.03 (.02)	.14		.01 (.01)	.10	
Distress count	−.11 (.03)	−.44***		−.05 (.01)	−.42***	
Empathy	.24 (.17)	.16		.08 (.08)	.11	
NEG change	.17 (.10)	.18†		−.02 (.05)	−.05	
Empathy × NEG change	−.35 (.15)	−.25*		−.03 (.08)	−.04	
Laughter condition						
Gender (0=Male)	.46 (.20)	.25*	.39 ***	.04 (.10)	.05	.27**
Child age	.04 (.02)	.20†		.01 (.01)	.08	
Distress count	−.12 (.03)	−.46***		−.06 (.01)	−.47***	
Empathy	.13 (.17)	.08		.06 (.08)	.08	
NEG change	.10 (.13)	.08		−.07 (.07)	−.11	
Empathy × NEG change	−.33 (.16)	−.23*		−.16 (.08)	−.24*	

† $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$