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Children's Empathy Responses and their Understanding of Mother's Emotions

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Abstract

This study investigated children's empathic responses to their mother's distress to provide insight about child factors that contribute to parental socialization of emotions. Four- to six-year-old children ($N=82$) observed their mother's sadness and anger during a simulated emotional phone conversation. Children's facial negative affect was rated and their heart rate variability was recorded during the conversation, and their emotion understanding of the conversation was measured through their use of negative emotion words and perspective-taking themes (i.e., discussing the causes or resolution of mother's emotions) in narrative accounts of the conversation. There were positive quadratic relationships between HRV and ratings of facial affect, narrative references to mother's negative emotions, and perspective-taking themes. High and low HRV was associated with high facial negative affect, suggesting well-regulated sympathy and poorly regulated personal distress empathic responses, respectively. Moderate HRV was associated with low facial negative affect, suggesting minimal empathic engagement. High and low HRV were associated with the highest probabilities of both emotion understanding indicators, suggesting both sympathy and personal distress responses to mother's distress facilitate understanding of mother's emotions. Personal distress may motivate attempts to understand mother's emotions as a self-soothing strategy, whereas sympathy-related attempts to understand may be motivated by altruism.

Keywords: parent child relations, empathy, emotional development, emotion understanding, heart rate

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Early childhood is a critical period for the development of emotion understanding and empathy due to advancements in cognitive skills, theory of mind, self-understanding, and language abilities that enable children to identify and shape their own and others' emotional experiences (Eisenberg, Fabes, & Spinrad, 2006; Thompson & Meyer, 2007). Young children's emotion understanding and empathic responding abilities have been linked to academic success (Denham et al., 2012), social competence (Denham et al., 2003), and behavior regulation (Denham, Caverly, et al., 2002). Witnessing parents' emotional displays, their strategies for managing emotions, and their responses to others' emotions provides an important context for acquiring emotional competence (Denham & Kochanoff, 2002; Eisenberg, Spinrad, & Sadovsky, 2006). While parenting practices, such as emotion "coaching," are known to facilitate children's emotional development (e.g., Denham et al., 1997), little is known about child factors that influence children's emotion learning from parents' emotional experiences. The purpose of this study is to investigate the role of young children's empathic physiological responses in their understanding of their mother's emotions.

Development of Emotion Understanding

Emotion understanding refers to a range of related skills, including awareness of one's own emotions, discernment of other's emotions, knowledge of the causes and consequences of emotions, and recognition of one's own role in other's emotional experiences. Development of these skills during early childhood allows children to communicate their feelings, recognize the role of emotions in social situations, and discern causal relations between interpersonal events and emotions. Emotional competence theories (Denham, 1998; Saarni, 1999) emphasize emotion understanding as a key component of early social cognition, self-efficacy in emotional encounters, the

formation of healthy social relationships, and continued emotional development throughout childhood. According to models of parental socialization of emotion (e.g., Eisenberg, Spinrad, & Cumberland, 1998; Thompson et al., 2007), children's emotion understanding is shaped by explicit socialization strategies, such as discussion and direct teaching about emotion-laden situations, as well as indirect socialization processes, such as parents' affect displays and reactions to children's emotions (Denham & Kochanoff, 2002; Dunn & Hughes, 1998; Eisenberg et al., 1998). Indeed, parents' labeling and explaining children's emotions, comforting children's distress, and sharing positive emotions have been associated with better emotion understanding in children (e.g., Denham, Mason, & Couchoud, 1995; Denham et al., 1997).

While both mothers and fathers are important to young children's social and emotional development (e.g., Liang et al., 2012), research suggests that mothers may play a more key role in facilitating young children's understanding of and communication about emotions (e.g., Chaplin, Cole, & Zahn-Waxler, 2005; Hastings et al., 2007). Mothers are more likely to discuss the causes and origins of emotions than fathers (Fivush et al., 2000), and mothers' but not fathers' positive emotional displays and facilitation of children's emotional expressions predict children's emotion understanding (Denham & Kochanoff, 2002). Thus, although understanding the role of both mothers and fathers is important, this study will focus on mothers.

Children's Empathic Responses

Although many studies have investigated parent factors that facilitate the socialization of children's emotion understanding, surprisingly little research has investigated how child factors contribute to emotion learning through parent socialization processes. According to Eisenberg, Spinrad, and Cumberland's (1998) socialization of emotion model, parents' emotion-related socializing behaviors will be

most effective in facilitating emotion learning when they promote children's emotional involvement. Researchers distinguish two types of empathic responses to witnessing distress in others (Eisenberg, 1989; Eisenberg, Schaller, et al., 1988). Personal distress is an aversive emotional reaction characterized by physiological hyperarousal that often causes individuals to withdraw from the person in distress in an attempt to reduce one's own discomfort. Sympathy, on the other hand, is an other-oriented response characterized by compassionate feelings of concern for the distressed person that is associated with good physiological regulation (Eisenberg et al., 1991). Personal distress reactions indicate awareness and some processing of the other's emotions, but emotion learning may be hindered by distressed children's tendencies to direct their cognitive and emotion resources inward for self-comforting and thus away from the parents' emotions (Wallin, Quas, & Yim, 2009). Sympathy in response to parents' distress might facilitate the socialization process as good regulation would allow the child to focus on the parent and learn from the encounter and sympathy emotions may signal parents to explain the source of their own emotions and facilitate children's emotion regulation.

Measuring Children's Emotion Understanding and Empathic Responding

One method of indexing children's emotion understanding is through their autobiographical narratives about emotional events (e.g., Fivush, 2007). Consistent with emotional competence models, studies have shown that children can produce autobiographical narratives to communicate their interpersonal experiences by age two or three (Fivush & Hudson, 1990), and by about age four children can reliably and spontaneously recognize and label positive and negative emotions (e.g., Widen & Russell, 2010) and demonstrate more advanced perspective-taking skills, such as providing coherent and plausible explanations for their own and others' emotions (e.g., Dunn et al., 1998). The content of young children's narratives is not identical to the

reality of the events; rather, it is the product of children's past experiences and learning and their cognitive processing during the event, including their awareness and discernment of other's emotions and perceptions of the cause of emotions (e.g., Alexander & O'Hara, 2009). Thus, quantifying emotion recognition/labeling and perspective-taking ideas in children's narratives provides a measure of their emotion understanding.

Current developmental models of empathic responding (e.g., Decety & Svetlova, 2012) emphasize the role of biological systems, and physiological indices are critical for quantifying sympathy and personal distress responses. Psychophysiological measures of cardiac activity, particularly measures of heart rate and heart rate variability (HRV), in response to others' emotions witnessed either in vivo or on videos are most often used to index the biological component of children's empathic responses (e.g., Liew et al., 2003; Van Hulle et al., 2013). HRV refers to fluctuations in the duration of the interbeat intervals in the normative cardiac rhythm. It reflects the continuous interplay between sympathetic and parasympathetic influences on heart rate, providing a measure of autonomic flexibility to environmental demands (Appelhans & Luecken, 2006; Porges, 2001). Greater autonomic flexibility during stressful social encounters is adaptive, as it readies the body for action and promotes social behavior (Doussard-Roosevelt, Montgomery, & Porges, 2003; Porges, 2001); indeed, greater HRV during social stressors has been linked to various positive social and emotional outcomes in young children (e.g., El-Sheikh, Harger, & Whitson, 2001; Zahn-Waxler et al., 1995).

Empathic responding is typically characterized not only by physiological changes but also by behavioral evidence of negative affect (Decety et al., 2012). Ratings of facial expressions during lab tasks and parent/experimenter simulations of emotions have been widely used to quantify young children's emotional responses to distress in

others (e.g., Zahn-Waxler et al., 1992), and the validity of these ratings is supported by expected associations, for example between observed high anger on frustrating lab tasks and rating scale measures of poor self-control (e.g., Gilliom et al., 2002).

Present Study

In summary, children's emotion understanding develops largely through socialization experiences with their parents, particularly mothers. While mothers' socialization behaviors have been found to facilitate children's emotion learning, studies have not investigated the role of child factors, such as empathic involvement, in children's understanding of parents' emotions. The purpose of the present study was to investigate how young children's empathic responses to mother's sadness and anger are related to evidence of emotion understanding in the children's narratives about their mother's emotions.

In this study, we examined individual differences in children's empathic responses by exposing all children to the same emotional scenario; children witnessed their mothers simulate sadness and anger during a pretend emotional phone conversation. Children's facial expressions of negative affect were rated and their HRV was measured throughout the phone conversation. Children then provided narrative accounts of the phone conversation and the narratives were coded for their emotion understanding, specifically for inclusion of negative emotion words, a basic emotion understanding skill, and perspective-taking themes, a more advanced emotion understanding skill. First, we hypothesized both personal distress and sympathy physiological responses would predict high levels of observed facial negative affect. That is, we predicted a quadratic relationship between HRV and facial expressivity ratings with low HRV and high facial negative affect indicating a poorly regulated personal distress response, high HRV and high facial negative affect indicating a well-

regulated sympathy response, and low facial negative affect and moderate HRV (i.e., neither poor nor good physiological regulation) indicating little empathic engagement. Second, we predicted a quadratic relationship between HRV and the two measures of emotion understanding. We expected high HRV (i.e., empathic and well-regulated sympathy responses) would be associated with the greatest emotion understanding, low HRV (i.e., empathically engaged but poorly regulated personal distress responses) would be associated with moderate emotion understanding, and moderate HRV (i.e., low empathic engagement responses) would be associated with the poorest emotion understanding.

Method

Sample

Four- to six-year-old children and their mothers ($N=82$) were recruited from two sources: (1) a pool of families who responded to mailings soliciting individuals interested in participating in studies ($n=71$), and (2) clinics at a large health maintenance organization (HMO; $n=11$). The sample was primarily Caucasian (80.5%), with 7.3% African American, 3.7% Hispanic, 3.7% Asian, and 4.9% other races. Mothers were well educated (90.2% had at least an undergraduate college degree), and 63% of the families had a yearly income of at least \$100,000 (average of \$110,000-119,000). Most mothers were married or living with a partner (90.2%).

Simulated Emotional Phone Call

Children witnessed their mother express emotions during a pretend phone conversation with a friend (procedure adapted from the Simulated Phone Argument Task developed by Davies, Cummings, & Winter, 2004). The mother and child sat alone at a table in a room. The child drew a picture as the mother received a telephone call from a researcher. An audiorecording with emotional phrases was played over the

phone, and the mothers repeated the emotional phrases in the appropriate emotional tones. The mother first greeted her "friend" using a happy tone. Then, she used a sad tone while making five statements that either identified her sadness (e.g., "that makes me so sad") or were emotionally consistent with sadness (e.g., "that's awful"). Next, the mother pretended to be "on hold" to provide greater opportunity for the child to interact with her. This procedure was repeated for mother's anger; she was happy, made five angry statements, and was "on-hold." She then ended the conversation using a neutral tone. The duration of the phone conversation was four minutes and forty seconds, with mothers spending equal time (70 seconds) expressing anger and sadness. The script did not indicate the causes of mothers' emotions to avoid inclusion of details that may have been particularly salient to individual children. Mothers were instructed to use a level of emotional expressiveness they might typically use in a similar situation so that the level of expressiveness would not seem more atypical for some children than others. The children and their mothers were videotaped during the phone conversation; the tapes were used to rate children's and mothers' affect. Two participants questioned the reality of the scenario during the phone call and thus were not included in the sample of 82 participants.

Affect Ratings

Children's empathic affect. Children's negative affect, specifically their sadness, anxiety, and anger, when their mother expressed sadness and anger were rated by one of three researchers who were blind to the study purpose and all information about the family. Ratings were made on a 5-point rating scale that is closely aligned with previous systems for rating affect (Eisenberg, Fabes, et al., 1988; Zahn-Waxler et al., 1995). Higher ratings are given to affect that is intense and persistent and lower ratings are given to affect that is subtle and brief. Initial inter-rater reliabilities and

observer drift reliabilities (calculated for at least twenty-five percent of the sample) were strong. Cohen's Kappas ranged from .74 to .85 across the raters and emotions ($M=.80$). Displays of the separate negative emotions occurred at low rates, so the highest rating of children's anxiety, anger, or sadness during mother's "sadness" or "anger" was used as a measure of children's empathic affect when mother displayed distress.

Mothers' affect. Mothers' affect (used as a covariate) was rated by three additional, blind researchers using the same 5-point rating scale used to rate children's affect with the modification that mother's tone of voice was given more weight since children were often focused on drawing, rather than looking at the mother. Mothers' sadness was rated during the sad portion of the phone call and anger was rated during the angry portion. Average inter-rater reliabilities (Cohen's Kappas) were .89 for sadness and .84 for anger. A paired samples t test revealed no significant within-person differences in mean ratings of mother's anger and sadness [$M_{Sad}=3.51$, $M_{Angry}=3.51$; $t(81)=0.00$, $p=1.00$], and the correlation between anger and sadness ratings was strong ($r=.48$). Thus, an average of these two ratings was used.

Narrative Recall

A researcher who had been working with the child for at least thirty minutes elicited the narrative about the phone conversation using a script of questions (e.g., "What happened when the phone rang?") and requests for information (e.g., "Tell me everything you remember about what your mother was feeling and you were feeling."). After reading the script, the researcher listened to the child and encouraged further responses with the prompt "Tell me more." The researcher continued prompting until the child said he or she could not remember any more or did not respond to the researcher's questions. Two additional blind researchers transcribed and coded the

narratives for references to mother's negative emotions and children's inclusion of perspective-taking themes (specifically descriptions of the causes or resolutions of mother's emotions). Cohen's Kappas for the two researchers ranged from .92 to 1.0 ($M=.95$ for sad, $M=1.0$ for anger, $M=.97$ for hypotheses). Since only 57.3% children mentioned negative emotions and 40.2% included a perspective-taking theme, these variables were used as binary variables rather than a count of the number of references, a rating of the sophistication of the theme, or distinct theme categories.

Heart Rate Variability

HRV was measured using procedures similar to those used in previous studies of children's empathic responses (Cole et al., 1996; Zahn-Waxler et al., 1995). Three electrodes were placed on the child's chest in a triangular arrangement: two on the chest and a third, ground electrode above the naval. The electrocardiogram (ECG) signal was recorded continuously during the phone call and a resting period at a sampling rate of 1125 Hz and was amplified using a custom-built amplifier. The digitized ECG files were cleaned by trained researchers to remove noise, such as that generated by coughing or large body movements. The length of time between R spikes of the QRS complex in the ECG waves was quantified using a computer program written for this study. A researcher then examined the files to ensure the program captured each R spike and not spikes resulting from artifacts. The variance in interbeat intervals (R to R spikes) during a resting period was subtracted from the variance in interbeat intervals during the phone conversation to calculate a measure of autonomic reactivity in response to the phone call. For interpretability, these difference scores were transformed into z-scores. Higher scores indicate greater HRV (i.e., greater autonomic flexibility) during the phone conversation.

Modifications to the procedure and equipment made at the beginning of the study rendered data from three initial participants unusable. Other data were lost due to malfunctions in the equipment (e.g., a wire coming loose within the amplifier). A few files were also unusable due to the children playing with the electrodes, creating too much noise to clean, or removing the electrodes during the phone call. Finally, five children refused to wear the ECG electrodes. Sixty-one of the 82 children with video data had usable ECG files for both the emotional conversation and resting periods. A small amount of noise ($M=1.67$ seconds, $SD=4.34$) was cut from 20.1% ($n=14$) of the ECG data files.

Questionnaires and Tests

Family conflict was assessed using mother's report on the 9-item *Family Environment Scale* (FES; Moos & Moos, 1984) subscale that measures degree of expressed anger, conflict, and aggression among family members ($\alpha=.62$ in our sample). The *Psychiatric Diagnostic Screening Questionnaire* (PDSQ; Zimmerman & Mattia, 2001) is a brief, psychometrically strong, self-report checklist to assess the presence or absence of current symptoms of DSM-IV disorders. For this study, the 21-item, major depressive disorder scale ($\alpha=.78$) was used. A subtest of the *Test of Early Language Development-Third Edition* (TELD-3; Hresko, Reid, & Hammill, 1999) was administered to assess oral communication skills. Higher TELD-3 standard scores indicate better expressive language abilities.

Procedure

Families first completed informed consent and assent procedures. After the child seemed comfortable in the research setting, the ECG electrodes were placed on the child's chest. Then, the TELD-3 was administered to the child in one room, while the mother was trained on the phone call procedure in another room. The training included

reading a script of the dialogue, listening to the audiotape of the phone conversation, and practicing the script. Next, the mother rejoined the child. They sat at a table; video cameras captured views of the child and the mother. The child was given crayons and paper, was asked to draw a picture, and did not have access to other toys. After leaving the mother and child alone in the room, the researcher called the mother on her cell phone and played the audiotape of the conversation. The child's heart rate was recorded during the phone conversation. After the phone call, the mother left the room and the researcher returned to elicit the child's narrative. During this time, the mother completed the questionnaires in another room. Finally, after approximately 30 minutes of play time, a 5-minute sample of resting ECG was recorded as the child looked at picture books.

Results

Preliminary Analysis

Independent samples *t* tests and chi-square tests were used to determine if there were differences in variables by recruitment source and missingness on ECG variables. There were no significant differences for the outcome or predictor variables and only a few differences for the covariates. Mothers recruited from the HMO had higher levels of depression, $t(80) = -3.16, p = .002$. Family conflict was higher for children with ECG data than children without ECG data, $t(80) = -2.23, p = .03$, and expressive language scores were higher for children with noise cut from their ECG than children without noise cut, $t(80) = -2.80, p = .006$. Table 1 displays means, standard deviations, frequencies, ranges and correlations among study variables.

(Table 1 about here.)

Tests of Hypotheses

Mplus 6 software (Muthén & Muthén, 1998-2010) was used to estimate path analysis (regression) models with maximum likelihood estimation, thus using all available data ($N=82$). Several covariates were included in the models: children's age, gender, and expressive language abilities; ratings of mother's simulation of emotions; and two measures of children's typical exposure to negative emotions, mother's current depression symptoms and family conflict. A curvilinear (OLS) regression model was used to examine the association between HRV and facial expression ratings. This model revealed a significant quadratic relationship, ($b_{\text{linear}}=-.03$, $SE=.13$, $p=.81$; $b_{\text{quadratic}}=.12$, $SE=.05$, $p=.04$), such that facial negative affect was highest at both high and low levels of HRV, though particularly at high levels of HRV (see Figure 1, panel A). One covariate, ratings of mother's negative emotions, had a significant positive effect on ratings of children's facial expressions.

(Figure 1 about here.)

Curvilinear logistic regression models were used for the binary measures of emotion understanding in the narratives, (a) reference to mother's negative emotions and (b) inclusion of a perspective-taking theme. There were significant quadratic relationships between HRV and both referencing mother's negative emotions, ($b_{\text{linear}}=-.73$, $SE=.37$, $p=.04$; $b_{\text{quadratic}}=.33$, $SE=.14$, $p=.04$) and including a perspective-taking theme ($b_{\text{linear}}=-1.34$, $SE=.49$, $p=.006$; $b_{\text{quadratic}}=.55$, $SE=.20$, $p=.005$). None of the covariates were significant predictors in either model. See Figure 1, panels B and C. Low and high HRV were associated with the highest probabilities of referring to mother's negative emotions in the narrative and the highest probabilities of including a theme that indicates perspective-taking abilities. For both variables, the probabilities were particularly strong at low levels of HRV. Models estimated using the subset of participants with complete ECG data revealed very similar findings, that is significant

quadratic effects for facial expressivity ratings ($b_{\text{linear}}=-.07$, $SE=.14$, $p=.62$; $b_{\text{quadratic}}=.13$, $SE=.06$, $p=.03$), references to negative emotions ($b_{\text{linear}}=-.88$, $SE=.38$, $p=.02$; $b_{\text{quadratic}}=.43$, $SE=.18$, $p=.02$), and ($b_{\text{linear}}=-1.58$, $SE=.49$, $p=.001$; $b_{\text{quadratic}}=.65$, $SE=.20$, $p=.001$).

Discussion

Young children's development of emotion understanding is shaped primarily through socialization processes within the family context (e.g., Denham, Bassett, & Wyatt, 2007; Denham & Kochanoff, 2002). Little is known about the role of child factors, such as empathy responses, in emotion learning through parental socialization. The paradigm used in this study provided an opportunity to measure individual differences in children's physiological reactions (HRV) and facial expressions of negative affect in response to their mother's sadness and anger expressed during a pretend phone conversation and their understanding of mother's emotions measured through their narrative accounts.

The findings revealed a pattern of empathy-related emotional responding that is consistent with our hypotheses and Eisenberg's (2010) distinction between sympathy and personal distress responses to another's distress. Ratings of children's facial negative affect in response to mother's emotions were highest for children with both low and high HRV. Facial negative affect accompanied by low HRV, indicating poor autonomic flexibility, are consistent with a personal distress response, and facial negative affect with high HRV, indicating adaptive autonomic flexibility, is consistent with a sympathy response.

Children's empathic responding predicted their emotion understanding of the phone conversation in a way that largely supports the hypotheses. Children's HRV had a U-shaped quadratic relationship with the two measures of emotion understanding.

Children with high and low HRV had the highest probabilities of referring to mother's negative emotions in their narratives and discussing in their narratives the cause or resolution of mother's emotions. Children with moderate levels of HRV had the lowest probabilities of demonstrating these two emotion understanding skills. Thus, as expected, sympathy (high HRV) and personal distress (low HRV) physiological responses, both of which were associated with high facial distress and are indicative of empathic engagement, were associated with better emotion understanding than moderate HRV, which was associated with low facial negative affect, suggesting low empathic involvement. Unexpectedly, autonomic inflexibility characteristic of personal distress reactions was associated with slightly better emotion understanding than good autonomic flexibility characteristic of sympathy responses. Although personal distress responses are often associated with internal efforts to self-soothe and thus restricted cognitive engagement with the other's distress, these responses may motivate attempts to understand mother's negative emotions as a self-soothing strategy, given the importance of mother's emotional stability in children's sense of security. Sympathy-based attempts to understand mother's emotions, on the other hand, may be motivated by altruism.

Together these findings (a) support individual differences in children's empathic responses to mother's emotions, (b) suggest that empathic involvement in the form of both sympathy and personal distress were associated with evidence of children's better understanding of their mother's emotions, and (c) provide a framework for future research. Although personal distress and sympathy responses were related to children's emotion understanding, the processes through which these distinct responses lead to emotion understanding and the long-term consequences of consistent personal distress versus sympathy motivations for interest in mother's emotions may be quite different.

Good physiological regulation, particularly when combined with outward expressions of sympathy, might facilitate the socialization process by allowing children to focus on their parent, rather than their own distress, and providing opportunities for parents to respond to children's emotions and facilitate emotion learning. Over time, personal distress reactions to parents' emotions may minimize the effectiveness of socialization processes if children are consistently focused on understanding their mother's emotions for the purpose of self-soothing, thus rendering parents' emotions and attempts to facilitate emotion understanding less salient and minimizing children's awareness of opportunities to act prosocially. While the purpose of this study was to examine how child factors contribute to emotion understanding, we expect that empathic responses provide the context for emotion learning and that better emotion understanding facilitates expressions of concern for others. That is, empathic responses and emotion learning likely have bidirectional influence.

Limitations

A few limitations of the design should be noted. First, the presence of cameras and instruction that mothers avoid discussing the causes of their emotions likely created a somewhat artificial environment. Second, other indices of heart rate variability, such as frequency domain or spectral analysis methods, provide more pure indices of parasympathetic activity. However, despite their power, they have yet to yield more consistent information about children's empathic responses than HRV, and our HRV findings are consistent with the larger literature on children's empathy (Van Hulle et al., 2013). Third, the mothers in the sample were primarily Caucasian and had relatively high levels of education, possibly limiting the generalizability of the findings. Finally, this was a cross-sectional study and does not indicate how children's responses to mother's emotions are related to emotional competence over time.

Future Directions

Future investigations of longitudinal and reciprocal associations between young children's empathic responses to parents' emotions, their cognitive processing of these emotions, parents' socialization behaviors, and children's emotional development would be informative for understanding factors that facilitate young children's social-emotional competence. Our findings underscore the value of employing diverse methods to assess different facets of children's empathic responding, and future research may expand the design to include mothers and fathers, more interactive emotional scenarios, and both time-series and frequency domain measures of HRV.

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Table 1. *Descriptive Statistics and Correlations among Study Variables*

	<i>N</i>	<i>M (SD) or %</i>	<i>Range</i>	<i>Correlations</i>									
				2.	3.	4.	5.	6.	7.	8.	9.	10.	
1. Age (months)	82	59.57 (6.43)	48 - 72	-.05	.04	-.17	.10	-.11	-.34**	.14	.15	.21	
2. Gender	82	52.4%			-.07	-.27*	-.07	-.10	-.15	-.09	-.07	.07	
3. Mother's Emotion Rating	82	3.51 (0.66)	2 - 5			.05	-.01	-.17	.12	.26*	-.06	.12	
4. Expressive Language	82	99.16 (9.44)	82 - 124				-.04	-.16	-.01	.11	.01	.18	
5. Family Conflict	82	2.51 (1.81)	0 - 7					.30**	-.13	-.06	.08	-.11	
6. Mother's Depression	82	2.57 (2.67)	0-13						.01	-.01	-.03	-.12	
7. Heart Rate Variability (z-score)	61	0.0 (1.00)	- 2.31-3.19							-.01	-.24	-.35**	
8. Facial Expressivity	82	3.01 (.99)	1 - 5								.31**	.17	
9. Reference Negative Emotions	82	57.3%										.46**	
10. Perspective-Taking Theme	82	40.2%											

Notes. * < .05, ** < .001. Gender (0=female, 1=male).

Figure 1. Quadratic Relationship between Heart Rate Variability and (A) Negative Facial Expressivity Ratings, (B) Probability (of the log odds) of Recounting Mother's Negative Emotions during the Narrative, and (C) Probability (of the log odds) of Including a Perspective-Taking Theme in the Narrative.

