

Mothers' Emotional Reactions to Crying Pose Risk for Subsequent Attachment Insecurity

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Abstract:

Links between maternal emotional reactions to crying (anger and anxiety) and infant attachment security were examined in 119 mother-infant dyads. Mothers rated the intensity of their emotional responses to videotapes of crying infants prenatally. Maternal sensitivity was observed during infant exposure to emotion eliciting tasks at six and 16 months postpartum and mothers' self-reported on their responses to their infant's negative emotions at 16 months. Infant attachment security was assessed using the Strange Situation at 16 months postpartum. Results indicated that observed sensitivity was associated with fewer avoidant and resistant behaviors and prenatal maternal anger and anxiety in response to infant crying predicted the developing attachment system independent of observed sensitivity, but in different ways. Maternal anxiety in response to crying was positively associated with resistant behaviors as a direct effect. Maternal anger in response to crying was associated with avoidant behaviors indirectly through mothers' self-reported punitive and minimizing responses to infant distress at 16 months. Theoretical, applied, and methodological implications are discussed.

Keywords: attachment | infant crying | maternal emotions | maternal sensitivity | security | anger | anxiety

Article:

From attachment and evolutionary perspectives (Bowlby, 1969/1982), infant crying is a highly salient social cue that signals the infant's need for safety, protection, and comfort and is believed to serve the purpose of survival by bringing the caregiver back into proximity with the infant and eliciting caregiving and protective behaviors. Yet, infant crying is viewed as an aversive stimulus by adults (Murray, 1985), and there is substantial variability in the nature of maternal emotional reactions to crying ranging from sadness and empathy, to mild irritation or anxiety, to extreme hostility (Frodi & Lamb, 1980; Vecchio, Walter, & O'Leary, 2009). Moreover, there is emerging evidence that mothers' emotional arousal in response to child stimuli is linked with the quality of parenting they provide (Lorber & O'Leary, 2005; Mills-Koonce et al., 2009). Presumably, mothers' affective responses to crying affect the nature of the caregiving they provide during

times of infant distress, which in turn predicts attachment security (McElwain & Booth-LaForce, 2006). In the current study, we examine the possibility that mothers' anger and anxiety in response to infant crying play a unique role in the development of attachment security, both directly via the impact of maternal emotion expression on the infant and indirectly via their impact on maternal sensitivity in distressing situations.

A secure mother-infant attachment is linked with a variety of adaptive child outcomes including feelings of self-worth, social competence, and fewer behavioral problems, and these positive effects extend into adulthood (see Weinfield, Sroufe, Byron, & Carlson, 2008 for a review). The implications of early attachment for long-term positive adjustment and adaptive family functioning illustrate the importance of identifying risk factors for an insecure attachment. Theoretically, sensitive maternal behavior in response to infant signals is the key precursor to a secure attachment (Ainsworth, Blehar, Waters & Wall, 1978; Bowlby, 1969/1982), and prior evidence supports this view, although the effect size has been smaller than expected, as demonstrated by de Woolf and van IJzendoorn's meta-analysis (1997). Criticism of prior attachment research has emphasized that sensitivity in response to infant distress or during times of threat should be the most salient predictor of attachment security, given the nature of the attachment system as one that promotes safety and protection; but most prior work in this area has relied on observational measures of sensitivity derived from nonstressful settings (Goldberg, Grusec, & Jenkins, 1999; Thompson, 1997). Consistent with this view, when entered simultaneously in logistic regression, maternal sensitivity to infant distress but not to nondistress at six months predicted subsequent attachment security (McElwain & Booth-LaForce, 2006). However, the effect size for the association between sensitivity to distress and attachment was no larger than the average effect reported by de Woolf and van IJzendoorn demonstrating the need to identify predictors of attachment security in addition to sensitive maternal behavior.

Cassidy's (1994) synthesis of research linking attachment classifications to both mothers' and infants' emotion regulation processes provides a compelling theoretical argument supporting the view that mothers' emotional reactions to crying may shape their infants' internal working models and related attachment behaviors. Cassidy postulated that infants' attachment behaviors, or the strategies they use to elicit and maintain proximity to mothers, evolve to suit their mothers' attachment-based emotional needs and preferences. Mothers' emotional needs and preferences are communicated to infants both by the manner in which mothers display their own affect and by the manner in which mothers respond to their infants' affect, particularly negative affect. Cassidy noted three patterns of emotional communication that map onto the three primary attachment classifications. Secure infants experience maternal sensitivity in response to a broad range of emotional signals, which promotes open and flexible communication of both positive and negative affect. Avoidant infants experience maternal rejection, which promotes the minimization of affect in an effort to prevent additional rejection. And, resistant infants experience inconsistent care or maternal unavailability, which promotes the maximization or

heightening of affect in an effort to gain the mother's attention. We propose that mothers' emotional reactions to crying influence the messages about emotions they convey to their infants.

Consistent with Cassidy's (1994) view about links between maternal emotional communication and infant attachment behaviors, we propose that mothers who become anxious when their infants cry, or when they anticipate their infants might cry, may display their anxiety to their infants. Displays of maternal anxiety may heighten infants' arousal and create uncertainty about their mothers' ability or willingness to keep them safe, directly contributing to a resistant attachment. Likewise, infants may infer that maternal anger in response to crying is directed toward them, which could contribute to emotion minimization and subsequent attachment avoidance because it teaches infants that crying is an undesirable behavior. Few investigators have examined links between maternal negative affect and infant attachment security. Of the two studies in which maternal affect was rated while interacting with their infants, maternal negative affect was linked with less attachment security in one (Main, Tomasini, & Tolan, 1979) and greater attachment security in the other (Pauli-Pott & Mertesacker, 2009). In another study, mothers' self reported proneness to negative emotions was linked with less attachment security, whereas an openness to displaying negative emotions in front of their infant was linked with greater attachment security (Izard, Hayne, Chisholm, & Baak, 1991). Perhaps mothers' display of negative emotions is adaptive in some contexts, as it teaches children valuable lessons about emotions, but the display of mothers' negative emotions in distressing contexts, when the infant is reliant on maternal assistance to self-regulate, is likely maladaptive. Consistent with this view, Donovan and Leavitt (1989) reported that mothers who responded to audiotapes of a crying infant in an aversive manner at five months postpartum (as indicated by heart rate acceleration) had infants who were more likely to be classified as insecurely attached one year later.

It may also be that mothers who become distressed in response to or in anticipation of infant crying respond less sensitively to their infants in distressing contexts, which in turn undermines attachment security. For example, a mother who is annoyed by crying may withdraw from her infant or punish her infant for displaying negative affect in order to reduce her exposure to distress, which in turn socializes her infant to minimize negative affect, contributing to an insecure-avoidant attachment. And, a mother who is anxious in response to infant crying, primarily because she worries about her ability to soothe her infant and how others perceive her parenting abilities, may engage in a mixed pattern of responding and withdrawing, particularly if her initial efforts are unsuccessful (Donovan, Leavitt, & Walsh, 1990). This pattern would likely maintain or enhance infant distress, contributing to an insecure-resistant attachment. Although we know of no prior studies that test this indirect effect, there is theory and evidence to support this proposition. Notably, Dix (1991) theorized that parental negative emotions in response to child behavior increase the self-focus of parenting goals, which interferes with parents' ability to respond sensitively to children's needs. Consistent with this view, maternal anger and anxiety in response to child behavior was linked with less supportive and more negative parenting behavior

(Dix, Gershoff, Meunier, & Miller, 2004; Frodi & Lamb, 1980; Lorber & O'Leary, 2005). Of most relevance, mothers' negative emotional reactions to both their own and other crying infants were linked with less sensitive responses to their infant's distress (Leerkes, 2010); and less sensitive behavior in response to infant distress was associated with insecure attachment (McElwain & Booth-LaForce, 2006). This pattern of findings is consistent with Cassidy's (1994) view that mothers' emotional preferences may be transmitted to their infant via their responses to their infants' affect.

In sum, we hypothesized that maternal anger and anxiety in response to infant crying would be associated with attachment insecurity, both directly and indirectly, via less sensitive responses to infant distress. Specifically, maternal anger in response to crying would be directly associated with attachment avoidance because it conveys the message that distress should be minimized, and maternal anxiety in response to crying would be directly associated with attachment resistance in that the expression of maternal anxiety may elicit, maintain, and enhance (i.e., maximize) infant distress. Finally, maternal anger and anxiety would be indirectly associated with attachment avoidance and resistance via less sensitive maternal behaviors toward the infant that either encourage the minimization of emotions (e.g., punitive responses to crying) or the maximization of distress (e.g., a mix of sensitive and insensitive responses).

Method

Participants

One-hundred and 19 primiparous mothers completed the prenatal data collection. Of these, 18 mothers failed to complete the 6-month data collection, primarily because they moved out of the area. When infants were 16 months of age, we were unable to locate five mothers, six had moved from the area and did not participate, three agreed to complete the questionnaires only, and 17 declined to participate, primarily because they were too busy. Complete data at all waves were available from 70 mother-infant dyads. These dyads did not differ from those that attrited on maternal age, education or income, child gender, prenatal emotional reactions to crying, and observed sensitivity at six months. Two marginal differences emerged: minority mothers were less likely to complete all phases of the study than European American mothers, $\chi^2(1) = 3.52, p < .07$, and single mothers were less likely to complete all phases than partnered mothers, $\chi^2(1) = 3.65, p < .06$. Mothers' age at recruitment ranged from 15 to 40 years ($M = 27.68$), education ranged from less than a high school diploma to a graduate degree (34% did not have a college degree), and annual income ranged from \$10,000 to \$190,000 ($Mdn = \$65,000$). Seventy-one percent of mothers were European American, 22% African American, 2% Asian American, 1% Hispanic, and 4% were multiracial. Ten mothers were single mothers with no father involvement; the rest were married, living with, or dating their child's father. Infants were term and healthy; 54% were male.

Procedures

Expectant mothers were recruited at childbirth classes offered in the local hospital and public health department. Those who agreed to participate were mailed consent forms and a demographic questionnaire. Mothers visited the campus research laboratory for an audiotaped interview four to six weeks prior to their due date. Within one week of the infant's 6-month birthday, mothers and infants visited campus for an observation of mother-infant interaction. Mothers were invited, by phone, to participate in a follow-up study when their children were 15 months old. Mothers who agreed were mailed a new consent form and a parenting questionnaire, and mothers and infants visited campus for an observation of mother-infant interaction within one month of the child's 16-month birthday. Mothers received gift cards in the amount of \$15, \$20, and \$25 for completing the prenatal, 6-month, 16-month assessments, respectively.

Prenatal interview

Four to six weeks prior to their due dates, mothers viewed 1-min video clips of two different 6-month-old infants crying. One displayed fear during a novel toy approach and one displayed anger during an arm restraint procedure. Then, mothers rated the extent to which they felt various emotions while watching and explained why they felt each emotion. The audiotaped interviews were transcribed, and then coded as described below.

Six-month observation of maternal sensitivity

Mother and infant behavior were videotaped during the 6-month laboratory assessment. Dyads engaged in two emotion-eliciting tasks (novelty and limitations; counterbalanced), with a 5-min break in between. For the first minute of each task, mothers were instructed to remain neutral and uninvolved unless they wanted to end the activity, then mothers were signaled they could interact as they wished. During both tasks infants were seated in an infant chair adjacent to the mother; mothers were visible to infants with some effort. A basket of toys was within mothers' reach during these tasks.

During the *novelty task*, the infant was tucked into a table with a short barrier near the infant that prevented the toy from falling in the infant's lap. A remote control operated dump truck approached the infant from the opposite side of the table twice. While immobile in front of the infant, the truck's horn, ignition, and a voice sounded, and music played while the truck vibrated and its lights flashed. The same sequence was repeated twice, then the silent and still truck remained within the infant's reach for 1 min. The entire task lasted 3.5 min. During the *limiting task*, the experimenter knelt in front of the infant seat and held the infant's forearms immobile for 4 min. The experimenter kept her head down and did not interact with the infant.

Sixteen-month observation of attachment and maternal sensitivity

During the laboratory visit, mothers and their infants were observed during Ainsworth et al.'s (1978) Strange Situation followed by two emotion-eliciting tasks (limiting task then novelty task). During the eight-episode *Strange Situation* procedure mothers and their infants engaged in

a series of brief separations and reunions. During the emotion-eliciting tasks, mothers were seated on a couch and asked not to interact with their infants for the first minute of each task. After a minute, mothers were instructed they could interact with their infants as they wished. Infants were seated on a rug on the floor at the onset of the tasks. A basket of toys was within reach.

During the *limiting task*, the researcher offered the infant a toy phone that made noise and lit up. Once the infant was interested in the phone, the researcher placed it in a clear plastic jar and closed the lid tightly so it was impossible for the infant to open. The jar was placed on the floor near the infant. The researcher encouraged the infant to open the jar with verbal prompts. After 4 minutes, the researcher opened the jar and allowed the infant to play with the phone.

During the *novelty task*, a research assistant dressed in a green monster costume entered the room and stood quietly at the door for 10 seconds. The research assistant spoke a script (“Hello, I’m an ogre...what are you doing” etc.) in a neutral voice as she approached within two feet of the infant, crouched down and repeated the script. The researcher then crossed the room, danced while humming a nursery rhyme, and then slouched in a chair pretending to sleep and snore loudly. The researcher pretended to wake up, approached the infant again, crouched down next to the infant and repeated the script until four minutes passed.

Measures

Mothers' prenatal emotional reactions to crying

After watching each 1-min clip during the prenatal interview, mothers rated how strongly they felt 17 emotions (e.g., sad, irritated, concerned) on a 4-point scale ranging from (1)*not at all* to (4)*very strongly*. Then, mothers were asked to elaborate verbally on why they felt each emotion. Following Dix et al. (2004), each explanation was then coded from the transcript as infant-oriented or mother-oriented. Infant-oriented explanations involved concerns about the infant's welfare, a desire to help the infant, sympathy or empathy for the infant, or feeling pleasure or pride in the infant's behavior. Examples include: “I was angry that someone put the baby in that situation” and “I was anxious because I wanted to do something for the baby.” Mother-oriented explanations involved self-focused concerns or negative reactions about the infant. Examples include: “I was irritated by the sound of the baby's cry” and “All that crying made feel nervous; like I am supposed to know what to do.” One coder coded all of the transcripts, and intercoder reliability for the orientation of each distinct emotion (i.e., mother vs. infant-oriented) was calculated on 25 transcripts double coded by the first author; kappa ranged from .72 to 1.0. The numeric ratings mothers provided for the extent to which they felt irritated, angry, annoyed, and frustrated that were subsequently coded as mother-oriented were averaged across clips to yield a measure of self-focused maternal *anger* in response to crying ($\alpha = .70$). Likewise, the numeric ratings mothers provided for concerned, worried, nervous, and anxious that were subsequently

coded as mother-oriented were averaged across clips to yield a measure of self-focused *anxiety* in response to crying ($\alpha = .75$).

Observed maternal sensitivity at six and 16 months

Infant affect and maternal behavior during the emotion-eliciting tasks were continuously coded from digital media files using the Observer 5.0 (Noldus Information Technology, Wageningen, The Netherlands). Two coders rated infant affect and two others coded maternal behavior; coders varied across assessment points. Event based coding was used, meaning once a code was activated, it remained active until another code was selected. For all behavioral coding, coders were blind to other data, reliability cases were selected at random, and disagreements were resolved via consensus.

Infant affect was rated on a 7-point scale ranging from (1) *high positive affect* to (7) *high negative affect*, adapted from Braungart-Rieker and Stifter (1996) based on infants' vocalizations, facial expressions, and body tension. Interrater reliability was calculated based on 33 tapes at six months and 21 tapes at 16 months; weighted $K = .79$ and $.92$, respectively. Only four infants did not become distressed at six months and only six at 16 months, demonstrating the effectiveness of the tasks at eliciting distress; the average duration of distress was $M = 55.19$ sec, $SD = 58.00$ sec and $M = 67.20$ sec, $SD = 66.30$ sec at six and 16 months, respectively.

Maternal behavior was coded using 12 mutually exclusive categories. Intercoder reliability for maternal behavior was calculated based on 18 tapes at six months and 20 tapes at 16 months, $K = .79$ and $.89$, respectively. The maternal behavior and infant affect files were then merged, and the appropriateness and quality of maternal behaviors, given concurrent infant affect, were assigned a sensitivity rating on a 3-point scale (1 = *insensitive*, 2 = *moderately sensitive*, 3 = *sensitive*) for each moment of the interaction. For example, drawing the infant's attention toward the task is rated as (3) *sensitive* if the infant is neutral or positive, but (1) *insensitive* if the infant is distressed. Other behaviors, such as intrusiveness are rated as (1) *insensitive* regardless of infant affect. Maternal behavior codes are described next, and their sensitivity ratings on the 3-point scale during infant positive, neutral and negative affect respectively follow each description: *negative* (directs negative affect toward the infant; 1,1,1); *intrusive* (forces own agenda on the infant; 1,1,1); *withdraw* (abruptly moves away or ends interaction with infant; 1,2,1); *mismatched affect* (affect is incongruent with infant's; 1,1,1); *distracted from infant* (uninvolved or minimally involved with infant; 1,2,1); *persistent ineffective* (continues to respond to infant in same ineffective manner when alternative responses are available; 2,2,2); *monitor*(watches infant/situation; 2,3,1); *task focused* (engages with infant focusing on the arousing task; 3,3,1); *calming* (soothes infant physically or vocally; 3,3,3); *supportive* (provides soothing support for engagement with the task; 3,3,3); *nontask focused engagement* (plays with or distracts the infant without using the arousing task; 3,3,3); and *routine care*(engages in practices like wiping nose, straightening clothing; 3,3,1). Mothers' average sensitivity during the arousing tasks was calculated to yield a measure of *observed*

sensitivity during emotionally arousing tasks at both time points. Sensitivity ratings derived from this continuous coding scheme correlate positively with global ratings of sensitivity and predict subsequent child anxiety demonstrating the validity of this approach (Crockenberg & Leerkes, 2006).

Attachment security at 16 months

Infant attachment security during the Strange Situation was coded using procedures outlined by Ainsworth and colleagues (1978). Two certified reliable coders double coded 25 videos using the traditional three category coding system (ABC); agreement was 88%, $K = .78$. Given the goals of the study, we created two continuous scores by averaging the scores for resistance and avoidance across episodes 5 and 8. The high degree of stability across episodes supports this approach ($r = .52$ for avoidance, and $.58$ for resistance, both $p < .001$). Interrater reliability for these specific codes was calculated via intraclass correlation coefficients which ranged from $.77$ to $.95$.

Maternal reported responses to toddler negative emotions at 16 months

Mothers completed the Coping with Toddlers Negative Emotions Scale (Spinrad, Eisenberg, Kupfer, Gaertner, & Michalik, 2004) at 16 months by rating the extent to which they used different strategies to respond to their toddlers' negative emotions in 12 common situations (e.g., If my child fell down and scraped himself while trying to get a favorite toy, I would...) on a 7-point scale from (1) *very unlikely* to (7) *very likely*. Two subscales were used: distress reactions (12 items; e.g., feel upset myself; get nervous myself; $\alpha = .79$) and punitive/minimization (24 items; e.g., send my child to his room; tell my child there is no reason to be upset; $\alpha = .84$). Scores were derived by averaging appropriate items across the 12 situations. In prior research, scores from this scale correlated with observed maternal behavior and predicted children's subsequent externalizing behavior and social functioning, demonstrating validity (Spinrad et al., 2007).

Results

Missing data were imputed using the NORM (Schafer, 1999a) software program. NORM uses an Expectation-Maximization algorithm to replace missing values. Predictor variables, dependent variables, and demographics (including those associated with attrition) were included in the imputation model to maintain unbiased associations between the variables of interest. Because 24% of data was missing overall, multiple imputation was preferred over a single imputation (Schafer, 1999b). Three complete data sets were constructed using NORM and data were analyzed separately with each. Results averaged across these data sets are presented.

Maternal minority status, education and income, and child gender were examined as potential covariates. Maternal education correlated negatively with infant avoidant behavior ($r = -.18, p < .05$) and positively with maternal sensitivity at six months ($r = .21, p < .05$). Family income

correlated negatively with infant avoidant behavior and maternal anger in response to crying ($r = .27, p < .01$ and $r = -.19, p < .05$) and positively with sensitivity at six months ($r = .31, p < .01$). Therefore, education and income were entered as covariates in subsequent analyses predicting avoidant behaviors. Next, we calculated descriptive statistics and examined mean differences in the primary variables as a function of infant attachment classification using ANOVA followed by Bonferonni's Difference Tests. These results appear in Table 1. Mothers of resistant infants reported more anxiety in response to infant crying prenatally than mothers of secure infants. Mothers of avoidant infants exhibited significantly lower sensitivity at six months than mothers of secure and resistant infants. Mothers of resistant infants exhibited significantly lower sensitivity at 16 months than mothers of secure and avoidant infants. As expected, avoidant infants engaged in more avoidant behavior than secure and resistant infants, and resistant infants engaged in more resistant behavior than secure and avoidant infants.

Table 1
Descriptive Statistics and Mean Comparisons Based on Attachment Classification

	Grand (<i>N</i> = 119)	Secure (<i>n</i> = 74)	Avoidant (<i>n</i> = 30)	Resistant (<i>n</i> = 15)	<i>F</i>	<i>p</i>
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		
Prenatal anger to cry	1.11 (.20)	1.11 (.21)	1.10 (.15)	1.16 (.21)	1.40	.25
Prenatal anxiety to cry	1.15 (.21)	1.12 (.17) ^a	1.16 (.20)	1.27 (.35) ^b	3.71	.03
Observed sensitivity 6M	2.84 (.18)	2.88 (.12) ^a	2.74 (.26) ^b	2.90 (.11) ^a	10.65	.00
Observed sensitivity 16M	2.75 (.27)	2.76 (.26) ^a	2.81 (.28) ^a	2.60 (.26) ^b	4.97	.01
Punitive/minimizing 16M	2.64 (.71)	2.59 (.68)	2.70 (.74)	2.73 (.71)	0.50	.61
Distress reactions 16M	3.15 (1.02)	3.13 (.92)	3.33 (1.20)	2.76 (.94)	2.37	.10
Avoidant behavior 16 M	2.78 (1.69)	2.34 (1.30) ^a	4.46 (1.22) ^b	1.21 (1.30) ^c	45.89	.00
Resistant behavior 16 M	1.67 (1.14)	1.62 (.88) ^a	1.00 (.87) ^b	3.35 (1.10) ^c	36.50	.00

Note. Different subscripts denote significant group differences at $p < .05$ based on Bonferonni's Difference test.

Descriptive Statistics and Mean Comparisons Based on Attachment Classification

Next, we examined simple correlations among all study variables as a preliminary test of the hypotheses and to determine which variables would be included in the path model predicting avoidant and resistant behaviors. These are illustrated in Table 2. Consistent with the view that mothers' negative emotional reactions to crying would undermine sensitivity, maternal anger in response to crying prenatally was positively associated with maternal reported punitive and minimizing responses at 16 months, and maternal anxiety in response to crying prenatally was positively associated with maternal reported distress reactions at 16 months. Consistent with the view that maternal sensitivity would be linked with fewer insecure behaviors, observed sensitivity at six months was positively associated and self-reported punitive reactions at 16 months was negatively associated with avoidant behavior; and observed sensitivity at 16 months was negatively associated with resistant behaviors. Maternal reported distress reactions to infant negative emotions was unrelated to attachment security and was excluded from the path model.

Table 2
Simple Correlations Among Study Variables

	1	2	3	4	5	6	7
1. Prenatal anger to cry	—						
2. Prenatal anxiety to cry	.22*	—					
3. Observed sensitivity 6M	-.09	-.10	—				
4. Observed sensitivity 16M	.04	.12	-.08	—			
5. Punitive/minimizing 16M	.40**	-.02	.04	-.28**	—		
6. Distress reactions 16M	.01	.18*	-.31**	.00	.02	—	
7. Avoidant behavior 16 M	.02	-.13	-.32**	.09	.18*	.11	—
8. Resistant behavior 16 M	.01	.15	.07	-.18*	-.02	-.05	-.49**

* $p < .05$. ** $p < .01$.

Simple Correlations Among Study Variables

Next, we tested the path model predicting resistant and avoidant behaviors using a series of multiple regressions and bootstrapping procedures to test proposed indirect effects. First, observed sensitivity at six months was regressed on prenatal anger and anxiety. Second, observed sensitivity at 16 months and maternal reported punitive and minimizing reactions to distress were regressed on prenatal anger and anxiety, observed sensitivity at six months, and one another. Finally, avoidant and resistant behaviors during the Strange Situation were each regressed on prenatal anger and anxiety, both measures of observed sensitivity, and mother reported punitive and minimizing responses to negative emotions. Results of each regression appear in Table 3, and significant effects from the path model are displayed in Figure 1.

Table 3
Multiple Regressions Used To Construct Path Model

	<i>B</i>	<i>SE (B)</i>	β	R^2	<i>B</i>	<i>SE (B)</i>	β	R^2
Model 1: Observed Sensitivity 6 M				.02				
Prenatal anger	-.06	.09	-.07					
Prenatal anxiety	-.07	.08	-.09					
Model 2: Observed Sensitivity 16 M				.19				
Prenatal anger	.16	.13	.11					
Prenatal anxiety	.11	.11	.09					
Obs. sensitivity 6 M	-.12	.14	-.08					
Punitive reactions 16 M	-.10	.04	-.23*					
Model 3: Punitive reactions 16 M				.31				
Prenatal anger	1.59	.28	.45**					
Prenatal anxiety	-.29	.27	-.09					
Obs. sensitivity 6 M	.30	.33	.08					
Obs. sensitivity 16M	-.56	.22	-.23*					
Model 4:				.28				.11
					Resistant Behavior			
Prenatal anger	-.95	.81	-.11		.01	.59	.00	
Prenatal anxiety	-1.11	.68	-.14		.97	.50	.18*	
Obs. sensitivity 6 M	-3.00	.87	-.31**		.45	.62	.07	
Obs. sensitivity 16 M	.76	.56	.12		-1.00	.41	-.24*	
Punitive reactions 16 M	.53	.24	.22*		-.07	.17	-.05	

¹Maternal education and family income were covariates in the model predicting avoidant behavior. For education, $B = -.18$, $SE(B) = .13$, $\beta = -.16$, ns. For income, $B = -.00$, $SE(B) = .00$, $\beta = -.07$, ns.

* $p < .05$. ** $p < .01$.

Multiple Regressions Used To Construct Path Model

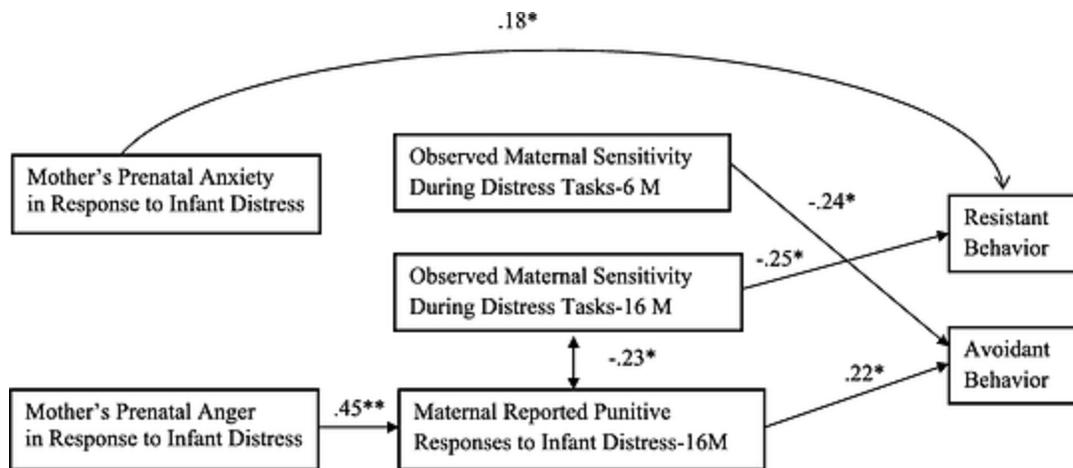


Figure 1.

Path model predicting avoidant and resistant infant behavior during the Strange Situation. For simplicity, only significant paths are illustrated. Values are standardized regression coefficients. * $p < .05$. ** $p < .01$.

Indirect effects were calculated using Preacher and Hayes' (2008) SPSS macro for testing multiple indirect effects simultaneously while controlling for the other variables in the path model via bootstrapping. In this procedure 5,000 samples of 119 units were drawn from the original sample of 119 units, with replacement, and the unstandardized coefficients were calculated for each of these samples. The average indirect effect and the 95% bias-corrected confidence interval were calculated as the mean across the 5,000 samples for each imputed data set. These were then averaged across imputed data sets. Indirect effects are significant if the confidence interval (CI) does not contain zero.

The results support the view that mothers' emotional reactions to crying predict attachment related behaviors, but the nature of the effects varied for anxiety and anger. As illustrated in Figure 1, prenatal anxiety in response to crying was directly associated with more resistant behaviors independent of the significant direct effect of observed sensitivity at 16 months. In contrast, prenatal anger in response to crying was indirectly associated with avoidant behaviors via punitive and minimizing responses to distress, $B = .80$, $CI = .19; 1.70$, and this effect was independent of the significant negative association between observed sensitivity at six months and avoidant behavior. Thus, mothers who reported greater anger in response to infant crying were more punitive and minimizing in response to their children's negative emotions which was in turn linked with their infants' greater use of avoidant behaviors. The path model accounted for 28% of the variability in avoidant behaviors and 11% of the variability in resistant behaviors, a large and small effect size respectively ($F^2 = .39$ and $.12$).

Discussion

Our goal was to understand the role of maternal emotional reactions to crying prenatally in shaping the developing attachment system. The results indicate that negative, self-focused emotional reactions to crying undermine the developing attachment relationship, although the

mechanisms vary for maternal anger and anxiety. The presence of both direct and indirect effects of maternal emotion on infants' subsequent attachment behavior is consistent with Cassidy's (1994) view that mothers' may transmit their attachment-related emotional preferences to their infants via multiple processes (e.g., modeling, nonresponsiveness). That these effects were apparent over and above the negative association between observed sensitivity at six and 16 months demonstrates the utility of considering maternal emotions as additional predictors of attachment security. These results have implications for identifying risk factors for compromised parenting and for the measurement of sensitivity as described below.

Maternal anxiety in response to infant crying was linked with greater attachment resistance, as apparent both from the mean comparisons of attachment groups and the path model predicting resistant behaviors during the Strange Situation. This pattern may be consistent with the emotion maximization process described by Cassidy (1994). However, this effect was not accounted for by any of our measures of maternal behavior and was significant over and above the contribution of observed sensitivity at 16 months. That mothers' self-reported distress reactions when their infants were distressed did not mediate this effect was counter to our prediction, but that the measure of distress reactions does not clarify if mothers displayed their distress in front of their infants makes this finding difficult to interpret. It is also possible that maternal anxiety in response to crying is linked with attachment resistance via behavioral or physiological mechanisms that we did not measure. For example, mothers who are anxious may engage in comforting behaviors that are subtly less sensitive. Their bodies and touch may be tense or rigid and their breathing and heart rate may be irregular, which would presumably be experienced as less comforting by the infant. Feldman's (2007) work demonstrating links between mothers' and infants' physiology and behavior is compatible with this view.

Maternal anger in response to infant crying was linked with greater use of punitive and minimizing responses to infant distress, which in turn predicted avoidant behavior. This is consistent with Cassidy's (1994) notion of emotion minimization as a pathway to attachment avoidance. Presumably, mothers who are irritated or annoyed by crying are motivated to distance themselves from the aversive stimuli or to end it promptly, and efforts to punish their infant or discourage the expression of distress likely serve this goal. Infants who encounter this type of response to their negative affect likely learn that they cannot count on their mothers to comfort or protect them when they are distressed; this confidence in protection is believed to be a key precursor of a secure attachment relationship (Goldberg et al., 1999).

The role of mothers' negative emotional responses to crying in the developing attachment relationship has several implications. First, these results provide direct, prospective support for Cassidy's (1994) view that mothers' emotional preferences, as indicated by their emotional reactions to crying, shape infants' subsequent attachment behaviors. Coupled with Donovan and Leavitt's (1989) finding that physiological arousal in response to infant crying predicted attachment insecurity, it seems that maternal emotional reactions to infant crying is a particularly salient predictor of attachment security. Second, given that insecure adult attachment scripts have

been linked with negative emotional reactions to crying (Groh & Roisman, 2009), our findings linking emotional reactions to crying with infant attachment suggest a possible mechanism to explain the “transmission gap,” or the variability in infant attachment that is predicted by adult attachment independent of maternal sensitivity (van IJzendoorn, 1995).

From an applied perspective, our results suggest mothers who find infants' crying particularly aversive and struggle to respond sensitively can be identified prenatally, which would allow for early identification and intervention with at-risk mothers. Further, efforts to alter mothers' emotional reactions to crying by changing their perceptions or attributions about what infant crying signals (Donovan & Leavitt, 1985) or by enhancing their strategies to regulate their arousal in response to crying (Mills-Koonce et al., 2009) might be fruitful modes of intervention to enhance sensitivity and subsequent attachment security. These elements are present in two successful attachment-based interventions, Attachment and Behavioral Catch-Up (Dozier, Lindheim, & Ackerman, 2005) and the Circle of Security (Cooper, Hoffman, Powell, & Marvin, 2005), but as these programs have multiple components it is impossible to assess the impact of attending to mothers' emotional reactions to infant distress specifically.

The results also have methodological implications. First, that mothers' self-reported emotional reactions to videos of crying infants with whom they had no relationship predicted attachment security approximately a year and a half later is in some ways remarkable. This speaks to the validity of the stranger video methodology which is important given the difficulty inherent in creating comparable stimuli using women's own infants. Second, two features of the present results raise questions about the long-held view that behavioral indices of maternal behavior are the gold standard: (a) our measures of observed sensitivity during emotionally arousing tasks were no more predictive of attachment than has been the case in studies that relied on measures derived from free play or other nonarousing contexts (de Woolf & van IJzendoorn, 1997), and (b) prenatal anxiety in response to crying and self-reported punitive and minimizing responses to infant's negative emotions predicted additional variability in attachment behavior even after accounting for observed measures of sensitivity. Thus, we believe that relying solely on behavioral observations of maternal sensitivity to distress is problematic for two reasons: (a) limited opportunities to observe mothers' behavior when their infants are distressed, and (b) the inability to ascertain the motives underlying maternal behavior.

In regard to the first, although our emotion-eliciting tasks were effective in eliciting distress, the average duration of distress was brief, limiting opportunities to observe how mothers respond to distress. Thus, complementing behavioral observations with self-reported reactions to distress may be necessary. That parents can report on their behavior across a broader time-frame and a variety of contexts is appealing because it may better capture what the young child typically experiences from their parent when they are distressed, an issue of central importance in the field of attachment. That self-reported punitive and minimizing reactions to distress was associated with less observed sensitivity at 16 months and with greater attachment avoidance offers support for the convergent and predictive validity of this type of parent self-report.

In regard to the motives underlying maternal behavior, it is important to acknowledge that different mothers engage in similar behaviors for different reasons. For example, some mothers engage in comforting behaviors because they want their infant to feel better, whereas others engage in comforting behaviors because they want the crying to stop because it is aversive to them. Although the observed behavior is the same, one can argue that the former is more sensitive than the latter because the mother is prioritizing her infant's needs (Crockenberg & Leerkes, in press). Mothers who prioritize their infants' needs may be sensitive more consistently (i.e., beyond the brief observational context that is subject to social desirability and other demand features), or there may be subtle stylistic differences in how these mothers enact "sensitive" behaviors that infants pick up on even if we cannot readily see them (e.g., self-focused mothers' touch may be more rigid, less gentle, or convey tension in some way). In fact, Ainsworth et al. (1978) incorporated the prioritization of infant needs in their definition of sensitivity, but rarely has this distinction been applied empirically. Measuring the affective or cognitive motives underlying maternal behavior may get at the degree of infant prioritization and improve the measurement and hence predictive validity of sensitivity. Composite measures of sensitivity that include both behavioral and motivational properties could be created or motives could be examined as a moderator of the effect of observed behavior on child outcomes.

Several limitations of the current study should be noted. That this was a small, low risk sample reduced the statistical power to detect effects and limits the generalizability of these findings. Replication in larger and more diverse samples is needed. This would allow for the use of attachment categories, which are based on the pattern of ratings across multiple behavioral dimensions, as the outcome which would ultimately be the best test of Cassidy's (1994) propositions about links between emotion minimization and attachment avoidance and emotion maximization and attachment resistance. A sample including more at-risk families would also afford the opportunity to examine the role of maternal emotional reactions to crying in the formation of a disorganized attachment. Important extensions of this work include examining emotional arousal in response to infant crying at the physiological level, considering the role of regulatory processes that may moderate links between arousal and sensitivity and arousal and attachment security, and identifying factors that predict mothers' emotional arousal and regulation in response to infant crying. The latter will be particularly useful in relation to efforts to screen and identify mothers at-risk for insensitive behavior early in infancy. The possibility that mothers' negative emotional reactions to crying have a particularly negative effect on the development of attachment security among temperamentally reactive infants also warrants attention given evidence that mothers of temperamentally reactive infants report that infant crying is more aversive to them (Donovan & Leavitt, 1989). Finally, observational measures of expressed maternal affect during emotionally arousing interactive tasks may shed further light on the mechanisms linking negative emotional reactions to crying to infant's attachment security.

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