

Attachment Security: The Role of Infant, Maternal, and Contextual Factors

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ABSTRACT

Infant temperament, parenting factors, and aspects of mother-infant interactions have all been demonstrated to influence the early attachment relationship. It has been suggested since attachment is multiply determined, these factors should be evaluated cumulatively as predictors of attachment security. This study examined contributions of child and parent characteristics to infant attachment security. We hypothesized that infant Negative Emotionality (NE) would be linked with attachment security, and that this relationship would be mediated by maternal parenting efficacy and sensitivity in mother-infant interactions. Associations between Positive Affectivity/Surgency (PAS), Orienting/Regulatory Capacity (ORC), and attachment security were also explored. Study design: Longitudinal study including laboratory observation of mother-infant dyads and parent completion of questionnaires. Subjects: 47 mother-infant dyads (26 female infants, 21 male infants) participated in laboratory assessment and questionnaires when the infants were 4 months of age, then provided attachment information at 12 months of age. Attachment security, measured with the abbreviated Attachment Q-Set (AQS). Significant correlations emerged for associations between attachment security, maternal parenting efficacy and sensitivity, but not infant NE. Higher levels of maternal sensitivity and fewer problems with maternal efficacy were associated with more secure attachment. PAS and ORC were both significantly correlated with attachment security at 12 months of age, with higher levels of these infant attributes leading to more secure attachment. Although the proposed mediational model was not supported, these findings suggest the importance of infant temperament and parenting/contextual factors in explaining attachment security, as well as need for their simultaneous consideration.

Key words: infant attachment, negative emotionality, positive affectivity/surgency, orienting/regulatory capacity, maternal sensitivity, maternal parenting efficacy.

Novelty and Significance

What is already known about the topic?

- Attachment represents a critical milestone of early social-emotional development.
- Secure attachment results in positive adjustment/competence, whereas insecure attachment has been linked to developmental psychopathology and adjustment difficulties.
- Consistent evidence of associations between more sensitive/responsive parenting and secure attachment.

What this paper adds?

- Examining the contribution of infant temperament, examining attributes associated with Negative Emotionality, Positive Affectivity/Surgency, and Orienting/Regulatory Capacity.
- Addressed parenting competence along with sensitivity, in predicting attachment security.
- Observed contributions of both parenting and infant temperament factors, with both sets of variables influencing attachment security.

Since its inception, attachment has become a core concept in both research and clinical applications concerning human development. Encompassing research in developmental, clinical, social, and even physiological psychology, and dealing with

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every period of development, from the prenatal period to adulthood, attachment theory has been called “one of the best current examples of the value of serious, coherent theorizing in psychology,” (Cassidy & Shaver, 1999). It has been established that mothering, and maternal sensitivity in particular, impacts attachment security (Belsky, 1997). However, additional factors may also be important to consider in understanding the nature of the attachment relationship. It has been suggested that attachment security is better predicted by examining a combination of maternal and child characteristics, than by focusing on individual characteristics in isolation (Mangelsdorf, Gunnar, Kestenbaum, *et al.*, 2000). Viewing attachment as multiply determined, however, means that the relative and cumulative impact of all these factors should be considered.

Bowlby (1969, 1982) argued that the biological function of attachment is protection, asserting that during human evolution infants who were biologically predisposed to remain close to their mothers were more likely to survive and produce their own offspring. Thus, according to Bowlby, genetic selection favored behaviors, which served to maintain child-mother proximity. Some of these behaviors, such as smiling or vocalizing, serve as positive signals of the infant’s interest, bringing the attachment figure closer for interaction. Others, such as crying, are aversive, signaling the infant’s distress, and serve to bring the attachment figure to the child in order to terminate them. As the child develops, gaining more control over locomotor activities, he or she may also approach or follow the attachment figure, allowing him or her to maintain proximity to the attachment figure of their own volition. These attachment behaviors are thought to be organized into the attachment behavioral system, a specific control system. As long as the child feels at ease, the attachment figure serves as a secure base of operations whose presence fosters exploration, play, and social behavior. When the child feels threatened, however, exploratory goals are overridden, as the child seeks closer proximity to the attachment figure. Thus, in familiar contexts, the attachment behavioral system favors exploration with intermittent checks on the attachment figure’s location, while in risky contexts, the system favors physical contact over exploration (Waters & Deane, 1985). Overall, the infant’s use of an attachment figure as a “secure base from which to explore” is a central concept in attachment theory (Ainsworth, 1963).

The establishment of secure attachment in the first year of life represents a significant milestone in social-emotional development, promoting later competence and positive adjustment. Securely attached infants and children show greater positive affect when engaging in problem-solving, greater social competence, and higher levels of empathy and compliance (Goldsmith & Harman, 1994). Conversely, infants who are insecurely attached demonstrate greater levels of dependency, anger, distancing, and hostility in relationships, and have higher levels of both internalizing and externalizing problems as they mature. A number of studies have shown that attachment security is relatively stable, often unchanging throughout childhood, and even into adulthood (Vaughn *et al.*, 1979; Waters, 1978; & Waters, Hamilton, & Weinfield, 2000). Notably, changes in attachment were demonstrated to occur mainly in the presence of negative life events or adverse changes in the family environment (Weinfield, Sroufe, Egeland, & Carlson, 2000). In summary, attachment security represents an important theme in child development and developmental psychopathology research, critical in explaining

healthy, positive social-emotional development, as well as the onset/maintenance of behavioral difficulties and symptoms of psychopathology.

The Strange Situation procedure provides opportunity to observe the infant's behaviors in a variety of contexts including: exploration of a novel environment in the presence of the mother, reaction to stranger in the presence of the mother, reaction to separation from the mother, reaction to stranger without the mother, and reaction to reunion with the mother, classifying the infant into securely, or one of the insecurely attached groups (Ainsworth *et al.*, 1978). Main and Solomon (1986, 1990) offered a revision of the original Ainsworth classification scheme, adding a disorganized/disoriented (D) group to the previously identified securely attached (B), anxious/avoidant (A), and anxious/resistant (C) categories (Ainsworth *et al.*, 1978). The reliability and validity of the Strange Situation have been established through numerous studies (van Ijzendoorn *et al.*, 2004), yet criticisms have also been articulated. For instance, ethical concerns have been raised relating to placing the infant in a situation likely to cause distress (e.g., Thompson, 1990). Additionally, Bronfenbrenner questioned the ecological validity of the assessment (1979). The primary concerns about the Strange Situation, however, have related to its limitations as a measurement tool. For instance, the distribution of infants across categories is markedly unbalanced, limiting data analysis options (Waters & Deane, 1985). In fact, researchers often collapse Group A and Group C infants into one insecure group in order to obtain sufficient power for analyses, sacrificing the meaningful differences between anxious-insecure and anxious-resistant infants. In addition, the procedure is difficult to score, requiring extensive training, with considerable cost associated with administering and scoring (Waters & Deane, 1985).

Recognizing these criticisms of the Strange Situation, and in an effort to provide a practical alternative to Ainsworth's home observation narratives, Waters and Deane (1985) developed the Attachment Q-sort. Importantly, whereas the Strange Situation relies on a categorical approach to attachment measurement, the Attachment Q-sort (AQS; Waters & Deane, 1985) provides a continuous measure of attachment security, focusing on secure base behavior. Items in the Attachment Q-set were developed following a literature review and home visits with infants and toddlers (Waters & Deane, 1985). The AQS in its current version consists of 90 statements designed to reflect either the secure base phenomenon itself or behaviors associated with it, with secure base behavior defined as the smooth organization of and appropriate balance between seeking proximity to the attachment figure and exploring the environment (Solomon & George, 1999). Different scoring approaches are available for items that can be completed by observers or parents (Waters, 1995). While in existence for a shorter period than the Strange Situation, the reliability and validity of the AQS have been widely established. For example, inter-observer reliabilities ranging from .72 to .95 have been reported (Solomon & George, 1999). A meta-analysis showed that observer AQS security scores were related to attachment security measured by the Strange situation ($r=.32$), showing "substantial but modest" convergent validity (van Ijzendoorn *et al.*, 2004). Further, with more than three hours of observation prior to completing the sort, the relation between AQS security and Strange Situation security rose ($r=.42$) (van Ijzendoorn *et al.*, 2004). With this evidence for reliability and validity, van IJzendoorn and colleagues

(2004) concluded that it was reasonable to include the observer-rated AQS in “a small number of gold standard measures in attachment including the Strange Situation and Adult Attachment Interview.”

Following Ainsworth's initial work in the area of sensitivity, researchers sought to delineate specific maternal behaviors responsible for individual differences in attachment quality (Isabella, 1993). This body of work provides evidence that mothers of securely attached 1-year-olds are significantly more responsive to their infants' vocalizations and distress signals and more likely to involve their infants in moderate levels of interaction resulting in neither over- or understimulation (Belsky, Rovine, & Taylor, 1984), hold their infants significantly more often and interrupt infants' ongoing behaviors less often (Miyake et al., 1985), and interact with their infants in a synchronous manner more frequently (Isabella, Belsky, & von Eye, 1989; Isabella & Belsky, 1991). Mothers of secure infants have also been shown to be more involved with their infants (Lyons-Ruth, Connell, Zoll, & Stahl, 1987), more positive (Ainsworth *et al.*, 1978; Maslin & Bates, 1983; Tracy & Ainsworth, 1981), less negative (Lyons-Ruth *et al.*, 1987), more responsive to infant signals (Ainsworth *et al.*, 1978; Belsky, Rovine, & Taylor, 1984; Crockenberg, 1981; Isabella & Belsky, 1991; Isabella, Belsky, & von Eye, 1989; Pederson *et al.*, 1990; Smith & Pederson, 1988), more appropriate in their responsiveness (Smith & Pederson, 1988), and more appropriate in pacing of interactions (Blehar, Leiberian, & Ainsworth, 1977; Egeland & Farber, 1984; Miyake, Chen, & Campos, 1985). Goldsmith and Alansky (1987) found that studies included in their meta-analysis supported Ainsworth *et al.*'s (1978) findings regarding the relation between maternal sensitivity and secure attachment; however, they noted that the actual size of the predictive effect of maternal sensitivity was substantially smaller than that suggested in the original study. A subsequent meta-analyses conducted by de Wolff and van Ijzendoorn's (1997) revealed that neither the setting of the study (lab or home), nor the duration of observations, nor the type of assessment (Strange Situation or alternate measure of security) had an impact on the magnitude of relation between maternal sensitivity and attachment security.

Whereas some attachment theorists have discounted the impact of temperament, asserting that it is not a major determinant of attachment security (Sroufe, 1985), certain temperament theorists have argued that security of attachment is a result of temperamental variation amongst infants (Chess & Thomas, 1982; Kagan, 1982, 1984). Alternatively, temperament may have an indirect effect on the quality of the attachment relationship by impacting child-caregiver interactions, and thus, the overall child-caregiver attachment (Goldsmith *et al.*, 1986). Some studies have found support for direct relation between components of temperament and attachment (e.g., Calkins and Fox, 1992; Ding, Xu, Wang, Li, & Wang, 2012; Frodi, Bridges, & Shonk, 1989; Goldsmith & Alansky, 1987; Miyake, Chen, & Campos, 1985), whereas others have not (e.g., Bates, Maslin, & Frankel, 1985; Bohlin, Hagekull, Germer, Andersson, & Lindberg, 1989; Gunnar, Mangelsdorf, Larson, & Hertsgaard, 1989). It has been proposed that these mixed findings may be a result of the heterogeneity within temperament theory and literature (Vaughn & Bost, 1999). For studies consistent with the psychobiological model of temperament (Rothbart, 2011), addressing temperament as reflecting reactivity and regulation tendencies, Vaughn and Bost (1999) reported three studies with significant relations between temperament and

AQS security, specifically between a composite score for negative reactivity (Kochanska, 1995; Kotsaftis, 1989), and Distress to Limitations (Seifer *et al.*, 1996). Given the observed inconsistencies with respect to direct effects of temperament on attachment security, it has been suggested that difficult infant temperament (e.g., high levels of negative emotionality/irritability) may affect attachment security in combination with other risk factors, such as maternal low sensitivity (e.g. Mangelsdorf, Gunnar, Kestenbaum, & Lang, 1991; van den Boom, 1994) or parental beliefs about family roles (Wong, Mangelsdorf, Brown, Neff, & Schoppe-Sullivan, 2009). For example, maternal sensitivity was found to mediate the effect of irritability on attachment security in the first year of life (Susman-Stillman, Kalkoske, Egeland, & Waldman, 1996). Additionally, only one recent study has demonstrated a significant relationship between approach (positive affect) and secure attachment (Ding, Xu, Wang, Li, & Wang, 2012), while no research to date has looked specifically at orienting/regulating and its relation to attachment.

Parenting self-efficacy has been explored as a contextual factor, which may impact attachment security. Beliefs about self-efficacy as a parent can impact mothers' response to their infants, influencing how much and what she attends to, the effort she expends in raising her child and her emotional responses to the child's behavior (Mash & Johnston, 1990). Parents who believe that their children will be responsive to their efforts to parent may be more likely to invest time in effective parenting practices, and mother's perceived self-efficacy is likely an important determinant of whether or not she responds sensitively to her child (Donovan, 1981; Donovan & Leavitt, 1985, 1989). Several studies have shown that mothers of secure infants report greater confidence in handling caregiving tasks shortly after birth than mothers of insecure infants (Donovan & Leavitt, 1989; Donovan, Leavitt, & Walsh, 1990; Spieker & Booth, 1988). To date, research has not examined maternal parenting self-efficacy in concert with sensitivity in parent-child interactions and infant temperament in predicting child attachment security.

This study was designed to fill the existing gap in research, examining these variables simultaneously as potential determinants of infant attachment security. Specifically, it was hypothesized that infant Negative Emotionality (NE) would be linked with attachment security, and that the relationship between NE and attachment would be mediated by maternal parenting efficacy and sensitivity in mother-infant interactions. Although specific a-priori hypotheses concerning additional infant temperament factors: Positive Affectivity/Surgency (PAS) and Orienting/Regulatory Capacity (ORC) were not generated, their associations with attachment security were also explored.

METHOD

Participants

Participants were recruited from communities in the Eastern Washington/Northern Idaho area (See Table 1 for demographic information). Parents and infants participated in laboratory observation assessments and parents completed questionnaires when infants were 4 months of age. Attachment security was evaluated when the children were 12 months of age. Infants were considered to fall within these age categories if they were

Table 1. Descriptive Statistics: Demographics; Independent and Dependent Variables

Variable		Mean	Range	SD	Percentage
Maternal Age (Years)		28.67	20-42	5.27	
Ethnicity	Caucasian				91.9%
	African American				3.7%
	Asian				2.9%
	Hispanic/Latino				1.5%
Marital Status	Married				93.1%
	Divorced/Separated				1.6%
	Single				3.8%
	Remarried				1.5%
Education Attainment (Years)		15.87	10-20	2.29	
Family Income	\$0 – \$7,000				5.2%
	\$7,001 – \$10,000				3.0%
	\$10,001 – \$13,000				5.2%
	\$13,001 – \$16,000				4.5%
	\$16,001 – \$20,000				9.0%
	\$20,001 – \$30,000				10.4%
	\$30,001 – \$50,000				29.9%
	\$50,001 – \$75,000				17.2%
	Over – \$75,000				15.7%

within two weeks of each exact age. Infants were recruited to approximate a similar number of male and female participants. At 12 months of age, complete data were available for 47 mother-infant dyads (26 female infants, 21 male infants).

Instruments

Infant Behavior Questionnaire-Revised (Gartstein & Rothbart, 2003). This 191-item parent-report questionnaire yields 14 scales that have been demonstrated to form three over-arching factors: Positive Emotionality/Surgency (Activity Level, Smiling and Laughter, Vocal Reactivity, Approach, High Intensity Pleasure, and Perceptual Sensitivity), Negative Affectivity (Fear, Distress to Limitations, Sadness, and negatively loading Falling Reactivity), and Regulatory Capacity/Orienting (Duration of Orienting, Soothability, Cuddliness/Affiliation, and Low Intensity Pleasure). Reliability and validity of the IBQ-R has been supported for samples from different cultures, with Cronbach's alpha's ranging from 0.77 to 0.96 (Gartstein & Rothbart, 2003; Gartstein, Knyazev, & Slobodskaya, 2005; Gartstein, Slobodskaya, & Kinsht, 2003). In addition, inter-rater reliability has been demonstrated for mother and father-report (Gartstein & Rothbart, 2003; Parade & Leerkes, 2008) and validity of this instrument has also been supported by studies incorporating the IBQ-R and laboratory indicators of temperament (Gartstein *et al.*, 2011; Gartstein & Marmion, 2008).

The Parent Stress Inventory (Abidin, 1995). The PSI provides indices of child and parent characteristics, family context, and stressful life events (Abidin, 1995). The Parenting Competence scale, which assesses factors related to perceived parenting efficacy, with high scores interpreted as indicating low self-efficacy in the parenting domain, was included in this study. The sense of competence subscale taps insecurity in the parenting role, and includes the following items: "Being a parent is harder than I thought it would be"; "I enjoy being a parent" (reverse-scored), along with others. Cronbach's alpha coefficients as high as .84 have been reported for the PSI subscales, and test-retest

reliability estimates have ranged from .88 to .96 (Abidin, 1995). Parenting competence scores have also been linked with toddler behavior problems in prior research (Gartstein & Sheeber, 2004). Additionally, the maternal domain scores have been demonstrated as sensitive to maternal stress associated with having difficult children (Sheeber & Johnson, 1992, 1994).

Maternal Sensitivity (Gartstein, Crawford, & Robertson, 2008). The parent-child interaction episode was conducted in the laboratory in a standardized manner. The interaction between parents and infants lasted for two minutes, and was video-recorded to be coded later. Mothers were provided with the following instructions, "Here is a toy telephone that you can use to play with your baby. You can interact/play however you would like. I will be back when it's time for the next activity." After providing the instructions, the examiner left the room. These interactions were video-recorded to be coded later, focusing on 10 interactional attributes linked with maternal sensitivity and responsivity (e.g. initiatives to motivate play, emotional attunement, enjoyment of joint activity; Baldwin, 1995). Thus, a global rating (i.e., score of one to seven) was assigned for each dyad's sensitive interactional behavior based on the coders' examination of these 10 factors. Responsiveness/sensitivity were coded using a 7-point Likert scale (1-7), with 1 representing "Extremely Insensitive" interactions, which were in turn operationalized as interactions wherein the mother avoids, ignores, or reprimands the child; lacks genuine interest and empathy toward the child, and/or does not accurately interpret communications/cues from the child. In addition, an extremely insensitive parent (a) does not initiate/motivate child's play; (b) does not reinforce child's activities; (c) does not draw the child into joint activity; (d) does not use versatile motivational strategies; (e) is not emotionally available/attuned; (f) does not provide affective encouragement; (g) does not show enjoyment of joint interaction; (h) does not allow the child independent activity; (i) demonstrates no sensitivity in the guidance of child activity; (j) is not able to effectively extend child activity. The middle range of the Likert scale was reflective of "Moderately Sensitive" interactions, wherein the mother provides only perfunctory, half-hearted responses, appears to be only moderately interested, demonstrates moderate levels of empathy toward the child, and periodically accurately interprets communication/cues from the child. The moderately sensitive parent (receiving ratings in the middle range of the 7-point scale) periodically (a) initiates/motivates child play; (b) reinforces child activities; (c) draws the child into joint activity; (d) displays a moderate frequency of versatile motivational strategies; (e) is moderately emotionally available/attuned; (f) provides moderate frequency of affective encouragement; (g) shows moderate enjoyment of joint interaction; (h) periodically allows the child independent activity; (i) demonstrates moderate levels of sensitivity in guidance of child activity; and (j) is able to periodically, effectively extend child activity. Finally, 7 represented "Extremely Sensitive" parent-child exchanges, with the mother providing prompt, contingent, warm, and supportive responses, appearing to be genuinely interested and empathic toward the child, accurately interpreting communication. The extremely sensitive parent also (a) consistently initiates/motivates child play; (b) consistently reinforces child activities; (c) consistently draws the child into joint activity; (d) frequently uses versatile motivational strategies; (e); is highly emotionally available/attuned; (f) provides high frequency of affective encouragement; (g) shows high levels of enjoyment in joint interaction; (h) consistently allows the child independent activity; (i) demonstrates high levels of sensitivity in guidance of child activity; (j) is able to effectively extend child activity.

Three raters participated in the coding of maternal interactional behavior. All coders were

graduate students in psychology, who participated in training and reliability checks to ensure understanding of the categories and specific criteria, as well as agreement among raters. Inter-observer reliability was assessed by having the three coders independently code the same training cases, with the inter-class correlation coefficients ranging from 0.60 to 0.96 (average $r = .82$).

Attachment Interview. This assessment tool represents an adaptation of the Attachment Q-Sort (AQS; Waters & Deane, 1985). Research suggested an abbreviated, scale scored version of the Q-set may prove to be valid and simpler for mothers to complete (Roggman, Cook, & Akers, 2004). Based on the attachment security expert criterion sort, an abbreviated version of the AQS was developed. The abbreviated version retained the 31 items with the highest criterion scores and 30 items with the lowest criterion scores, while discarding the remaining 29 items. Mothers were then asked to rate each item on a 7-point Likert scale, ranging from very unlike their child to very similar to their child. At the 12 month lab appointment, mothers were given a copy of the items to take home, asked to read them over, and observe their child's behavior. They were then telephoned at home by a research assistant who asked them to provide their ratings for each of the items. The interview took approximately 20 minutes to complete. The attachment security score was then computed by summing the scores from the 21 items with the highest criterion scores and the reverse scores from the 30 items with the lowest criterion scores. Utilizing data from a previous sample, and treating sorted piles as Likert-type ratings, analyses suggested that scale scores from the abbreviated version were comparable to the traditional criterion-scoring of the full AQS, $r = .99$, $p < .01$ (Swanson *et al.*, 2006).

Procedure

Infants in were located through local birth announcements, as well as by advertisement through local community-based organizations and programs (e.g., Whitman and Latah Counties' Ages and Stages Early Intervention Project), medical centers, and pediatricians. The First Steps prevention program operating in both local hospitals was also instrumental in recruiting participants for this research. Prospective families were contacted by telephone approximately 2 weeks before their infants were 4 months of age. At this time, parents were informed about the nature of the study and their participation, including the time demands and reimbursement. Mothers were asked to complete the PSI and IBQ-R prior to the 4-month laboratory appointment, wherein parent-child interactions were video-recorded. Mothers were provided with the Attachment Interview items, and telephoned by a research assistant to complete the attachment security assessment, when the children were 12 months of age. Upon completion of the study, participants received a \$100 reimbursement.

RESULTS

Significant Pearson product moment correlations were observed for associations between attachment security, maternal parenting efficacy and sensitivity, but not infant NE. Higher levels of maternal sensitivity and fewer problems with maternal efficacy were associated with more secure attachment. Interestingly, PAS and ORC were both significantly correlated with attachment security at 12 months of age (Table 2), with

higher levels of infant regulation and positive emotionality being linked with more secure attachment.

Although the proposed mediational model was not supported by the outcome of simple correlation analyses, NE was examined via Multiple Regression along with other predictors, hypothesized to contribute to attachment security. NE emerged as a significant predictor of attachment security, when entered into a regression equation with parent-related predictors, suggesting that parenting efficacy and sensitivity were functioning as suppressor variables (Table 3). That is, NE reached statistical significance once additional predictors were in the final equation, with higher NE being linked with greater attachment security. These findings suggest the importance of infant temperament and parenting/contextual factors in explaining attachment security, as well as need for their simultaneous consideration.

Table 2. Simple Correlations: Infant Negative Emotionality, Positive Affectivity/Surgency, Orienting/Regulatory Capacity, Maternal Parenting Efficacy, Sensitivity in Mother-Infant Interactions, and Child Attachment Security.

	Infant PAS	Infant ORC	Parenting Efficacy	Maternal Sensitivity	Attachment Security
Infant NE	.43**	.50**	.24*	-.21*	.16
Infant PAS		.42**	-.25**	.05	.39**
Infant ORC			.03	-.12	.38**
Parenting Efficacy				-.17	-.36**
Maternal Sensitivity					.31**

Notes: * = $p < .05$, ** = $p < .01$

Table 3. Hierarchical Regression Predicting Child Attachment Security from Infant Negative Emotionality, Maternal Parenting Efficacy and Sensitivity in Mother-Infant Interactions.

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Infant Negative Emotionality	3.96	3.91	.156	6.48	3.71	.26**	7.97	3.59	.31**
Parenting Efficacy				-2.05	.72	-.42**	-1.86	.69	-.38**
Maternal Sensitivity							7.39	3.25	.32**
R^2	.02 $F(1,118) = 1.02$.19 $F(2,117) = 4.71^*$.29 $F(3,116) = 5.20^{**}$		

Notes: * = $p < .05$, ** = $p < .01$

DISCUSSION

The current study sought to extend previous research on the antecedents of attachment by examining the relations between this construct and infant temperament, parenting efficacy, and maternal sensitivity. While mediation was not supported by analyses, at the level of direct relationships a number of findings are of interest. First, temperament attributes other than NE demonstrated significant associations with child attachment security, with higher PAS and ORC predicting greater attachment security. Second, lower levels of parenting competence were linked with insecure attachment. Third, the contribution of maternal sensitivity to attachment security was also observed. Overall, findings suggest the importance of considering both child and maternal variables

in addition to maternal sensitivity in examining the development of attachment security.

In contrast to a number of previous studies (e.g., Goldsmith & Alansky, 1987; Kochanska, 1995; Seifer *et al.*, 1996), a significant relationship was not found between infant negative emotionality and attachment security at the level of simple correlations. In the context of multiple regression analyses, negative emotionality emerged as a significant predictor, with the parent variables in the regression equation. It is of interest that the direction of this association was positive, so that higher negative emotionality was predictive of more secure attachment. When viewed through a developmental lens, this finding may be less surprising, however. During the first several months of life, negative emotionality is generally characterized by early irritable forms of distress (Derryberry & Rothbart, 2001) and later differentiating into anger, fear, and irritability, each following a different developmental trajectory. Within this study, parental report of temperament was obtained when the infant was four months of age, a period of time when anger responses are generally decreasing, likely in response to greater flexibility in attention (Johnson, Posner, & Rothbart, 1994), while fear has not yet begun to increase in response to the infant's greater degree of interaction with the environment and as a function of maturation of the Behavioral Inhibition System (Gray 1982; Putnam & Stifter, 2002; Rothbart 1988, 1989.) Thus, it may be that infant negative emotionality during this early infancy period may be of less importance in the development of attachment security relative to distress demonstrated in the latter half of the first year. This may be a function of the fact that aspects of negative emotionality (e.g., fear, anger) tend to increase and become more noticed by caregivers in the second part of the first year of life (e.g., Gartstein & Rothbart, 2003).

Significant associations were found between both infant positive emotionality and orienting/regulatory control and later attachment security. These findings suggest the importance of examining all domains of temperament in trying to elucidate the relationship between temperament and attachment rather than focusing solely on negative emotion to the exclusion of other qualities. A great deal of the literature has focused exclusively, or nearly exclusively, on the role of irritability and negative emotionality (e.g., Goldsmith & Alansky, 1987; Mangelsdorf, *et al.*, 1991); however, during the first months of life positive emotionality and regulatory abilities may play an equally important, and perhaps an even more important role in the development of eventual attachment security, as suggested by this study.

It is notable, however, that although infant negative emotionality was not significantly correlated to later attachment security, it did emerge as a significant predictor of attachment security when both parenting efficacy and maternal sensitivity were entered into the regression equation. Conger (1974) defines a suppressor variable as "a variable which increases the predictive validity of another variable (or set of variables) by its inclusion in a regression equation" where predictive validity is assessed by the magnitude of the regression coefficient. In this case, it appears that the parenting variables may be acting as suppressor variables, as the magnitude of the association between infant negative emotionality and attachment security increased substantially with the addition of these variables. Thus, a significant association between negative emotionality and attachment security, indicating that the two constructs are positively related, emerges as a function

of accounting for variance in attachment due to parenting, yet overlapping with infant negative emotionality. Multiple regression analyses conducted in this study suggest that higher levels of infant negative emotionality at four month are related to more secure infant attachment at 12 months. This is a surprising finding, as a negative relationship between these variables is more often expected and reported (e.g. Kochanska, 1995; Vaughn & Bost, 1999). It may be that with the variance related to parenting/parent characteristics accounted for, the remaining portion of negative emotionality variability reflects those cues, sensitivity to which on the part of the parent actually leads to increased attachment security later on. As mediation between temperament and later attachment security by maternal parenting efficacy and sensitivity was not supported, this study further suggests the possibility of a direct relationship between infant temperament and attachment security, or suggests that the relationship may be mediated by something other than parenting behaviors (i.e., maternal sensitivity) or belief/s (i.e., parenting efficacy).

Maternal sensitivity was significantly related to attachment, demonstrating a moderate positive relationship. This finding is consistent with previous research and theory; the magnitude of the relationship found is similar to that found within the meta-analyses by Goldsmith and Alansky (1987) and de Wolf and van Ijzendoorn (1997) when the outlying findings from Ainsworth et al's (1978) original study were excluded. It is interesting to note, however, that the magnitude of the association between maternal sensitivity and attachment security was similar to the magnitude of associations between attachment security and temperament variables (infant positive emotionality and orienting/regulatory control) and parenting efficacy, suggesting that while maternal sensitivity remains an important predictor of attachment security, other factors are likely equally important. Parenting efficacy was related to subsequent attachment security, such that parents with a greater sense of competence at 4 months tended to have infants who were more securely attached at 12 months, consistent with findings reported by Diener, Nievar, and Wright (2003) and demonstrating a relationship of similar magnitude to that found within their study. Overall, results of this study indicate that mothers demonstrating higher levels of sensitivity in interactions with their infants facilitate the development of attachment security for their children. In addition, mothers who perceive themselves as more competent in the parental role report higher levels of attachment security for their infants later in the first year of life. It is possible that greater parenting competence supports sensitivity in parent-child interactions, and this possibility should be evaluated in future research.

This study has a number of implications for future research. First, the abbreviated version of the Attachment Q-set administered via telephone interview appears to hold promise with respect to measurement of attachment security. The interview demonstrated adequate internal consistency and attachment security was significantly related to all variables, with the exception of infant negative emotionality, in the expected direction, with these findings supporting the validity of this measurement. Some researchers, Teti *et al.* (1991) for example, have argued against employing mothers' ratings when using the Attachment Q-set due to the relative difficulty presented by the task of completing a valid and accurate Q-sort with equally-sized piles, as required. By eliminating the need for the complex sorting task, the adaptation of the Attachment Q-set utilized in

this study may present a more appropriate task for mothers to complete, in terms of the information processing demands, leading to higher quality (e.g., more reliable) data. Further, as the measure was completed via a telephone interview, there is no reason to be concerned regarding mothers' ability to read or comprehend the items within the Q-set, as the interviewer was able to provide information and answer questions as necessary during the procedure. Thus, the abbreviated attachment interview utilized in this study may be useful for a variety of investigations, providing a low cost and time-limited approach to the evaluation of attachment security.

The study also points to the importance of considering dimensions of temperament in addition to negative emotionality. When examined separately, both infant positive emotionality and orienting/regulatory control demonstrated significant relationships with attachment security, whereas infant negative emotionality did not. Overall, it appears that a narrow focus on aspects of negative emotionality may obscure relationships between attachment security and other potentially important aspects of temperament. The present study has implications for clinical practice as well. Specifically, parenting efficacy was shown to be significantly related to later attachment security, suggesting that addressing parenting efficacy may present another avenue for early intervention, in addition to approaches addressing specific parenting behaviors.

Our small sample size represents the single most significant limitation of this research, limiting the statistical power to detect small and medium effects (Cohen, 1992). Thus, future research should include larger sample sizes in examining the variables and relationships addressed in this study. In addition, participants included in this research can be described as a community sample. As a result, most mothers exhibited at least moderately sensitive responding to their infant, with few infants receiving scores indicative of insecure attachment, and the patterns of relationships may vary within a clinical sample (e.g., mothers with depression or anxiety or mother/infant dyads diagnosed with relationship problems in the DC:0-3 system). This work is nonetheless important in so far as research on "non-symptomatic precursors of psychopathology" is essential for understanding etiological pathways" (Gilliom & Shaw, 2004). At the same time, future research including a more "high-risk" group of parents and infants is essential to determine if a similar pattern of findings would emerge.

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