

## **Predicting children's separation anxiety at age 6: The contributions of infant–mother attachment security, maternal sensitivity, and maternal separation anxiety**

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### **Abstract**

The purpose of the present investigation was to examine the precursors and familial conditions which sustain school-aged children's separation anxiety. In a prospective, longitudinal study of 99 mother–child dyads, infancy measures of infant–mother attachment security, maternal separation anxiety, and maternal sensitivity were used to predict children's self-reported symptoms of separation anxiety at age 6. Insecurely attached children reported more separation anxiety than securely attached children. Insecure-ambivalent children reported marginally more separation anxiety than securely attached children, but not more than insecure-avoidant attached children. Regression analysis showed infant–mother attachment security and mother's sensitivity added uniquely to the prediction of children's separation anxiety, but mother's separation anxiety did not. Mediation tests show that the effect of mother's separation anxiety on children's separation anxiety may be mediated by maternal sensitivity. Research and clinical implications are discussed.

**Keywords:** *Separation anxiety, attachment, maternal sensitivity*

### **Introduction**

Separation anxiety is a developmentally appropriate distress reaction to separation situations from significant others shown by infants between the ages of 6 and 20 months. For most children, symptoms of separation anxiety decline after age 2 years; for other children, separation anxiety may persist well into early childhood (Kearney, Sims, Pursell, & Tillotson, 2003). Separation anxiety can become problematic and debilitating for some children when normative fears and worries regarding separations from caregivers escalate into more serious concerns, as in the case of separation anxiety disorder, which is often marked by school refusing behavior and excessive truancy (Berg, 1995; Kearney & Albano, 2004). As such, it becomes important to understand the precursors and the familial conditions which may sustain or even increase a child's separation anxiety (Bogels, van Dongen, & Muris, 2003; Eley, Bolton, O'Connor, Perrin, Smith, & Plomin, 2003). In the present investigation, a longitudinal design and an attachment perspective were employed to assess the impact of experiences during infancy on school-aged children's symptoms of separation anxiety.

Bowlby's theory of attachment provides a theoretical framework to understand the etiology of separation anxiety (Bowlby, 1969/1982). According to attachment theory, infants learn how to regulate their emotions through the use of strategies that maintain proximity to the attachment figure. Once infants develop an attachment relationship with their primary caregiver, an organized set of behaviors serves to maintain contact with the caregiver. Infants who are securely attached to their caregivers have confidence that the attachment figure will be available and accessible if needed. Insecure infants lack this confidence. Bowlby writes "when an individual is confident that an attachment figure will be available . . . that person will be much less prone to either intense or chronic fear than will the individual who has no such confidence" (Bowlby, 1973, p. 202). By school age, children who were securely attached as infants tend to be more outgoing and competent with peers (Berlin, Cassidy, & Belsky, 1995; Grossmann & Grossmann, 1991) and less anxious (Thompson, 1991) than their insecure counterparts. Cassidy and Main (1984) report that children classified as insecurely attached during infancy expressed more anxiety-related statements and showed more distress during a brief separation episode from their mothers at age 6 years than children classified as securely attached during infancy.

The role of sensitive and responsive parenting has been identified as a major contributor of attachment security in infancy (e.g., Ainsworth, Blehar, Waters, & Wall, 1978; NICHD ECCRN, 1997), as well as into early childhood (e.g., Booth, Rubin, & Rose-Krasnor, 1998). Sensitive and responsive parenting, consisting of synchrony, mutuality, emotional support, positive attitude, and stimulation (DeWolff & van IJzendoorn, 1997) impacts not only infant-mother attachment security, but has also been implicated as playing an important role in the formation and maintenance of separation anxiety in children. Lynch and Cicchetti (2002) found that children from a community sample who reported more separation anxiety also reported experiencing more harsh and negative parenting. Similarly, Wolchick and colleagues reported finding that poor mother-child relationship quality predicted children's fear of abandonment (Wolchick, Tein, Sandler, & Doyle, 2002). Furthermore, other researchers have rather consistently reported that children's separation anxiety is associated with chaotic and problematic home environments (e.g., Egger, Costello, & Angold, 2003; Kearney et al., 2003).

In addition to problematic home environments and parenting, parents of children with separation anxiety have also been found to have elevated levels of anxiety or other psychiatric disorders. Biederman and colleagues report finding that children with separation anxiety disorder were more likely to have parents who were diagnosed with an anxiety disorder or major depressive disorder (Biederman, Faraone, Hirshfeld-Becker, Friedman, Robin, & Rosenbaum, 2001). Other researchers have shown a direct connection between mothers' self-reported separation anxiety and their child's competence. Hock and colleagues (2001) found that adolescent children of parents who self-reported high levels of separation anxiety had less warm and close relationships with their parents. Deiner and Kim (2004) found that mothers' self-reported separation anxiety was significantly negatively correlated with their children's social withdrawal and self-regulation strategies.

Infant-mother attachment security and separation anxiety are both dyadic constructs, grounded in parent-child relationship quality, so it is surprising that there is not more research directly linking these constructs. For example, "there is a growing body of evidence for shared environmental influence on attachment, a concept which is both conceptually and developmentally related to separation anxiety" said Eley and colleagues (2003, p. 956). Evidence linking separation anxiety, insensitive parenting, and parental separation anxiety suggest that a longitudinal design assessing early infant-mother attachment security, early maternal anxiety, and early as well as concurrent maternal sensitivity would help researchers

understand the interrelations among these attachment-related constructs. Needed is a valid, reliable, and easily administered measure of young children's symptoms of separation anxiety.

The purpose of the present investigation was twofold. First, we sought to develop a reliable and valid measure of separation anxiety for use with early school-aged children. Second, we examined the precursors and familial correlates of separation anxiety at school age using measures of infant–mother attachment security, maternal sensitivity, and maternal separation anxiety made during the first 2 years of the child's life. Regarding the reliability and validity of our measure: first, we expected that children's separation anxiety would be related to concurrent measures of children's internalizing behaviors, but not related to children's externalizing behaviors. Second, we assessed the relation between children's temperament and our measure of children's separation anxiety. Based on work linking early difficult temperament with later internalizing symptoms (see Fox, Henderason, Rubin, Clakins, & Schmidt, 2001), we expected children's difficult or fussy temperament during infancy to be significantly correlated with their separation anxiety at age 6 years. Third, we expected children's separation anxiety to be correlated with mother's own separation anxiety and concurrent and previous sensitive maternal behavior. In addition, we made the following specific hypotheses: (a) we expected children classified as securely attached during infancy to express fewer symptoms of separation anxiety than insecurely attached children, and we expected children with insecure-resistant attachment to have more separation anxiety than children in any other group; (b) We expected each of the predictor variables: infant–mother attachment security, the mother's own separation anxiety, and early and concurrent maternal sensitivity to add uniquely, or in non-redundant ways, to the prediction of school-aged children's separation anxiety.

## Method

### *Participants*

Ninety-nine participants were drawn from a sample of families at the Temple University site of the NICHD Study of Early Childcare (NICHD SECC). The families began participating in this longitudinal study in 1991. At that time, 136 mothers were recruited soon after delivery from local hospitals (see NICHD ECCRN, 1997, for more information on recruitment of participants). The children and their families were first visited in their homes when the children were 1 month old. Following that, participants were seen at regular intervals in their homes, at our lab, and their childcare centers from the time the study child was 6 months old. After the common protocol data for the NICHD study were collected for the first grade assessment, when the children were 6 years old, the families were re-contacted and asked to participate in the present, site-specific study. Of the 136 original families recruited, 99 mother–child dyads agreed to participate in the present study. Reasons for non-participation included time conflicts and lack of interest.

The families in this sub-sample were European American ( $n = 67$ ), African American ( $n = 26$ ), Hispanic American ( $n = 2$ ), and Asian American ( $n = 4$ ). The mean age of the study children at the time of this visit was 6 years and 3 months, and 52% of the children were males. In addition, the participating families represent a wide range of income and educational backgrounds. Non-participating families were less likely to be white (35% non-white participant dropouts vs. 32% non-white participants); non-participating mothers were less educated ( $M = 13.9$  years vs. 14.5 years), and had lower income to need ratios as reported during the 1-month interview ( $M = 1.9$  vs. 2.1); the differences between participating and non-participating families were not significant.

*Measures*

Attachment security was assessed at 15 months old using the Strange Situation procedure (Ainsworth & Bell, 1970), the standard procedure used to measure infant attachment security. Briefly, during this interaction mother and child were videotaped in an unfamiliar playroom in a series of 3-minute episodes designed to increase the child's stress and activate the child's attachment system through separation and reunion episodes and the presence of a stranger (see NICHD ECCRN, 1997, for more information about the procedure used in the current study).

Videotapes of all strange situations were coded in a central location and attachment security was evaluated by a team of three coders who double coded all videos. Four child behaviors were rated in each of the reunion episodes: proximity and contact seeking; contact maintaining; resistance; and avoidance. The organization of the child's attachment and exploratory behaviors, especially in the reunion episodes, was analysed and classified into one of three major standard A B C classifications: Secure (Group B), insecure-avoidant (Group A), and insecure-ambivalent (Group C). Disorganized (Group D), classification was made as secondary to the primary A, B, and C classifications, but these D codes were not used for these analyses (see NICHD ECCRN, 1997, for more information pertaining to the coding system for classifying A, B, C, and D attachment subtypes used in the present study).

Comparisons were made between children with secure (B) and insecure (A and C) attachment classifications; 65 (66%) of the 99 participating children were classified as securely attached, and 34 (34%) were classified as insecurely attached. Of the 34 insecurely attached children, 14 children received an insecure-avoidant primary classification and 20 received an insecure-ambivalent primary classification. Sixteen children received a secondary disorganized, or D, classification.

Across all coders, agreement with the 3-category classification system was 83% ( $\kappa = .69$ ), and agreement for the 2-category system (secure/insecure) was 86% ( $\kappa = .70$ ). If there were disagreements, the group of three coders viewed disagreements, and a code was assigned by consensus.

Maternal sensitivity was measured in three free play interaction tasks at 6, 15, and 24 months of age and during a slightly more structured interaction task at the early childhood assessment at 72 months old. These tasks were conducted in the home at 6 and 24 months of age, and conducted in the lab at 15 and 72 months of age and designed to be age-appropriate. In the interaction tasks at 6 and 15 months old, mothers played with their children for approximately 15 minutes. During the first 7–8 minutes the mothers were asked to play as they would at home with their infants. During the second 7–8 minutes the mothers were provided with a standard set of toys with which they were instructed to engage their infants in play with. Beyond a time limit for the two segments of the procedure, any structuring of the activity was left up to the mother. At 24 months old, children were instructed to spend time playing with each of three different toys (a picture book, a toddler kitchenette, and a doll house) over the course of 15 minutes. Mothers were told that they could play with the child if they wished but they did not have to. After approximately 15 minutes, mothers were instructed to ask their children to help clean up and put the toys away. At 72 months of age, the task presented to the mother-child dyad was designed to be too difficult for the child to complete alone. The research assistant gave only the mother instructions; the mothers were then instructed to tell their children what to do. Mothers were told to first instruct their children to complete three tasks in a specified order and then to assist their children as needed in the completion of the tasks.

These procedures were designed to elicit interactions that occur naturally between mother and child and to highlight the mother's capacity to interact in a sensitive, warm, and stimulating manner with her infant. Similar procedures have been used in previous studies to describe the quality of mother–infant interaction, these types of procedures have accounted for significant amounts of variance when predicting the security of infant–parent attachment (e.g., Belsky & Rovine, 1988; Cox, Owen, Henderson, & Margand, 1992). These scales were developed by Margaret Owen and Deborah Vandell for use in the SECC and were based upon the work of others who studied quality of parenting and the development of secure attachments and competence in children (e.g., Ainsworth et al., 1978; Egeland & Farber, 1984).

Coders rated the quality of mother–child interaction from videotapes of the interactions. A composite score of maternal sensitivity, which reflects positive, non-intrusive, responsive, and supportive maternal care, was formed by summing ratings of the following three behaviors rated at 6, 15, and 24 months old. Ratings were made using global 4-point scales of maternal behavior that assessed: (a) sensitivity to non-distress (the extent to which the mother responds promptly and appropriately to the child's social gestures, expressions, and signals, and the extent to which the mother is child-centered); (b) intrusiveness (the degree to which the mother imposes her agenda on the child, reverse scored); and (c) positive regard for the child (the quality and quantity of expressions to the child that connote the mother's positive feelings toward the child). The Cronbach's alpha for the 3 ratings made of sensitivity at 6, 15, and 24 months old were .75, .70, and .74 respectively, these three ratings were summed into a single composite of sensitivity for each time point. At 72 months old a single rating of maternal sensitivity (supportive presence) was obtained, and it was rated on a 7-point scale.

For each assessment point, tapes were sent to a central location for coding and a team of trained research assistants coded all mother–child interactions. Research assistants who coded the tapes were blind to all of the participants' family characteristics (e.g., income). Inter-coder reliability, determined by assigning two coders to 20% of the tapes at random, was calculated as the intra-class correlation coefficient (Winer, 1971). For more information about these procedures and codes, please see the SECC website at <http://secc.rti.org> and NICHD ECCRN, 1999. At 6, 15, and 24 months old, respectively, the inter-rater reliabilities for the sensitivity composite were .87, .83, and .84; at 72 months old the inter-rater reliability coefficient for supportive presence was .89.

Maternal separation anxiety was assessed at 6, 15, and 24 months old with the Separation Anxiety Scale (Hock, McBride, & Gnezda, 1989). At each assessment point, mothers completed a 21-item self-report questionnaire that assesses their worry (e.g., "I worry when someone else cares for my child"), sadness (e.g., "I don't enjoy myself when I am away from my child"), and guilt (e.g., "I wonder whether my child is crying or missing me") during separations from their child. Mothers rated how much they agree with each statement on a 5-point scale with a rating of 1 meaning that the mother strongly disagrees and a rating of 5 indicating that the mother strongly agrees. At each assessment point, a single, summed score on this measure was calculated that reflected the mother's total score on this measure. Internal consistency for this scale exceeded .90 for each assessment (NICHD ECCRN, 1999).

Child separation anxiety was assessed when the child was 6 years old using a modified version of the Child Puppet Interview (CPI) adapted by Morris and colleagues from the Berkeley Puppet Interview (Ablow & Measelle, 1993; Morris, Silk, Steinberg, Sessa, Avenevoli, & Essex, 2002; Sessa, Avenevoli, Steinberg, & Morris, 2001). The CPI is an interactive tool designed to elicit young children's perceptions of their feelings and behaviors. We modified the measure by adding a scale consisting of eight items related to children's feelings of separation anxiety.

A trained research assistant read a series of statements to the child using two finger puppets, one on each hand (the puppets looked like frogs and were named either “Hip” and “Hop”, or “Zig” and “Zag”). First the researcher introduced the child to the puppets and then read a few introductory statements to the child to make sure he or she understood how to answer. For example, Zig says “I like ice cream” and Zag says “I don’t like ice cream”, then the research assistant asks the child to indicate, by pointing or saying, which of the two finger puppets’ statements was more like what the child thinks and feels. Once the researcher was sure that the child understood how to answer she or he proceeded to administer the CPI. Children’s answers were recorded as agree (1), or disagree (0). If a child could not decide, no score was recorded for that item. Using this procedure, we assessed children’s separation anxiety from mother with eight pairs of items (e.g., Zig says “When I am not with my mom I worry something bad will happen to her”; Zag says “I don’t worry that something bad will happen to her”). Scale items and item scoring information are presented in Table I.

Children’s temperament was assessed at 6 months of age with the Infant Temperament Questionnaire (ITQ; Carey & McDevitt, 1978; Medoff-Cooper, Carey, & McDevitt, 1993). Mothers completed the 55-item ITQ at the 6-month home visit and rated how often their baby exhibited behaviors that corresponded to five temperamental dimensions including approach, activity, intensity, mood, and adaptability. Ratings were made on a Likert type scale, with scores ranging from 1 (almost never) to 6 (almost always). Representative items include “My baby is fussy (frowns, cries) on waking up or going to sleep”, “My baby vigorously resists additional food or milk when full (spits out, clamps mouth closed, bats at spoon, etc.)”, and “My baby cries when left alone to play”. Carey and associates developed the ITQ to assess the New York Longitudinal Study temperament category schemes (e.g., Thomas & Chess, 1977). The ITQ was developed for use with 4–8 months old children and was standardized with a sample of over 200 infants and their mothers (Carey & McDevitt, 1978). In the current sample, across all subscales, the questionnaire items had an alpha of .81. A composite score was created based on the means of all the items (note that the composite score reflects a difficult or fussy temperament).

Table I. Scoring information and factor loadings for items on the separation anxiety scale.

Item	Score (1 or 0)	Factor Loading
A.	1. I worry that something bad will happen to my mom when I’m not with her. 0. I don’t worry that something bad will happen to my mom when I’m not with her.	.82
B.	1. On Sunday nights, I worry about going back to school. 0. On Sunday nights, I don’t worry about going back to school.	.70
C.	1. I worry about bad things happening to my mom. 0. I don’t worry about bad things happening to my mom.	.62
D.	1. When my mom’s not home, I can’t go to sleep. 0. When my mom’s not home, I can go to sleep.	.55
E.	1. Sometimes I cry when my mom goes out. 0. I never cry when my mom goes out.	.50
F.	1. It bothers me when my mom leaves me with someone else. 0. It doesn’t bother me when my mom leaves me with someone else.	.45
G.	1. I don’t like spending the night at friends’ houses. 0. I like spending the night at friends’ houses.	.40
*H.	1. When I am in school, I worry about my mom. 0. When I am in school, I don’t worry about my mom.	.25

\*Item H was dropped from subsequent analyses.

Child's externalizing and internalizing behavior was assessed at 54 months old using the Social Skills Rating System (SSRS; Gresham & Elliott, 1990). Mothers rated how often the child exhibits externalizing and internalizing behaviors on 3-point scales (0 = never, 1 = sometimes, 2 = very often). The externalizing behaviors scale consists of six items (e.g., "how often does your child act aggressive" or "exhibit poor temper control?"), these items have an alpha of .69. The internalizing behaviors scale consisted of four items (e.g., "how often is your child sad?" or "anxious?"), these items have an alpha of .56. The SSRS was normed on a diverse, national sample of children in the 3–5 years old age range and shows high levels of internal consistency (median = .90) and test–retest reliability (.75 to .88; see Gresham and Elliott, 1990, for more information pertaining to validity).

### *Overview of analyses*

Analyses occurred in four stages. First, we examined the psychometric properties and integrity of our measure of 6-year-olds' separation anxiety using factor analysis and Cronbach's reliability coefficient. Construct validity was examined by assessing the interrelations between children's reports of their own separation anxiety with mothers' reports of the behaviors. Next, the relation between children's report of separation anxiety and maternal sensitivity and maternal separation anxiety for each time point was examined using Pearson Product Moment correlation coefficients. Relations between children's separation anxiety and infant–mother attachment security were examined with *t*-tests, analysis of variance (ANOVAs), and pair wise comparisons. Next, using a simultaneous regression analysis, we tested the incremental predictive utility of each of the predictor variables (infant–mother attachment security, maternal sensitivity, and maternal separation anxiety) in predicting children's report of separation anxiety at age 6. Finally, a mediation model is tested using Structural Equation Modeling (SEM).

## **Results**

Table II provides descriptive statistics for each of the variables used in the analyses including means, standard deviations, and ranges.

### *Psychometric analysis of children's report of separation anxiety*

Factor loadings for each item on the child's separation anxiety scale are presented along with the items in Table I. When all of the items were subjected to a factor analysis, all but one of the items loaded a .40 or above on a single Separation Anxiety factor. The two highest loading items were, "I worry that something bad will happen to my mom when I'm not with her", and "On Sunday nights, I worry about going back to school." The one item that did not load on this scale with the others was "When I am in school, I worry about mom." The resulting factor accounts for 44% of the variance. The remaining seven items, with a Cronbach's alpha coefficient of .67, were summed into a single 6-year-old separation anxiety score for each child ranging from 0 to 7.

### *Relations between children's separation anxiety and other variables*

Correlations between maternal sensitivity, maternal separation anxiety, and mothers' reports of their child's behaviors with children's self-reported separation anxiety are presented in Table III. (A correlation matrix presenting all inter-correlations between variables is

Table II. Descriptive statistics: Means, standard deviations, and ranges.

Measure	Age of child (months)					
	6	15	24	54	72	
N	126	123	116	106	99	
M (SD) Range		M (SD) Range	M (SD) Range	M (SD) Range	M (SD) Range	
<i>Mother's ratings of child's:</i>						
<i>Temperament</i>	3.18 (.431) 2-4.05	-	-	-	-	-
<i>Internalizing behaviors</i>	-	-	-	1.59 (1.43) 0-8	-	-
<i>Externalizing behaviors</i>	-	-	-	4.72 (1.90) 0-12	-	-
<i>Maternal sensitivity</i>	9.35 (1.73) 4-12	9.34 (1.72) 4-12	8.72 (2.04) 4-12	-	4.72 (1.36) 1-7	
<i>Maternal separation anxiety</i>	64.29 (11.47) 21-105	63.92 (11.88) 21-105	62.24 (11.11) 21-105	-	-	
<i>Child's separation anxiety</i>	-	-	-	-	4.27 (1.60) 0-7	



presented in the Appendix.) All reported results are significant, 2-tailed, unless otherwise noted.

As can be seen in Table III, the measure of children's separation anxiety demonstrated construct validity; children's reports of separation anxiety were positively correlated with mother's reports of children's internalizing but not externalizing behaviors. Also presented in Table III are the relations between children's self-reported separation anxiety and maternal sensitivity and separation anxiety at each of the measured ages. Children's reports of separation anxiety at age 6 years were negatively correlated with ratings of mothers' sensitivity at 6, 15, 24, and 72 months of age, and positively correlated with mothers' reports of own separation anxiety at 6, 15, and 24 months of age. Also note that children's separation anxiety was not significantly related to mother's rating of temperament.

Notably, children's self-reported separation anxiety at age 6 years differed significantly based on infant-mother attachment security [ $t(98) = 2.48, p = .015$ ] with insecurely attached children ( $M = 4.67$ ) reporting more separation anxiety than securely attached children ( $M = 3.80$ ). Though children classified as C (insecure-ambivalent) reported the highest levels of separation anxiety ( $M = 4.79$ ), and securely attached children (B) reported the lowest levels, with insecure-avoidant (A) children's mean scores residing between B and C ( $M = 4.30$ ), an ANOVA revealed non-significant differences across all three primary attachment classifications [ $F(2, 97) = 2.30, p = .105$ ]. Non-significant differences were also obtained when the secondary disorganized classification was analysed in another ANOVA [ $F(3, 96) = 1.51, p = .22$ ].

To examine any and all possible effects of C attachment classifications, follow-up pair wise comparison tests were conducted to test C versus B, C versus A, and C versus A and B. Using a one-tailed test with an alpha set at .03 (.10/3) to control for Type I error, one marginally significant difference was found between Bs and Cs [ $t(98) = -2.14, p = .035$ ] with insecure-ambivalent children reporting significantly more separation anxiety than securely attached children. However, since groups A and C were not found to be different, it seemed appropriate to group them in subsequent analyses.

Table III. Pearson product moment correlations between mother's ratings of child's behavior, ratings of maternal sensitivity, mother's rating of own separation anxiety with child's self-reported separation anxiety.

<i>Child self-report at age 6 of separation anxiety</i>	
<i>Mother's rating of child's:</i>	
Temperament (rated at 6 months)	-.10
Externalizing behaviors (rated at 54 months)	.03
Internalizing behaviors (rated at 54 months)	.22*
<i>Maternal sensitivity rated at:</i>	
6 months	-.29**
15 months	-.37**
24 months	-.25*
72 months	-.25*
<i>Mother's report of maternal separation anxiety at:</i>	
6 months	.25*
15 months	.30**
24 months	.31**

N = 99.

$p < .10$ ; \* $p < .05$ ; \*\* $p < .01$  2-tailed.

*Regression analyses predicting children's separation anxiety*

Using a simultaneous regression analysis, we examined the prediction of separation anxiety at age 6 years; we were specifically interested in assessing the unique contribution of each of the constructs: mother–infant attachment security, maternal sensitivity, and maternal separation anxiety. We present the results of this analysis in Table IV. With non-significant regression coefficients, and only a marginally significant change in total variance accounted for, maternal separation anxiety may not add uniquely to the prediction of children's separation anxiety; however infant–mother attachment security and maternal sensitivity contribute in non-redundant ways to the prediction of children's separation anxiety at age 6. These results led us to conduct our final set of post-hoc analyses to test for mediation.

*The test of a post-hoc mediation model*

The results so far suggest the impact of maternal separation anxiety on children's separation anxiety may be mediated through maternal sensitivity or infant–mother attachment security. To further explore this possibility we tested a mediation model. For these analyses, please note that composite maternal sensitivity and maternal separation anxiety scores were created by summing the ratings of maternal sensitivity at 6, 15, 24, and 72 months of age and maternal separation anxiety ratings at 6, 15, and 24 months of age. These composite scores were used in the following analyses.

To test for mediation, we tested the four conditions that Baron and Kenny (1986) outlined as essential to show mediation. The basic test of mediation consists of four steps (see Figure 1). The first step is to test for the direct, or total, effect of maternal separation anxiety on children's separation anxiety (Path  $A_1$  in Figure 1), the second step is to test the effect of mother's separation anxiety on maternal sensitivity (Path  $B_2$ ) and infant–mother attachment security (Path  $C_2$ ), and the third step is to test the direct effect of maternal sensitivity and infant–mother attachment security on children's separation anxiety (Paths  $D_3$  and  $E_3$ ). The fourth step is to test for complete mediation (i.e., Path  $F_4 = 0$  in Figure 1). That is, to show full mediation, Path  $A_1$ , must be significant before other predictors are

Table IV. Simultaneous regression analysis using attachment security, maternal sensitivity, and maternal separation anxiety to predict children's self-reported separation anxiety at 6 years old.

Predictor	<i>B</i>	<i>SE(B)</i>	$\beta$	<i>R</i> <sup>2</sup>	$\Delta R^2$
<b>STEP 1</b>				<b>.07</b>	<b>.07***</b>
<i>Attachment security</i>	-.72**	.31	-.23		
<b>STEP 2</b>				<b>.19</b>	<b>.11**</b>
<i>Maternal sensitivity rated at:</i>					
6 months	-.06	.09	-.07		
15 months	-.24***	.12	-.24		
24 months	.01	.11	.01		
72 months	-.12	.14	-.10		
<b>STEP 3</b>				<b>.26</b>	<b>.08*</b>
<i>Self-report of maternal separation anxiety at:</i>					
6 months	.03	.02	.20		
15 months	.04	.02	.28		
24 months	.02	.02	.14		

\* $p < .10$ ; \*\* $p < .05$ ; \*\*\* $p < .01$ .

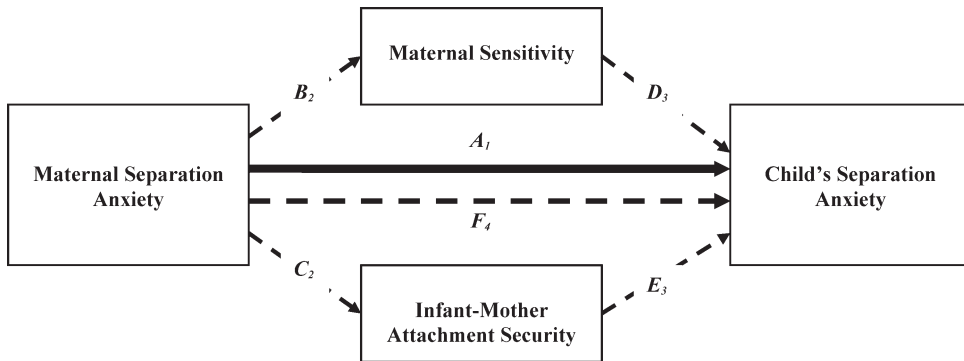


Figure 1. General mediation model.

introduced. If maternal sensitivity or infant–mother attachment security mediate the relationship between maternal separation anxiety and children’s separation anxiety, Paths  $B_2$  and  $D_3$ , or  $C_2$  and  $E_3$ , will be significant, and Path  $F_4$  will not be.

The model depicted in Figure 1 was tested using Arbuckle and Wothke’s (1999) SEM program, Analysis of Moment Structures (AMOS). The goodness of fit of the model was assessed using multiple criteria. First, the chi-square value was examined. The resultant chi-square (0.429 with 1 degree of freedom) was not statistically significant, indicating a good fit with non-significant differences between the expected and observed covariances. Alternate goodness of fit indexes examined included the Tucker-Lewis index (TLI; Tucker & Lewis, 1973), the comparative fit indexes (CFI; Bentler, 1990) and the root mean squared of the residuals (RMSEA; Steiger, 1990). With values greater than .95 for the TLI and the CFI indicating a good fit between the data and the model (Hu & Bentler, 1999), the current model is a good fit according to both of these indexes with a TLI of .996 and CFI of .999. With values less than .08 for the RMSEA indicating a good fit, the current model is a good fit according to this index with a value of .004.

The unstandardized path coefficients derived from the model are presented in Figure 2. As can be seen in Figure 2, support is evidenced for mediation. The direct relation between maternal separation anxiety and children’s separation anxiety was significant (Path  $A_1$ ) when no other predictors are in the model, but reduced to nearly zero (Path  $F_4$ ) when maternal sensitivity is accounted for (Paths  $B_2$  and  $D_3$ ). Because there is not a significant relationship evidenced here between maternal separation anxiety and infant–mother attachment security (Path  $C_2$ ), we conclude that the effect of maternal separation anxiety on children’s separation anxiety at age 6 years old is mediated thorough maternal sensitivity, not infant–mother attachment security.

## Discussion

The current study took steps to better understand the unique contribution of infant–mother attachment security to school-aged children’s separation anxiety, as suggested by Eley et al. (2003) and Bogels et al. (2003), taking into account other predictor variables like maternal sensitivity and separation anxiety. Four major findings emerged. First, our measure of separation anxiety demonstrated promising evidence of being a reliable and valid index of young children’s symptoms of separation anxiety. Second, infant–mother attachment insecurity during infancy predicted elevated levels of separation anxiety at age 6 years, even after controlling for the contribution of maternal sensitivity and separation anxiety. Third,

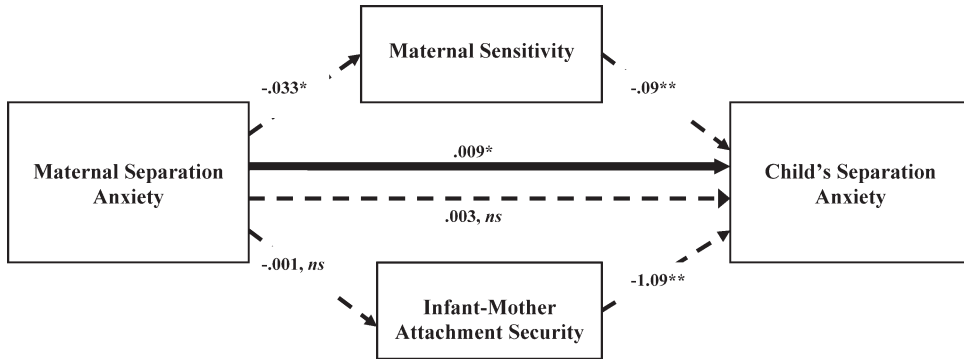


Figure 2. Mediation model with unstandardized path coefficients. *ns* = not significant; \* $p < .05$ ; \*\* $p < .01$ .

sensitive maternal behaviors at each of the ages assessed were correlated with fewer symptoms of separation anxiety in children. And fourth, the relation between mothers' and children's separation anxiety may be mediated through maternal sensitivity.

The self-report measure of children's separation anxiety developed for use in the current study demonstrated acceptable internal consistency and content validity. With the deletion of one of the original items, the remaining seven items that made up the scale had an acceptable internal reliability. When the items were subjected to a factor analysis, they configured into a robust, single Separation Anxiety factor. Construct validity was evidenced by a significant positive correlation of scores on the separation anxiety scale and mothers' report of internalizing behavior. Discriminant validity was evidenced by the fact that this measure was unrelated to mothers' reports of children's externalizing behavior. Furthermore, our measure of children's separation anxiety was related in theoretically predictable and meaningful ways to infant-mother attachment security, maternal sensitivity (both previous and concurrent), and mothers' reports of their own separation anxiety during the first 2 years of the child's life. The only question we have concerning the validity of this measure is its failure to correlate with our measure of temperament at 6 months old.

In answer to our central research question regarding the precursors and familial conditions which predict and sustain children's separation anxiety during early childhood, we found that children who were classified as being insecurely attached at 15 months of age self-reported significantly higher levels of separation anxiety at age 6 years than their securely attached counterparts, with children classified as C, or insecure-ambivalent, evidencing the highest levels. Moreover, even after accounting for the contribution of maternal insensitivity and separation anxiety, early infant-mother attachment insecurity had a significant effect. This finding confirms what Bowlby (1973) suspected, that insecurely attached children will experience more anxiety than securely attached children. In addition, we found that sensitive maternal behavior significantly predicted less separation anxiety at age 6 years, even after accounting for the contribution of infant-mother attachment security and maternal separation anxiety. This finding is consistent with literature linking children's separation anxiety with the lack of sensitive and responsive caregiving (e.g., Lynch & Cicchetti, 2002). Taken together, these findings indicate that both infant-mother attachment insecurity and maternal insensitivity contribute to children's fears about being separated from a caregiver in non-redundant ways.

It was interesting that although maternal separation anxiety was significantly positively correlated with children's report of separation anxiety, it failed to predict it after accounting for the contributions of infant-mother attachment security and maternal sensitivity. Indeed,

post-hoc testing of a mediation model revealed that the impact of maternal separation anxiety on children's separation anxiety is almost entirely mediated by maternal sensitivity. Although some researchers have found that maternal separation anxiety is directly related to children's anxiety, competence, and self-regulation (e.g., Biederman et al., 2001; Deiner & Kim, 2004), our results suggest that this relation could be explained indirectly, through the impact of maternal separation anxiety on parenting skills like sensitivity, rather than directly.

We did not find a significant relation between mothers' rating of child's temperament at 6 months of age with children's separation anxiety at age 6 years. However, as the genetic contribution to children's anxiety is likely high, corroborating evidence, further testing, and replication of this finding is needed. Indeed, children could very well inherit the same set of genes that shape maternal separation anxiety which could in turn make them more vulnerable to anxiety. Given the literature supporting the relation between genetically based temperament, attachment, and later internalizing and externalizing outcomes at school age (see Burgess, Marshall, Rubin, & Fox, 2003; Fox & Card, 1999; Fox et al., 2001) further examination of temperamental and genetic effects is especially warranted.

Concurrent maternal sensitivity was only modestly correlated with the child's separation anxiety. Although each rating of maternal sensitivity was significantly correlated with children's separation anxiety at first grade, and as a group the ratings were predictive, overall the 15 month of age rating of maternal sensitivity was the strongest, and only significant predictor in the regression block containing all of the ratings of maternal sensitivity. This is likely a statistical issue of colinearity, as all the measures are highly correlated with each other and can only account for so much of the available variance over and above each other. However, another theoretically based possibility exists. Perhaps a reason for the seemingly special impact of maternal sensitivity at 15 months of age is that this is a critical age for the formation of long-lasting representations regarding separations from the attachment figure.

The current study had several strengths. First, a longitudinal design was used with an ethnically and educationally diverse sample of mothers and their children. Some drawbacks include not having multiple assessments of children's separation anxiety. Sample size was smaller than desirable, and attrition limited the generalizability of the results somewhat. Ideally, we would have liked to have obtained test-retest reliability data on our measure of separation anxiety. With a larger sample size, more powerful comparisons could be made between children who had different insecure attachment classifications. The effect of attachment insecurity may be over-represented by the children classified as insecure-ambivalent. Additionally, it would be important to know whether children secondarily classified with disorganized patterns of attachment were more likely to have later separation anxiety, but the small number of disorganized classifications precluded testing this prediction.

Limitations of the current study suggest several interesting avenues for future research, including more reliability and validity studies of our measure of children's separation anxiety. Of particular interest is a study of the predictive validity of our measure. Is separation anxiety in early childhood a precursor of more generalized anxiety in older children? Additionally, in future research, we would like to better estimate a genetic contribution of maternal anxiety including additional measures mother's internalizing symptoms and of the child's temperament and behavioral inhibition. These issues warrant further investigation with a larger sample.

In conclusion, the current study employed a longitudinal design to better understand the unique contribution of infant-mother attachment security, maternal sensitivity, and mother's separation anxiety to children's separation anxiety during early childhood. Researchers may find the 7-item child self-report scale useful in examining the sequelae of children's early separation anxiety. The results indicate that both infant-mother attachment insecurity and

maternal insensitivity during infancy contributed significantly to the prediction of children's separation anxiety at age 6 years, whereas maternal separation anxiety did not. Clinicians might find it helpful to view separation anxiety in early childhood as a continuing issue for the mother-child dyad, and not as unique to the early school period. Interventions addressing the child's generalized attachment security and the history of the mother's sensitivity to the child might be more useful than those focusing on immediate issues in the child's life.

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### References

- Ablow, J. C., & Measelle, J. R. (1993). *Berkeley puppet interview: Administration and scoring system manuals*. Berkeley: University of California.
- Ainsworth, M. S., & Bell, S. M. (1970). Attachment, exploration, and separation: Illustrated by the behavior of one-year-olds in a strange situation. *Child Development*, *41*, 49–67.
- Ainsworth, M. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Potomac, MD: Erlbaum.
- Arbuckle, J. L., & Wothke, W. (1999). *AMOS 4.0 users guide*. Chicago: Small Waters Corporation.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182.
- Belsky, J., & Rovine, M. J. (1988). Nonmaternal care in the first year of life and the security of infant-parent attachment. *Child Development*, *59*, 157–167.
- Bentler, P. M. (1990). Comparative fit indices in structural models. *Psychological Bulletin*, *88*, 588–606.
- Berg, I. (1995). Absence from school: Research and practical management. In S. Lloyd-Bostock & G. Davies (Eds.), *Psychology, law, and criminal justice: International developments in research and practice* (pp. 459–468). Oxford: Walter De Gruyter.
- Berlin, L. J., Cassidy, J., & Belsky, J. (1995). Loneliness in young children and infant-mother attachment: A longitudinal study. *Merrill-Palmer Quarterly*, *41*, 91–103.
- Biederman, J., Faraone, S. V., Hirshfeld-Becker, D. R., Friedman, D., Robin, J. A., & Rosenbaum, J. F. (2001). Patterns of psychopathology and dysfunction in high-risk children of parents with panic disorder and major depression. *American Journal of Psychiatry*, *158*, 49–57.
- Bogels, S. M., van Dongen, L., & Muris, P. (2003). Family influences on dysfunctional thinking in anxious children. *Infant and Child Development*, *12*, 243–252.
- Booth, C. L., Rubin, K. H., & Rose-Krasnor, L. (1998). Perceptions of emotional support from mother and friend in middle childhood: Links with social-emotional adaptation and preschool attachment security. *Child Development*, *69*, 427–442.
- Bowlby, J. (1969/1982). *Attachment and loss. Vol. 1: Attachment* (2nd ed.). New York: Basic Books.
- Bowlby, J. (1973). *Attachment and loss. Vol. 2: Separation: Anxiety and anger*. New York: Basic Books.
- Burgess, K. M., Marshall, P. J., Rubin, K. H., & Fox, N. A. (2003). Infant attachment and temperament as predictors of subsequent externalizing problems and cardiac physiology. *Journal of Child Psychology and Psychiatry*, *44*, 819–831.
- Carey, W. B., & McDevitt, S. C. (1978). Revision of the infant temperament questionnaire. *Pediatrics*, *61*, 735–739.
- Cassidy, J., & Main, M. (1984). The relationship between infant-parent attachment and the ability to tolerate brief separation at six years. In R. Tyson & E. Galenson (Eds.), *Frontiers of infant psychiatry: Volume 2* (pp. 132–136). New York: Basic Books.
- Cox, M. J., Owen, M. T., Henderson, K. V., & Margand, N. A. (1992). Prediction of infant-father and infant-mother attachment. *Developmental Psychology*, *28*, 474–483.

- Deiner, M., & Kim, D. (2004). Maternal and child predictors of preschool children's social competence. *Applied Developmental Psychology, 25*, 3–24.
- DeWolff, M. S., & van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68*, 571–591.
- Egeland, B., & Farber, E. A. (1984). Infant–mother attachment: Factors related to its development and changes over time. *Child Development, 55*, 753–771.
- Egger, E. L., Costello, J., & Angold, A. (2003). School refusal and psychiatric disorders: A community study. *Journal of the American Academy of Child and Adolescent Psychiatry, 42*, 797–807.
- Eley, T. C., Bolton, D., O'Connor, T. G., Perrin, S., Smith, P., & Plomin, R. (2003). A twin study of anxiety related behaviours in pre-school children. *Journal of Child Psychology and Psychiatry, 44*, 945–960.
- Fox, N., & Card, J. A. (1999). Psychophysiological measures in the study of attachment. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 226–245). New York: Guilford.
- Fox, N. A., Henderason, H. A., Rubin, K. H., Clakins, S. D., & Schmidt, L. A. (2001). Continuity and discontinuity of behavioral inhibition and exuberance: Psychophysiology and behavioral influences across the first four years of life. *Child Development, 66*, 1770–1784.
- Gresham, F. M., & Elliott, S. N. (1990). *The social skills rating system*. Circle Pines, MN: American Guidance Service.
- Grossmann, K. E., & Grossmann, K. (1991). Attachment quality as an organizer of emotional and behavioral responses in a longitudinal perspective. In C. M. Parkes, J. Stevenson-Hinde, & P. Maries (Eds.), *Attachment across the life cycle*. New York: Routledge.
- Hock, E., Eberly, M., Bartle-Haring, S., Ellwanger, P., & Wildaman, K. F. (2001). Separation anxiety in parents of adolescents: Theoretical significance and scale development. *Child Development, 72*, 284–298.
- Hock, E., McBride, S., & Gnezda, M. T. (1989). Maternal separation anxiety: Mother–infant separation from the maternal perspective. *Child Development, 60*, 793–802.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55.
- Kearney, C. A., & Albano, A. M. (2004). The functional profiles of school refusal behavior: Diagnostic aspects. *Behavioral Modification, 28*, 147–161.
- Kearney, C. A., Sims, K. E., Pursell, C. R., & Tillotson, C. A. (2003). Separation anxiety disorder in young children: A longitudinal and family analysis. *Journal of Clinical Child and Adolescent Psychology, 32*, 593–598.
- Lynch, M., & Cicchetti, D. (2002). Links between community violence and the family system: Evidence from children's feelings of relatedness and perceptions of parent behavior. *Family Process, 41*, 519–532.
- Medoff-Cooper, B., Carey, W. B., & McDevitt, S. C. (1993). Early infant temperament questionnaire. *Journal of Developmental and Behavioral Pediatrics, 14*, 230–235.
- Morris, A. S., Silk, J. S., Steinberg, L., Sessa, F. A., Avenevoli, S., & Essex, M. J. (2002). Temperamental vulnerability and negative parenting as interacting of child adjustment. *Journal of Marriage and Family, 64*, 461–471.
- NICHD ECCRN. (1997). The effects of infant childcare on infant–mother attachment security: Results of the NICHD Study of Early Care. *Child Development, 68*, 860–879.
- NICHD ECCRN. (1999). Child care and mother–child interaction in the first three years of life. *Developmental Psychology, 35*, 1399–1413.
- Sessa, F. M., Avenevoli, S., Steinberg, L., & Morris, A. S. (2001). Correspondence among informants on parenting: Preschool children, mothers, and observers. *Journal of Family Psychology, 15*, 53–68.
- Steiger, J. H. (1990). Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research, 25*, 173–180.
- Thomas, A., & Chess, S. (1977). *Temperament and development*. New York: Brunner.
- Thompson, R. (1991). Childhood anxiety disorders from the perspective of emotion regulation and attachment. In M. R. Dadds & M. W. Vasey (Eds.), *The developmental psychopathology of anxiety* (pp. 160–182). London: Oxford University Press.
- Tucker, L. R., & Lewis, C. (1973). The reliability coefficient for maximum likelihood factor analysis. *Psychometrika, 38*, 1–10.
- Winer, B. J. (1971). *Statistical principles in experimental design* (2nd ed.). New York: McGraw-Hill.
- Wolchick, S., Tein, J., Sandler, I. N., & Doyle, K. W. (2002). Fear of abandonment as a mediator of the relations between divorce stressors and mother–child relationship quality and children's adjustment problems. *Journal of Abnormal Child Psychology, 30*, 401–418.

**Appendix.** Pearson product moment correlation table: Interrelations among ratings of maternal sensitivity, maternal separation anxiety, and mother's rating of child's behaviors.

	Ratings of maternal sensitivity				Maternal self-report of separation anxiety			Mother's rating of child's behaviors:		
	at 6	15	24	72 months	at 6	15	24 months	Temperament	Externalizing	Internalizing
Ratings of maternal sensitivity at:										
6 months	—									
15 months	.44***	—								
24 months	.30***	.47***	—							
72 months	.25**	.32***	.41***	—						
Maternal self-report of separation anxiety at:										
6 months	—				—					
15 months	-.19**	-.21**	-.24**	-.12	.77***	—				
24 months	-.27***	-.23**	-.30***	-.17*	.70***	.72***	—			
72 months	-.08	-.15	-.23**	-.14						
Mother ratings of child's behaviors:										
Temperament	-.19**	-.20**	-.32***	-.21	.30	.26***	.11	—		
Externalizing	-.07	-.07	-.16*	-.03	.16	.12	.01	.22**	—	
Internalizing	.01	-.05	.06	-.03	.29***	.17*	.09	-.20**	.16	—

\* $p < .10$ ; \*\* $p < .05$ ; \*\*\* $p < .01$ .