

Infant–mother attachment security and children’s anxiety and aggression at first grade

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Abstract

With a large and diverse sample of children from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development, the role of infant–mother attachment security as a protective factor against the development of children’s anxious and aggressive behaviors at first grade was examined. When child’s sex, family income, maternal sensitivity, and prior levels of anxiety and aggression were controlled for, attachment security at 15 months of age was found to moderate the effects of negative life events families experienced, thereby protecting children from experiencing symptoms of anxiety, but not aggression, at 4.5 years of age. Children classified as insecurely attached at 15 months of age who experienced many stressful life events exhibited more anxiety symptoms in first grade than children classified as securely attached who similarly experienced many negative life events. These findings are interpreted within attachment theory, which predicts that early attachment security has a unique role in children’s anxiety experiences later in childhood.

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1. Introduction

Attachment theory, as conceptualized by Bowlby (1969/1982, 1973) and Ainsworth and colleagues (Ainsworth & Wittig, 1969; Ainsworth & Bell, 1970; Ainsworth, Blehar, Waters, & Wall, 1978), has generated a great deal of research and interest since its inception more than 30 years ago. Researchers following in the Bowlby–Ainsworth tradition have advanced our understanding of developmental trajectories associated with attachment security and insecurity and the long-term implications of early infant–mother attachment security. Greater positive and fewer negative child outcomes have been linked to early infant–mother attachment security, leading researchers to speculate that infant–mother attachment security may serve as a protective factor against the development of negative psychosocial and emotional outcomes (Greenberg, 1999). Building on the work of others (e.g., McCartney, Owen, Booth, Clarke-Stewart, & Vandell, 2004; National Institute of Child Health and Human Development Early Child Care

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Research Network [NICHD ECCRN], 2006; Shaw & Vondra 1995; Sroufe, 1985), we investigated the role of early infant–mother attachment security as a protective factor against the development of anxious and aggressive behaviors at school age. We proposed that although attachment security may serve as a general protective factor against the development of negative outcomes like aggressiveness, attachment security may be a *specific* protective factor against the development of children’s feelings and symptoms of anxiety, particularly when families experience many stressful or negative life events.

1.1. Attachment security as a protective factor

Protective factors are attributes or characteristics an individual possesses that decrease the chance of developing an undesirable or negative psychosocial outcome later in life (Rutter, 1979). The positive effects of many protective factors may not be immediately apparent; they may be evident only under conditions of stress (Greenberg, 1999).

Bowlby (1973) proposed that early infant–mother attachment security serves as a protective factor for later anxiety disorders. Children with secure attachment histories during infancy, he suggested, might be protected against developing anxiety later in life because the child possesses an inner confidence that is lacking in a child who does not have a secure representation. In contrast, children classified as insecure-avoidant, insecure-ambivalent, or disorganized in the Strange Situation in infancy are at heightened risk for maladaptive outcomes later in life. Although attachment security alone is not a sufficient condition to protect an individual against disorder (Sroufe, 1990), attachment insecurity may be an important but nonspecific risk factor that increases risk in stressful life circumstances for a number of problem behaviors, including symptoms of internalizing and externalizing behaviors (Greenberg, 1999).

1.2. Attachment security and internalizing and externalizing behaviors

From a developmental psychopathology perspective, most developmental risk factors are not disorder specific. Early insecurity could serve as a risk factor for both internalizing and externalizing disorders (Toth & Cicchetti, 1999). Some reports suggest that aside from the disorganized categorization, by school age, children with different insecure classifications are indistinguishable (Sroufe, 1983, see also McCartney et al., 2004). However, Bowlby (1973) highlighted the unique role attachment insecurity might play in the development of anxiety. He wrote that insecurely attached children, who presumably lack confidence in their caregiver’s ultimate accessibility, were more susceptible to developing fears and anxiety than children who are securely attached. Evidence linking attachment to internalizing symptoms, including depression and anxiety, suggests that there is a main effect of attachment security, such that children who are classified as securely attached during infancy tend to show fewer symptoms of depression and anxiety at school age, in both high- and low-risk samples (Anan & Barnett, 1999; Booth, Rose-Krasnor, McKinnon, & Rubin 1994; Dallaire & Weinraub, 2005a; Goldberg, Gotowiec, & Simmons, 1995).

Though disruption in the mother–infant attachment relationship is often cited by patients as a contributing factor in cases of anxiety disorders like separation anxiety disorder (see Shear, Jin, Ruscio, Walters, & Kessler, 2006), it is surprising that more attention has not been devoted to the specific role attachment security may have in protecting children from developing anxiety under conditions of stress. In both the child and adult attachment literature, researchers have reported that securely attached individuals differ from insecurely attached individuals in the types of threatening and anxiety-provoking information they attend to in the environment (e.g., Lay, Waters, Posado, & Ridgeway, 1995; Van Emmichoven, Van IJzendoorn, DeRuiter, & Brosschot, 2003). For example, Van Emmichoven et al. (2003) found that individuals classified as insecure in the adult attachment interview showed significant differences in the way they processed anxiety-provoking cues from the environment when compared with secure or autonomous adults; the two insecure groups did not differ from each other. These results suggest that secure individuals may be protected from experiencing symptoms of anxiety by means of their ability to process and attend to different cues in the environment.

Van IJzendoorn (1997) has argued that a history of insecure attachments also puts children at risk for behaving aggressively. Evidence linking attachment security to externalizing symptoms, including aggressive behaviors, suggests that there is a main effect of attachment security in most high-risk samples (e.g., Egeland & Sroufe, 1981; Lyons-Ruth, 1996; Munson, McMahon, & Spieker, 2001), but there is less evidence of a main effect in low-risk samples (see Bates, Maslin, & Frankel, 1985; Fagot & Kavanaugh, 1990). In addition, there may be an interactive effect such that insecurely attached boys, but not girls, may be at risk for displaying externalizing behaviors (Lewis,

Feiring, McGuffog & Jaskir, 1984; McCartney et al., 2004). However, this gender effect has received only moderate support, and in some cases, girls with insecure attachments have shown greater externalizing behaviors than boys (i.e., Munson et al., 2001).

Using the National Institute Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD) data set, McCartney and her colleagues examined attachment security and children's internalizing and externalizing behavior outcomes at age 3. Their results indicated that attachment insecurity was a risk factor for the development of internalizing behaviors according to both mother and caregiver reports. For boys, attachment insecurity was associated with mothers' and caregivers' ratings of their externalizing behaviors. The current study attempts to replicate and extend these findings into school age using additional reporters of child behaviors, controlling for anxiety and aggression at age 3, and taking into consideration the role of attachment security as a protective factor against anxiety and aggression under conditions of familial stress. Given the theoretical link between attachment insecurity and anxiety, we expect that under conditions of high family stress, children with secure attachment histories will be protected specifically from developing symptoms of anxiety.

1.3. Maternal sensitivity, prior symptoms, and family stress

Infant–mother attachment security is robustly predicted by maternal sensitivity and responsiveness (see DeWolff & van IJzendoorn, 1997). The more sensitive and responsive a parent is to the infant's needs, the more likely the child is to develop a secure attachment. Sensitive and responsive parenting behavior continues to influence children's development in positive ways beyond infancy. Positive, warm, responsive parenting has been linked to fewer internalizing (e.g., Brennan, Le Brocque, & Hammen, 2003; Dallaire et al., 2006; Sheeber, Hops, Andrews, Alpert, & Davis, 1998) and externalizing (see Scarmella, Conger, Spoth, & Simmons, 2002) behaviors in childhood. NICHD ECCRN (2006) found that children who had secure infant–mother attachment security histories were protected against the effects of decreasing parent sensitivity on externalizing behaviors at first grade. Here, we further explore that finding, testing whether early attachment security can also protect children from developing anxiety and aggressive behaviors under conditions of familial stress.

The experience of family stress is a normative stressor that children in all families experience to different extents, and may be associated with the expression of problem behaviors (Grant et al., 2003; Kim, Conger, Elder, & Lorenz, 2003; McMahan, Grant, Compas, Thurm, & Ey, 2003). The interaction of protective factors, like attachment security, with contextual factors, like family stress, may be uniquely associated with the development and maintenance of children's anxiety (Wood, McLeod, Sigman, Hwang, & Chu, 2003). We expect children with secure attachment security histories to be protected from the possible deleterious outcomes associated with the experience of such family stress.

1.4. The present study

The focus of the current report is on the unique role of the child's attachment security in the prediction of anxious and aggressive behaviors at school age, accounting for such important factors as the child sex, concurrent parental sensitivity, family income, and prior symptom levels of anxiety and aggressiveness. Further, we address whether there is an interaction such that the protective nature of infant–mother attachment security on the expression of anxious and aggressive behaviors becomes evident under conditions of greater family stress. Finally, we predict that early infant–mother attachment security impacts the development of children's anxiety specifically, as compared with being a more general risk factor in the development of aggression.

Though other studies have assessed the role of attachment security as a protective factor against the development of internalizing and externalizing behaviors, the current study is an improvement over previous studies in a number of ways. First, in addition to examining main effects, we examine the interactive effects of attachment security and the experience of negative life events. Second, we control for prior symptom level, thus isolating changes in symptoms over time after the experience of negative and stressful life events. Third, we focus specifically on behaviors relating to anxiety and aggression to better isolate anxiety from more general somatic and withdrawn symptoms, and to isolate aggression from delinquent behaviors. Fourth, we have separated from our sample any children with disorganized or controlling (“D”) categorizations, so that we can test whether secure and insecure children have different outcomes even without considering this more at risk D group. Fifth, we use the perspective of multiple reporters of child outcomes,

including mothers', fathers', and teachers' reports at first grade, as well as multiple assessments of attachment security. Finally, the longitudinal design allows us to examine how children and families change over time and development.

2. Method

2.1. Participants

Data collected as part of the common protocol for Phases I and II of the NICHD SECCYD are publicly available to qualified investigators and were used in the present study. Participant recruitment and sampling procedures have been described elsewhere (see Dallaire & Weinraub, 2005b; NICHD ECCRN, 2001a) and are not described here. The final sample of 1364 participants who were enrolled in the SECCYD in 1991 was diverse: 52% were male, 24% were ethnic minority children, 11% of the mothers had not completed high school, and 14% of the mothers were single parents at the time of the child's birth.

Though not all of the 1364 original participants completed each and every assessment, there are complete data from 866 mother–child, 662 father–child, and 831 teacher–child dyads for the regression analyses. For the latent variable structural equation modeling analyses, we made the assumption that the missing data were not missing completely at random (see Muthen, Kaplan, & Hollis, 1987). Therefore we used full information maximum likelihood methods of data analysis, which provide a less biased estimate than more conventional methods such as listwise and pairwise deletion.

2.2. Measures

Descriptive data for all variables used in the current study and intercorrelations among variables are listed in the last column of Table 1.

Attachment security was assessed at 15 months with the Strange Situation (Ainsworth et al., 1978) and at 36 months with the modified Strange Situation (Cassidy, Marvin, & the McArthur Working Group on Attachment, 1992) procedures (please see NICHD ECCRN, 2001b, for a more detailed description of these measures). The Strange Situation is a 25-minute laboratory procedure containing a series of eight brief separation and reunion episodes for the mother–child dyad and the introduction of a stranger. The procedure is designed to be ecologically valid and moderately stressful for the child. When stressed, secure infants (B), on reunion, seek and accept comfort from their mother and engage in exploratory behavior. Children classified as insecurely attached may be avoidant (A) of the caregiver and the comfort she may provide, or the child may be resistant or ambivalent (C) to the comfort received. Secondary to the major A/B/C classification, disorganized (D) classifications were made. Children with a D classification lack an organized set of behaviors to get and maintain their caregivers' attention and often manifest contradictory (e.g., walking backward) or strange (e.g., falling down) behaviors. The primary A/B/C classifications and secondary D classification were used to identify the children as securely attached (B), insecurely attached (A and C), or disorganized (D). Most (643, 62%) infants were classified as securely attached at 15 months, with 239 (23%) infants placed in one of the insecure attachment classifications, and 161 (15%) infants classified as disorganized. Children's behavior in the laboratory procedure was videotaped, and tapes were sent to a central coding location where all tapes were doubled coded. Agreement with the two-category classification system used in the present study was 86% ($\kappa = .70$). Across coding pairs, before conferencing, agreement for the four-category A/B/C/D system was 82% ($\kappa = .70$).

A modified Strange Situation procedure, based on the recommendations of Cassidy et al. (1992), was used to assess attachment security at 36 months. A more detailed description of this procedure can be found elsewhere (see McCartney et al., 2004; NICHD ECCRN, 2001b). Briefly, it differs from the 15-month procedure in terms of length of mother–child separation (5 instead of 3 minutes). At 36 months, most of the children (650, 62%) were classified as securely attached, with 228 (21%) children classified as either insecure-avoidant or insecure-ambivalent, and 165 (16%) children classified as insecure-controlling/insecure-other (see NICHD ECCRN, 2001b, for description of classifications). All tapes were coded at a central location by two raters. When two coder classifications differed, the two coders watched the tape together and decided on a code together. Agreement was 80.1% between the two coders, before conferencing, for the two-category system. Inter-coder agreement (before conferencing) on the four-category A/B/C/D classifications was 75.7% ($\kappa = .58$).

Table 1
Correlations, means, and standard deviations of variables used in the present study

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	M (SD)
1. Mother's sensitivity at first grade	–	.32**	.07*	–.21**	–.13**	.08*	.06 [†]	.14**	–.05	–.15**	–.04	–.07 [†]	.05	–.12**	5.01 (1.37)
2. Family income	–	–	–.04	–.13**	–.13**	–.05	.05*	.08*	–.01	–.17**	–.03	–.15**	–.02	–.08*	3.66 (2.77)
3. Sex (male)	–	–	–	–.04	.02	–.02	.05	.04	.02	–.02	.03	.06	.03	.02	52% (–)
4. Mother's report of anxiety at age 3 ^a	–	–	–	–	.57**	.03	.04	–.11**	.32**	.32**	.18**	.18**	.02	.12**	4.66 (2.87)
5. Mother's report of aggression at age 3 ^a	–	–	–	–	–	.11**	.03	.11**	.31**	.49**	.20**	.29**	.01	.18**	9.18 (5.05)
6. NLE at age 4.5	–	–	–	–	–	–	–.01	.02	.15**	.16**	.12**	.14**	.07*	.05	3.31 (3.35)
7. Attachment security at 15 months ^b	–	–	–	–	–	–	–	.05	–.04	–.01	–.01	.01	–.07 [†]	–.07*	1.62 (.49)
8. Attachment security at 36 months ^b	–	–	–	–	–	–	–	–	–.06 [†]	–.06 [†]	–.06 [†]	–.09	–.01	–.12**	1.62 (.49)
9. Mother's report of child's anxiety at first grade ^c	–	–	–	–	–	–	–	–	–	.48**	.25**	.19**	.17**	.09**	52.76 (4.83)
10. Mother's report of child's aggression at first grade ^c	–	–	–	–	–	–	–	–	–	–	–.21**	.41**	.06 [†]	.27**	53.49 (5.85)
11. Father's report of child's anxiety at first grade ^c	–	–	–	–	–	–	–	–	–	–	–	.58**	.10**	.16**	52.70 (5.00)
12. Father's report of child's aggression at first grade ^c	–	–	–	–	–	–	–	–	–	–	–	–	–.08*	.29**	53.38 (5.53)
13. Teacher's report of child's anxiety at first grade ^c	–	–	–	–	–	–	–	–	–	–	–	–	–	.27**	53.59 (5.27)
14. Teacher's report of child's aggression at first grade ^c	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–53.99 (5.89)

[†] $p < .10$. * $p < .05$. ** $p < .01$.

^a CBCL subscale total scores.

^b Attachment security=dichotomous variable, coded as insecure=1, secure=2.

^c CBCL subscale T scores; N ranged from 687 to 1045.

For the current study, children were assigned a dichotomous score of 1 if they were rated as insecurely attached, and a score of 2 if they were classified as securely attached. In total, there were two dichotomous attachment security variables, one for attachment security at 15 months and another for attachment security at 36 months. Sixty-two percent of the sample at both 15 and 36 months was securely attached, and 23 and 21% of the children were classified as insecurely attached at 15 and 36 months, respectively. Children with disorganized (D) classifications at 15 months and insecure-controlling/insecure-other classifications at 36 months were dropped from the regression and structural equation modeling (SEM) analyses so that the effects of secure and insecure attachment could be considered separate from these cases. Though 96.5% of the children fell into one of the main (A, B, C, or D) attachment classifications at both ages, the 3.5% of the sample who were unclassifiable were also eliminated from these analyses.

Mothers reported the *number of negative life events* (NLE) the family experienced over the past 12 months when the child was 4.5 years of age using the 70-item Life Experiences Survey Questionnaire (Sarason, Johnson, & Siegel, 1978). Mothers were asked to identify events that happened to them and their family over the last year. Some events were relatively mundane (e.g., “argued with inlaws”, “got a speeding ticket”), whereas other events were more serious (e.g., “divorce”, “husband/partner detained in jail”, “foreclosure on mortgage”). In addition to rating if an event happened, mothers also rated on a 7-point scale how positive or negative the event was (ranging from +3 = extremely positive, to 0 = neutral, to -3 = extremely negative). For the present investigation, only the sum of NLE was used. Most mothers (80%, $n = 708$) reported experiencing fewer than six NLE (with most reporting three or fewer). However, 20% of mothers ($n = 185$) reported experiencing more than six NLE.

Children’s *anxious and aggressive behaviors* were assessed with the Child Behavior Checklist (CBCL) (Achenbach, 1991, 1992). The CBCL is a widely used screening tool, composed of about 100 items and is used to assess children’s social competence and problem behaviors. Raters rate on 3-point scales (0 = never, 1 = sometimes, 2 = often) how often the target child exhibits certain anxious and aggressive behaviors. At first grade, mothers, fathers, and teachers completed the CBCL 4–18 (Achenbach, 1991). The CBCL 4–18 is a highly reliable and predictive instrument (see Achenbach, 1991). Fourteen items constitute the Anxious Behaviors subscale of this instrument; representative items include “feels s/he has to be perfect,” “nervous”, and “self-conscious”. Twenty items constitute the Aggressive Behaviors subscale of this instrument; representative items include “acts disobedient at school”, “argues”, and “threatens”. Anxious and aggressive *T* scores were created on the basis of the scoring protocol provided by Achenbach (1991, 1992), with higher scores demonstrating a greater propensity to behave in anxious or aggressive ways. The narrowband anxious and aggressive subscales were used instead of the broadband internalizing and externalizing subscales so as to isolate anxious behaviors from other somatic complaints and withdrawn symptoms, and to isolate aggressive from delinquent behaviors. Though *T* scores are listed in Table 1 and used in the current analyses, the mean scores (and standard deviations) for mothers’, fathers’, and teachers’ reports of children’s anxiety were 2.58 (2.66), 2.50 (2.77), and 2.79 (3.34) respectively. The mean scores (and standard deviations) for mother, father, and teacher reports of children’s aggression were 6.90 (5.58), 6.98 (5.31), and 4.74 (7.08), respectively.

To control for prior levels of anxiety and aggression, mother reports of children’s symptoms of anxiety and aggression were used as control variables in the following analyses. When the children were 3 years old, mothers completed the CBCL 2–3, which was specifically designed for use with toddlers. The CBCL 2–3 has demonstrated good test–retest validity, as well as concurrent and predictive validity; it discriminates between clinically referred and nonreferred toddlers, and it predicts problem scores over a 3-year period (Achenbach, 1992). Eleven items constitute the Anxious Behaviors subscale of this instrument, and 15 items constitute the Aggressive Behaviors subscale of this instrument. Anxious and aggressive total scores were created on the basis of the scoring protocol provided by Achenbach (1991, 1992), with higher scores demonstrating a greater propensity to behave in anxious or aggressive ways.

Family *income* was computed with an income-to-needs ratio when the children were 1, 6, 15, 24, 36, and 54 months old by dividing the total family income by the poverty threshold for the appropriate family size (U.S. Bureau of the Census, 1999). A score less than 1 indicates that a family is very poor. The family income variable used in the present study was created by summing the family-reported income-to-needs ratios of all the assessments, and then dividing the sum by the number of assessments completed. The resultant variable was an average of the family’s income scores over the first 4.5 years of their child’s life.

Mothers’ *sensitivity* at first grade was assessed in a cooperative interaction task. Mothers and children were instructed to work together to complete a task. The task was designed to be too difficult for the children to complete

Table 2
Hierarchical regression analyses predicting mother's, father's, and teacher's reports of child's anxiety at first grade

Reporter	Mother					Father					Teacher				
	<i>B</i> (<i>SE</i>)	β	R^2	ΔR^2 Significant	f^2	<i>B</i> (<i>SE</i>)	β	R^2	ΔR^2 Significant	f^2	<i>B</i> (<i>SE</i>)	β	R^2	ΔR^2 Significant	f^2
Control variables															
Mother's sensitivity at first grade	.05 (.12)	.01	.00	–	–	.10 (.16)	–.03	.00	–	–	.19 (.14)	.05	.00	–	–
Income	.06 (.06)	.03	.00	–	–	.02 (.08)	.01	.00	–	–	.06 (.07)	–.30	.00	–	–
Sex	.25 (.31)	.03	.00	–	–	.13 (.38)	.01	.00	–	–	–.03 (.37)	.01	.00	–	–
Symptom at age 3	.54 (.05)	.32**	.11	**	.12	.25 (.07)	.14**	.03	**	.08	.04 (.07)	.02	.00	–	–
Main effects															
NLE at age 4.5	.79 (.21)	.55**	.13	*	.02	.73 (.29)	.46*	.04	**	.03	.39 (.26)	.25 [†]	.01	*	.01
Attachment Security at 15 months	.26 (.44)	.03	.13	[†]	.01	.29 (.56)	.03	.04	–	–	.22 (.54)	.02	.02	*	.01
Attachment Security at 36 months	–.01 (.45)	–.01	.13	–	–	.04 (.59)	.01	.04	–	–	–.29 (.55)	.03	.02	–	–
Interaction term															
NLE×Attachment Security at 15 months	–.25 (.10)	–.30**	.14	**	.01	–.14 (.13)	–.15	.04	–	–	–.30 (.12)	–.33*	.03	*	.02
NLE×Attachment Security at 36 months	–.11 (.10)	–.14	.14	–	–	–.19 (.13)	–.22	.04	–	–	.12 (.12)	.13	.03	–	–

[†] $p < .10$. * $p < .05$. ** $p < .01$.

Table 3
Hierarchical regression analyses predicting mother's, father's and teacher's report of child's aggression at first grade

Reporter	Mother					Father					Teacher				
	<i>B</i> (<i>SE</i>)	β	R^2	ΔR^2 Significant	f^2	<i>B</i> (<i>SE</i>)	β	R^2	ΔR^2 Significant	f^2	<i>B</i> (<i>SE</i>)	β	R^2	ΔR^2 Significant	f^2
Control variables															
Mother's sensitivity first grade	-.35 (.15)	-.18	.02	**	.02	-.18 (.18)	-.04	.01	*	.02	-.31 (.15)	-.07*	.01	**	.01
Income	-.24 (.07)	-.11**	.04	**	.02	.25 (.08)	.12**	.02	**	.02	-.10 (.08)	-.05**	.02	^t	.01
Sex	.13 (.38)	.01	.04	–	–	.55 (.43)	.05	.02	–	–	-.11 (.39)	-.01	.02	–	–
Symptom at age 3	.61 (.07)	.29**	.26	**	.30	.27 (.08)	.13**	.10	**	.07	.19 (.07)	.10**	.04	**	.03
Main effects															
NLE at age 4.5	.82 (.26)	.46**	.27	**	.02	.43 (.20)	.24	.11	**	.01	.04 (.27)	.02	.04	–	–
Attachment security at 15 months	.28 (.55)	.02	.27	–	–	-.28 (.63)	.02	.11	–	–	-.47 (.59)	-.04	.05	^t	.01
Attachment Security at 36 months	.42 (.56)	.03	.27	–	–	-.66 (.66)	-.01	.11	–	–	-1.56 (.59)	-.13**	.06	**	.01
Interaction terms															
NLE×Attachment Security at 15 months	-.13 (.12)	-.13	.28	–	–	-.07 (.14)	-.07	.11	–	–	-.01 (.12)	-.10	.06	–	–
NLE×Attachment Security at 36 months	-.20 (.12)	-.21 ^t	.28	–	–	-.05 (.15)	-.05	.11	–	–	.12 (.13)	.12	.06	–	–

^t $p < .10$. * $p < .05$. ** $p < .01$.

alone. The research assistant gave instructions only to the mothers; 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. Coders rated videos of the interaction using 7-point global rating scales (1 = not characteristic at all to 7 = very characteristic) to measure the mother's supportive presence. Reliability estimates were obtained from 20% ($n=196$) of the mother-child dyads. Two measures of reliability are available: the Pearson product moment correlation between the two raters' ratings was .77, and an unbiased estimate based on repeated measures (ANOVA) described by Winer (1971), consisting of the mean of $k=2$ measurements after taking into account differences between two raters, was .87.

2.3. Procedure

Research assistants at the 10 data collection locations were trained and certified to conduct all measures according to standardized procedures. Data collection was monitored at a central location to ensure continued compliance with protocol and procedures (see NICHD ECCRN, 2001b).

3. Results

3.1. Data analysis overview

The associations between the child's attachment security and anxious and aggressive behaviors was first assessed with hierarchical regression analyses whereby main effects and the interaction of the child's attachment security at 15 and 36 months with the number of NLE experienced in the family was assessed. All significant interactions are depicted with graphs. Latent variable SEM was used to examine anxious and aggressive behaviors at first grade as latent variables and the predictive utility of attachment security at 15 and 36 months, NLE, and the interaction term.

3.2. Hierarchical regression analyses

To consider the relative influence and interactive component of attachment security and the experience of NLE in the prediction of children's anxious and aggressive behaviors, a series of hierarchical regression analyses were performed. This procedure allows for examination of the unique contribution of each block of variables, entered in a theoretically prescribed order. For each regression, first the control variables (mother's sensitivity at first grade, child's sex, family income, and symptoms of anxiety and aggression at age 3) were entered. In the next block, number of NLE the families experienced was entered with the child's attachment security at 15 and 36 months. In the final block, two interaction terms were entered: NLE multiplied by child's attachment security at (a) 15 and (b) 36 months. The amount of variance accounted for (R^2) is presented for each variable; significant changes in amount of variance accounted for (ΔR^2) are noted; and significant predictor variables are noted with asterisks next to the standardized regression coefficient (β). In addition, the effect size Cohen's (1988) f^2 is presented for all

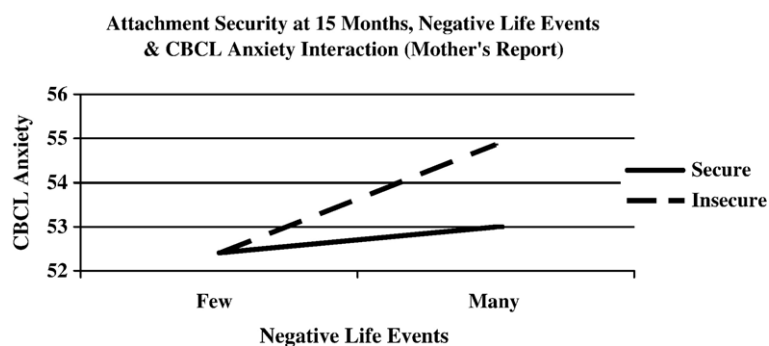


Fig. 1. Plot of interaction between negative life events and attachment security at 15 months for mother's report of children's anxiety at first grade.

significant variables; note that Cohen f^2 values of .02, .15, and .35 are considered small, medium, and large effects, respectively.

The results of the analyses regressing anxiety are summarized in Table 2, and the results of the analyses regressing aggression in Table 3.

For anxiety and aggression, the most consistent predictors for mothers', fathers', and teachers' reports were child's symptoms at age 3 and, to a lesser extent, number of NLE. There was also a main effect of the child's attachment security at 36 months for predicting teachers' reports of aggressive behaviors.

Of more interest to us were the effects of the interactions of attachment security and NLE. Attachment security at 15 months and number of NLE interacted to predict both mothers' ($\beta = -.30, p < .01, f^2 = .01$) and teachers' ($\beta = -.33, p < .05, f^2 = .02$) reports of children's anxiety.

The significant effect of interactions between number of NLE and children's attachment security at 15 months on mothers' and teachers' reports of children's anxiety are graphed in Figs. 1 and 2. The means for the group of children who experienced few and many NLE are broken down by security status as secure and insecure. Children who were classified as securely attached at 15 months who experienced many negative life events scored 1.86 points lower (38% of a standard deviation) on the mothers' report of the CBCL than children who were classified as insecurely attached who also experienced many negative life events. Children who were classified as securely attached at 15 months who experienced many negative life events scored 1.26 points lower (24% of a standard deviation) on teachers' reports of the CBCL than children who were classified as insecurely attached who also experienced many negative life events.

3.3. Latent variable structural equation modeling (SEM) analyses

Additional analyses used latent variable SEM. An advantage of using a latent variable SEM program is that it allows a researcher to perform a regression analysis on a latent variable. In this case, mothers', fathers', and teachers' reports of children's anxiety and aggression at first grade were used to create a latent variable representing child's anxiety or aggression at first grade. Both models depicted in Figs. 3 and 4 were tested using Arbuckle and Wothke's (1999) Analysis of Moment Structures program. Parameter estimates were derived using full information maximum likelihood. To identify the models, one unstandardized factor loading per latent variable was fixed at unity.

Another advantage of using latent variable SEM is that it provides a goodness-of-fit test as well as regression weights. If a model is a good fit to the data, then the regression weights are interpretable. Both models provided an excellent fit to the data by most standards. For children's anxiety, χ^2 was statistically significant, $\chi^2(25, N=1364) = 65.85, p < .001$, suggesting the existence of statistically significant discrepancies between the model and the data. Because a large sample size can generate statistical significance even when the absolute size of such discrepancies is relatively small (Raykov, 2000), we examined alternative fit indices, including the Tucker–Lewis index (TLI) (Tucker & Lewis, 1973), the comparative fit index (CFI) (Bentler, 1990), and the incremental fit index (IFI). These indices ranged in size from .996 to .999. All exceeded Hu and Bentler's (1990) recommended cutoffs, suggesting that the model explained almost all of the observed covariances. Furthermore, the root mean square of the residuals (RMSEA)

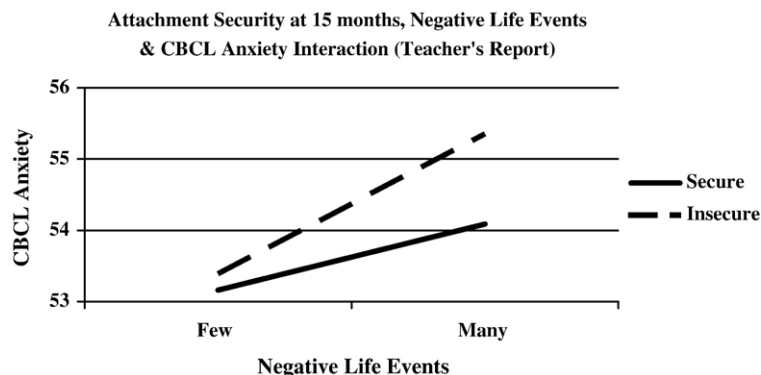


Fig. 2. Plot of interaction between negative life events and attachment security at 15 months for teachers' report of children's anxiety at first grade.

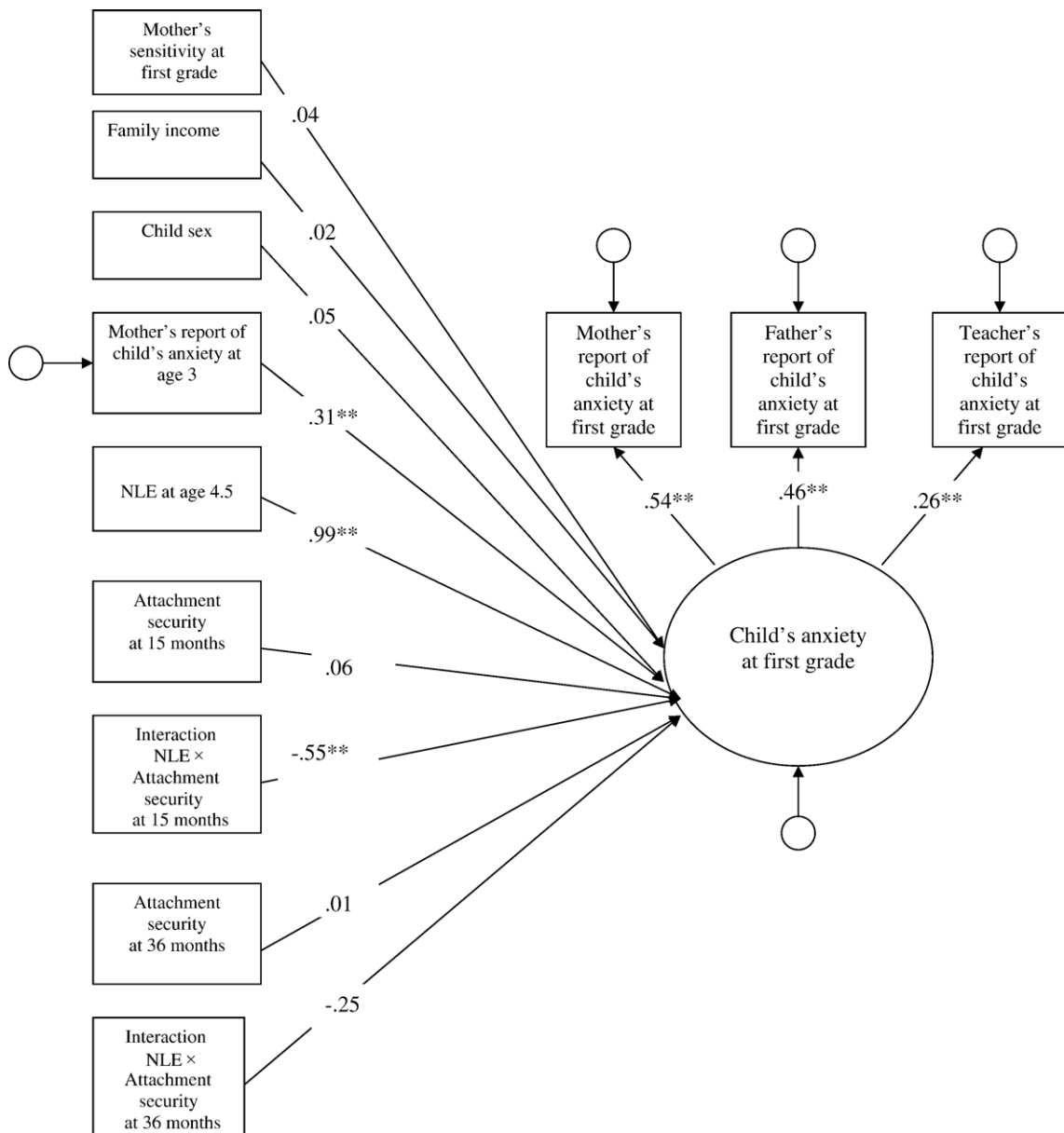


Fig. 3. Basic path diagram of model used to test relationship of control, main effect, and interaction variables to child's anxiety as a latent variable with standardized parameter estimates.

(Steiger & Lind, 1980) was only .035 (95% CI = .025–.045), meeting Hu and Bentler's (1999) criterion for a close fit. Taken together, these indices suggested that the anxiety model provided a good fit to the data.

Standardized parameter estimates for the anxiety model are illustrated in Fig. 3. According to this model, three variables significantly predicted children's anxiety at first grade: their anxiety at age 3, number of NLE at age 4.5, and the interaction NLE × Attachment Security at 15 months.

For children's aggression, the model depicted in Fig. 4 fit extremely well, according to most standards, with the exception of χ^2 [$\chi^2(25, N=1364)=71.87, p<.001$; TLI, CFI, and IFI range from .996 to .999; RMSEA = .037 (95% CI = .027–.047)]. Standardized parameter estimates for the aggression model are illustrated in Fig. 4. Child's aggression at age 3, mother's sensitivity at first grade, number of NLE at age 4.5, and family income all predicted the child's aggression at first grade. However, neither children's attachment security at 15 or 36 months, nor the

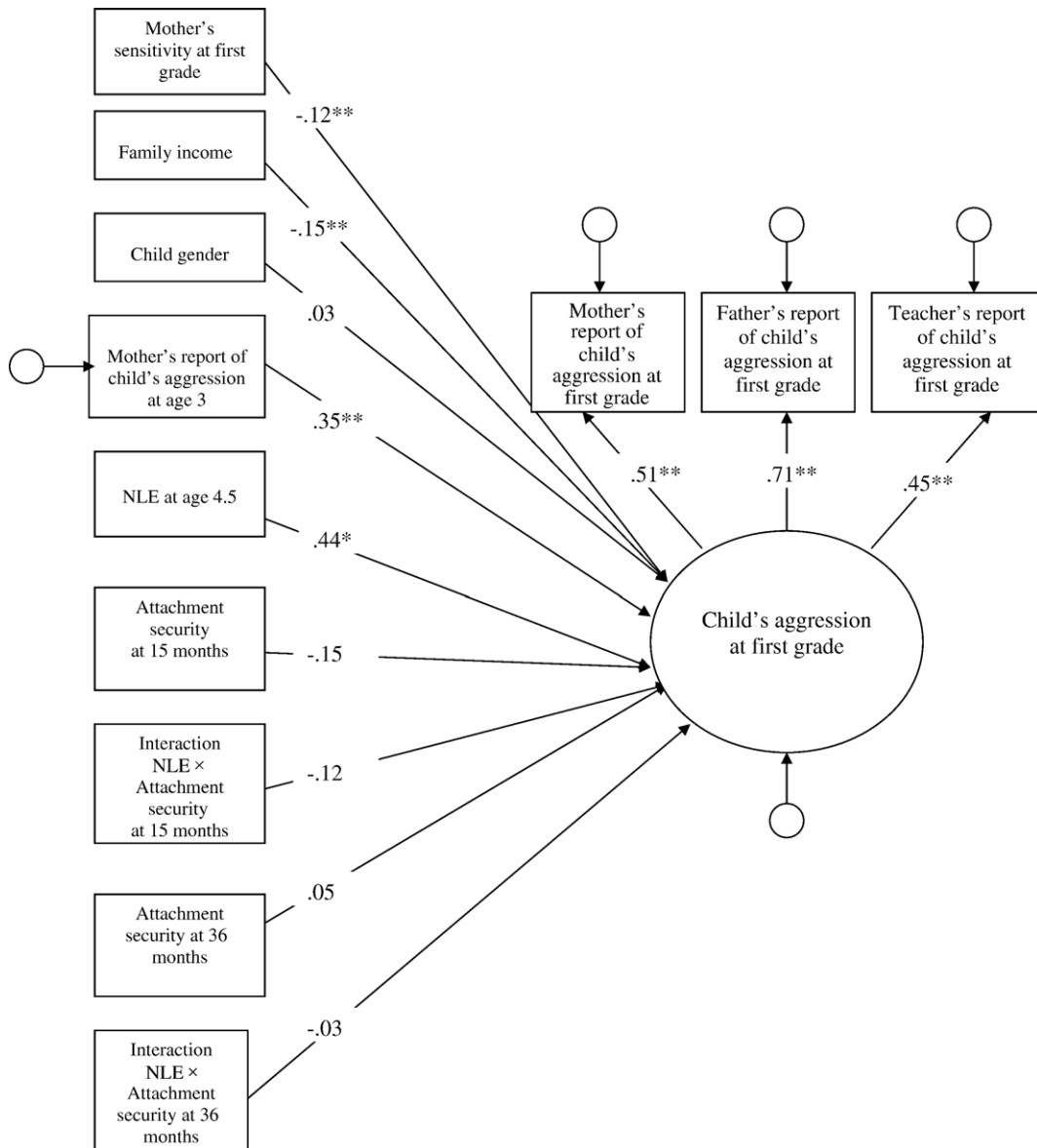


Fig. 4. Basic path diagram of model used to test relationship of control, main effect, and interaction variables to child's aggression as a latent variable with standardized parameter estimates.

interaction NLE × Attachment Security at 15 or 36 months significantly predicted children's aggression at first grade.

4. Discussion

Theoretically derived, developmentally appropriate empirical models linking infant–mother attachment security to particular outcomes that take into account normative family stresses and negative life events have been lacking in the literature (see McMahon et al., 2003). The current study took steps to address that gap. We examined the specific role of children's attachment security as a protective factor against the development of anxiety and aggression at first grade under conditions of family stress. We found evidence to support our hypothesis that attachment security at 15 months may protect children from developing symptoms of anxiety under conditions of high family stress. We also found

evidence suggesting that attachment security at 36 months may protect children from exhibiting aggressive behaviors, particularly in the classroom. These findings, though accounting for less than 1% of the variance, enable us to understand more clearly the role of early infant–mother attachment security in the trajectory of children’s lives, especially when those lives are stressful.

Three major findings derived from this study. First, with the use of hierarchical regression and latent variable SEM analyses, the evidence converged to indicate that infant–mother attachment security at 15 months may protect children against the development of anxiety in stressful family situations. Second, the interaction analyses and figures indicate that children who were classified as securely attached at 15 months were less likely to show symptoms of anxiety in families that had experienced a large number of stressful life events, according to both mothers’ and teachers’ reports. Third, there were clear differences in the pattern of results depending on the outcome examined. With respect to children’s aggressive behaviors, the results indicated that infant–mother attachment insecurity at 36 months may place children at risk for behaving aggressively toward classmates. At the same time, the experience of negative life events and infant–mother attachment security at 15 and 36 months did *not* interact to predict mothers’, fathers’, or teachers’ reports of children’s aggression. Though Greenberg (1999), Sroufe (1990), and others (e.g., Toth & Cicchetti, 1999) have suggested that attachment insecurity is a nonspecific risk factor for social and emotional difficulties, our results suggest that when attachment insecurity is coupled with stressful or negative life events, infant attachment insecurity may pose a specific risk for the development of anxious disorders.

These findings replicate and extend McCartney et al.’s (2004) results through the early school age period showing that early infant–mother attachment representations continue to influence children’s social and emotional competencies. Further, these results add to the general literature highlighting infant–mother attachment security as a protective factor against both internalizing and externalizing behaviors (e.g., Greenberg, 1999; Toth & Cicchetti, 1999). Uniquely, these results indicate that infant–mother attachment security interacts with the experience of negative life events to predict children’s anxiety at school age, lending support to Bowlby’s (1973) speculation that infants with early secure attachments are protected specifically against developing anxiety. Moreover, with respect to the etiology of anxiety-related disorders, the child’s early attachment security with their mother and the experience of negative life events should be considered. A child’s lack of security in the mother–infant relationship, coupled with the experience of stressful and negative life events, increases the risk of that child developing anxious as opposed to acting out behaviors. Perhaps, as suggested by Van Emmichoven et al. (2003) and Lay et al. (1995), insecure individuals are more prone to anxious feelings because they attend to more anxiety-provoking cues in the environment.

Several additional findings deserve mention. First, consistent with research linking the experience of negative life events to deleterious child outcomes (e.g., Grant et al., 2003; Kim et al., 2003; McMahon et al., 2003), our results also demonstrate that the family’s experience of negative and stressful life events is associated with increased anxious and aggressive behaviors in children at school age. However, our results suggest that infant–mother attachment security at 15 months specifically protects children from experiencing symptoms of anxiety in families that reported experiencing many negative life events. Second, concurrent maternal sensitivity was related to reports of decreased children’s aggression, but not anxiety, at first grade. Third, contrary to what other studies have found (e.g., Lewis et al., 1984; McCartney et al., 2004), we did not see an effect of child’s sex on the expression of either anxious or aggressive behaviors at school age. Fourth, we found these effects of early attachment security even without including children for whom disorganization was an added difficulty.

Several methodological and conceptual advantages afforded by the use of the NICHD SECCYD data set warrant mentioning. First, because multiple assessments of the child’s anxiety and aggression were obtained from the same measure over time, we could control for prior symptom level so as to better ascertain the unique effects of the independent variables of interest. As was the case in this as well as other studies, the strongest predictors of a particular outcome or symptom were prior levels of the outcome or symptom. This often leaves little room for other variables to account for much unique variance. However, perhaps during early childhood, when these symptoms may fluctuate more and may be less well established as part of the child’s personality, there is greater variability, thus affording researchers a unique window into the etiology of such disorders. Second, multiple reporters were used as reporters of the child outcomes of interest; this helps avoid a single reporter bias and allows for more complex, latent variable models to be tested. Though having multiple reporters is a strength of the research design, teachers’ reports differ in a fundamental way from parents’ reports, perhaps because of context differences. Indeed, teachers, whose ratings are based on the child’s interactions with other children in the classroom, may have more insight into the appropriateness of the child’s behavior in the classroom and may be privy to certain behaviors that parents learn about only in extreme cases of aggression.

Certain limitations of the current study suggest possible avenues for future research. Though the study design was more than adequate to test the research questions of interest, the SECCYD is not a study designed to test this hypothesis specifically. Future research should follow up this investigation with a study including children and infants who are at high risk for developing anxiety. Perhaps mothers who have been diagnosed with an anxiety disorder could be recruited to participate with their infants in a prospective design, and additional contributors to children's anxiety could be assessed (e.g., socialization patterns). Such studies could illuminate and inform theory regarding the unique influence of infant–mother attachment security on the etiology of anxiety disorders. Further, given the large sample size, there was sufficient power to detect the rather small effects demonstrated herein. With a high-risk sample, perhaps larger effects could be obtained. Also, perhaps stronger effects would have been obtained had the measurements of negative life events (at age 4.5) and attachment (at ages 15 months and 3 years) been closer in time to the outcome measures of children's anxiety and aggression (age 6). With a more focused design, examining these hypotheses specifically, the main effect of stressful life events, attachment security, and their interaction on children's anxiety and aggression can be better understood.

It is worth reminding readers that small effects are not negligible effects. In fact, in some cases, small effects can be quite impressive (Prentice & Miller, 1992). Here in this study, in which longitudinal relationships among variables from 15 months through 6 years were examined and in which levels of anxiety and aggression at age 3 were controlled, these findings could be considered impressive because of the length of time between measurements and the ability to control for measures of anxiety and aggression at age 3.

In addition, although the effect sizes we report are small, they are nevertheless important. In 1990, Robert Rosenthal commented that psychological findings of small effects were often larger than effects in the medical field that are taken very seriously by medical researchers and the general public. For example, the randomized double-blind experiment on aspirin's ability to reduce heart attacks was terminated prematurely on the basis of a finding with an effect size (r^2) of .0011. Indeed, the effect sizes between .01 and .30 we obtained in our study compare favorably with the effect sizes reported in a study of the effect of azidothymidine (AZT) on the survival rates of 282 patients with AIDS and AIDS-related complex. According to Rosenthal (1990), the correlation of .23 (an r^2 of .054) between survival and receipt of AZT “was so dramatic as to lead to the premature termination of the clinical trial on the ethical grounds that it would be improper to continue to give placebo to the control group patients” (Rosenthal, 1990, p. 776). The effect sizes of our findings compare favorably with those in the literature demonstrating the relationship between condom use and sexually transmitted HIV (that effect size was approximately .04), passive smoking and lung cancer at work (effect size approximately .02), and self-examination and extent of breast cancer (effect size below .01) (Bushman & Anderson, 2001).

In conclusion, our results have implications for developmental psychopathological theoretical models in general, and theories of the etiology of anxiety specifically. We found that infant–mother attachment insecurity interacted with the experience of negative and stressful family life events to uniquely predict children's anxiety in first grade, even after controlling for prior levels of anxiety, current levels of sensitive parenting, and child's sex. More generally, attachment insecurity was associated with increased children's aggressive behaviors, particularly in the classroom. Though attachment insecurity may be a nonspecific risk factor for certain disorders related to either internalizing or externalizing behaviors, when considered in combination with the general family milieu and specifically the experience of negative life events, attachment insecurity may be a small but specific risk factor for the development of children's anxiety.

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