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Predicting Social Wariness in Middle Childhood: The Moderating Roles of Child Care History, Maternal Personality and Maternal Behavior

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Abstract

Children with behavioral inhibition, a temperamental style characterized by infant distress to novelty and childhood social reticence, exhibit both continuity and discontinuity of this behavioral trait over the course of development. However, few researchers have identified factors that might be responsible for these different patterns. In the current study, child care history, maternal personality and maternal behavior were examined as moderators of the relations between infant temperament, preschool social reticence and childhood social wariness. Seventy-seven children participated in this longitudinal study that began in infancy and continued into middle childhood. Maternal negative personality moderated the relation between infant temperament and 7-year social wariness. In addition, maternal behavior moderated the relation between preschool social reticence and 7-year social wariness. The findings suggest that a complex interplay of within-child and maternal factors affect the development of internalizing behavior in the early school years.

Keywords

Reticence; Maternal Personality; Maternal Behavior; Temperament

Behavioral inhibition, along with its associated characteristics of social reticence and withdrawal, may be one of the most stable individual characteristics reported in childhood (Fox, Henderson, Marshall, Nichols, & Ghera, 2005). However, an examination of the extant literature suggests that some children who are behaviorally inhibited in early childhood do not display socially wary and inhibited behavior at later ages. Given that children who are consistently inhibited, shy and anxious are at heightened risk for numerous anxiety and mood disorders (Biederman et al., 1990; Gladstone, Parker, Mitchell, Wilhelm, & Malhi, 2005; Perez-Edgar & Fox, 2005; Schwartz, Snidman, & Kagan, 1999), understanding those factors that play a role in the continuity and discontinuity of behavioral inhibition is an important focus for developmental research. In the current study, we examined whether child care history and maternal factors moderated the relations between infant temperament, preschool social reticence and social wariness at age 7.

Research on inhibited behavior in childhood has often focused on the significant associations between infant negative reactivity to novelty, toddler inhibited behavior and child social reticence (Fox et al., 2005; Rothbart & Bates, 2006). Many studies indicate that negatively

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reactive infants are more likely to remain inhibited in childhood than non-reactive infants (Marshall & Stevenson-Hinde, 1998; Sanson, Pedlow, Cann, Prior, & Oberklaid, 1996), and behaviorally inhibited toddlers are more likely to display social reticence in childhood than non-inhibited toddlers (Fox, Henderson, Rubin, Calkins, & Schmidt, 2001; Rubin, Burgess, & Hastings, 2002). One approach to understanding continuity in behavioral inhibition is to examine the underlying biology associated with this temperament. Researchers have suggested that neural circuits in the limbic systems of behaviorally inhibited children are more excitable and, thus, may be less prone to modification over time (see Kagan & Snidman, 1991). In particular, Kagan and others (Fox, Henderson, & Marshall, 2001; Kagan, 2001) have speculated that enhanced amygdala activation to novelty and activation of "fear" circuitry may underlie increased avoidance of novel stimuli in these children (see Davis, 1986; LeDoux, Iwata, Cicchetti, & Reis, 1988). Avoidant behaviors, or freezing in the face of novelty, represent coping mechanisms by which fear of novelty is decreased. However, coping with fear through avoidance may reinforce the associated physiological responses and behaviors leading to continued behavioral inhibition and social wariness (Fox, Henderson, & Marshall, 2001; Rothbart, Derryberry, & Posner, 1994). Thus, infants who consistently display extreme distress to novelty may continue to display this pattern of behavior as behaviorally inhibited toddlers and socially reticent children.

Studies examining longitudinal samples have shown there is as much discontinuity as continuity in patterns of inhibition across childhood (Fox, Henderson, Rubin et al., 2001; Rubin, Burgess, & Hastings, 2002). Although children's lower levels of temperamental reactivity may account for some discontinuity (Kagan & Snidman, 1991), external factors, such as parenting and the caregiving context, also may influence the stability of behavioral inhibition and its concomitants (Rubin & Burgess, 2001; Rubin, Burgess, & Coplan, 2002).

One such external factor may be child care history. Fox, Henderson, Rubin et al. (2001) found that infants who showed high negative reactivity at 4-months of age were less likely to become inhibited as toddlers when they were placed in non-parental child care environments with one or more non-sibling children for 10 hours or more per week. Arcus and McCartney (1989) also showed that changes in child care between 2 to 3 years of age influenced the stability of behavioral inhibition such that children who remained in the same child care situation also maintained a similar level of behavioral inhibition. However, children whose child care context or status changed across toddlerhood showed marked instability in their level of behavioral inhibition. These studies suggest several ways that the child care environment could lead to different patterns of continuity and discontinuity. One possibility is that the experience of non-parental child care and exposure to same-age peers may contribute to a decrease in observed behavioral inhibition. Children may gain experience interacting with peers in a variety of situations and then may apply those skills to situations outside of child care. A second possibility is that the personality of parents who choose non-parental child care versus parental care may influence the continuity of reticence. For instance, a mother who is more introverted and disagreeable may be less likely to place a behaviorally inhibited child in child care (NICHD, 1997), given her own social wariness. This decision, in turn, may restrict the child's range of experiences in social settings and lead to greater continuity of inhibited behavior (Fox, Henderson, Rubin et al., 2001; Rubin & Burgess, 2001; Rubin, Burgess, & Coplan, 2002). Therefore, the type of child care history may either directly or indirectly influence whether children maintain or decrease their inhibited behavior over time.

In addition to its influence on child care decision-making, maternal personality itself may maintain children's negative reactivity to novelty. In particular, two aspects of maternal personality, depression and neuroticism, may work in concert to influence child behavioral inhibition because of their similar negative emotional core and common genetic underpinnings (Hettema, Neale, Myers, Prescott, & Kendler, 2006; Steunenberg, Beekman, Deeg, & Kerkhof,

2006). For example, researchers have found that maternal depression is related to child behavioral inhibition (Kochanska, 1991; Rosenbaum et al., 1988) and social reticence (Rubin, Both, Zahn-Waxler, Cummings, & Wilkinson, 1991). In addition, maternal neuroticism is related to child behavior problems in general (Kurdek, 2003) and to social withdrawal and internalizing behavior problems in particular (Ellenbogen & Hodgins, 2004). Moreover, it has been suggested that maternal neuroticism is associated with child inhibition (Belsky & Barends, 2002). Depression and neuroticism may influence the continuity of inhibition and social wariness for many reasons. One possibility is that children may model their mother's negative affect and highly vigilant view of the world (Kochanska, 1991). Another possibility is that mothers high in neuroticism or depression may respond to their children's emotions in qualitatively different ways from parents who are not neurotic or depressed. In fact, mothers who are highly neurotic and depressed have been shown to react with greater negative affect and greater vigilance to their children's distress than mothers who are not neurotic and depressed (Scalzo, Williams, & Holmbeck, 2005). In addition, parents of behaviorally inhibited children have reported their children to be highly vulnerable (Shamir-Essakow, Ungerer, Rapee, & Safier, 2004). Thus, the combination of maternal negativity (i.e., neuroticism and depression) and child behavioral inhibition may produce particularly maladaptive mother-child interactions, which, in turn, may maintain the child's negative reactions to novelty, behavioral inhibition or social reticence (Rubin & Burgess, 2001).

Specifically, mothers' personality traits may influence children's outcomes through the parenting behaviors they display (Brook, Tseng, Whiteman, & Cohen, 1998; Cummings & Davies, 1994; Fish & Stifter, 1993; Kochanska, Clark, & Goldman, 1997). For instance, mothers who are neurotic and/or depressed may attempt to limit their children's negative experiences in an effort to protect them. However, these limits may decrease the child's likelihood of developing skills to self-regulate their distress in novel or stressful social situations, leading to greater continuity in their inhibited, socially reticent behavior (Hastings & Rubin, 1999; Rubin, Burgess, & Hastings, 2002; Rubin, Hastings, Stewart, Henderson, & Chen, 1997). Research on anxious mothers has shown that they are more likely to display negative affect and overcontrol and less likely to display positive affect or grant autonomy during parent-child interaction (Ginsburg, Grover, & Ialongo, 2004; Moore, Whaley, & Sigman, 2004). Furthermore, Ginsburg et al. (2004) found that among anxious mothers, the level of autonomy granting displayed with their 1st grade children was negatively associated with their children's levels of anxiety. Given these latter findings, we examined whether similar parenting behaviors might be observed in mothers who were neurotic or depressed.

Independent of the mothers' personality, however, research on non-clinical samples has shown that over-solicitous or intrusive parenting is associated with toddler inhibition and preschool reticence (Rubin, Burgess, & Hastings, 2002; Rubin, Cheah, & Fox, 2001; Rubin et al., 1997). Specifically, mothers of behaviorally inhibited children are more likely to display over-solicitous behavior during interactions in which there is little contextual structure (free play; Rubin et al., 2001), as opposed to contexts with greater structure. In fact, Rubin, Burgess, and Hastings (2002) have reported that intrusive and overprotective maternal behavior strengthens the relation between toddler inhibition and preschool reticence. In addition, Arcus and colleagues (Kagan, Arcus, & Snidman, 1993) have reported that high reactive infants show less fearful behavior in toddlerhood when they have mothers who display high levels of directive behavior and less holding and affection.

This link between maternal behavior and child inhibition and reticence may be developed through the mother's beliefs about the risk status of particular child behaviors (Rubin, Nelson, Hastings, & Asendorpf, 1999). For instance, if mothers believe their children will exhibit socially fearful behavior in novel situations, they may feel overly concerned and attempt to control the situation to allay their children's fears. Therefore, children who as infants reacted

negatively to novelty may elicit protection from others; ironically, this protective parenting behavior may maintain inhibited child behavior (Mills & Rubin, 1993; Rubin & Mills, 1992). Although parents may interpret this concern and involvement as representing parental sensitivity, such behavior may prevent an inhibited child from independently experiencing positive achievements and developing coping skills in novel situations.

The primary aim of this study was to investigate factors that may contribute to the continuity or discontinuity of inhibited behavior from infancy to middle childhood. Although a small number of studies have examined the continuity of inhibited behavior (e.g., Fox, Henderson, Rubin et al., 2001; Rubin, Burgess, & Hastings, 2002), few researchers have studied stability and instability from infancy to middle childhood. To assess reasons for continuity, we explored child care history, maternal personality and maternal behavior as they predicted continuity between infant temperamental reactivity to novelty, preschool social reticence and subsequent social wariness in middle childhood. We expected that inhibited infants and reticent preschoolers would be at greater risk for social wariness in middle childhood if (a) they were primarily in parental child care throughout infancy and toddlerhood, (b) their mothers reported negative personality traits, and (c) their mothers displayed highly solicitous behavior during unstructured free-play.

Method

Participants

This report is part of a larger longitudinal study of infants followed from 4 months to 7 years of age. After contacting families by mail and receiving background surveys from interested parents, families were initially screened to ensure that infants were full term, normally developing, and that their parents were right-handed. Four hundred and thirty-three infants who met these criteria were screened in the laboratory at 4 months of age to assess their reactivity to novel auditory and visual stimuli. Videotapes of the screening procedure were coded for positive and negative affect and motor activity during the presentation of the novel auditory and visual stimuli. For a complete description of the screening and coding procedures as well as inter-coder reliability, see Fox, Henderson, Rubin, et al. (2001). One hundred and fifty-three primarily Caucasian infants from middle to upper middle class homes (female, n = 80; male, n = 73) were selected based on their classification into one of three different groups: *high negative/high motor reactive* (n = 56); *high positive/high motor reactive* (n = 45) and *low reactive* (n = 52). These groups did not differ from one another on gender, χ^2 (2, 153) = .83, p = .66.

Procedures

In addition to the reactivity groups described above, the current study examined information collected when the children were 2, 4, and 7 years of age. When the infants were 2 years of age, mothers were asked to report on their use of non-parental child care. In addition, when they were 4 years of age, social behavior in a same gender play quartet with unfamiliar peers was observed, maternal behavior was assessed during an observation of mother-child interaction, and self-report of maternal personality and symptoms of depression were obtained. When the children were 7 years of age, social behavior in same gender play quartets with unfamiliar peers was observed along with maternal report of child temperament and internalizing behavior problems.

Seventy-seven children (female, n = 42; male, n = 35) had complete data on all measures. These children did not differ from children with missing data on any of the key variables: infant temperament group, χ^2 (2, 153) = 1.24, p = .54, daycare status, χ^2 (1, 126) = .02, p = .88, maternal negativity, t (107) =−.84, p = .41, maternal solicitousness, t (110) = −.04, p = .97, 4-

year reticence, t (116) = −.19, p = .85, 7-year social wariness, t (106) = .62, p = .54, or gender, χ^2 (1, 153) = .32, p = .57.

Child Behavior Measures

Social Reticence and Quartet Behavior—Children were observed in a quartet playgroup at 4 and 7 years of age to assess their reactions to and interactions with unfamiliar peers. Quartets included children of the same sex and age. In addition, children were assigned to a quartet based on their behavior during a previous assessment when behavioral inhibition (age 2) or social reticence (age 4) was observed. Each playgroup consisted of one child who exhibited high social reticence/behavioral inhibition in the laboratory at the previous visit (half a standard deviation or more above the mean), one child who exhibited very low social reticence/behavioral inhibition in the previous laboratory visit (half a standard deviation or more below the mean), and two average children (within one standard deviation around the mean). The children engaged in a structured series of play activities, while their mothers waited in a waiting area and filled out questionnaires. Data from the first free-play session were analyzed in this study. For this task, the children were left alone in the playroom for 15 minutes with age appropriate toys.

The Play Observation Scale (POS; Rubin, 2001) was used to code behaviors in the play sessions. Coders observed the tapes in 10-second intervals and gave one of the following codes for each interval: *Unoccupied behavior* - the child demonstrates an absence of focus or intent, *Onlooking behavior* - the child observes the other children's activities without attempting to play, *Solitary play* – the child played by him/herself and *Social play* – the child played cooperatively with other children (see Rubin, 2001 for additional detail). Approximately 90 coding intervals were assessed for each child. Three independent observers became reliable on 30% of the sample at each age. For the full variable matrix, Cohen's kappas ranged from .71 to .86 at age 4 and .84 to .88 at age 7. Reticent behavior composites at both 4 and 7 years of age were created by summing *Onlooking behavior* and *Unoccupied behavior* (see also Fox, Henderson, Rubin et al., 2001). This sum was divided by the total number of observed segments minus the number of uncodeable segments to create the proportion of time spent displaying *Reticence*. Scores ranged from 0 to .85 (M = .18, SD = .16) at 4 years of age and 0 to 1.0 (M = .14, SD = .16) at 7 years of age with higher scores indicating greater reticence.

The Colorado Children's Temperament Inventory (CCTI; Buss & Plomin, 1984)—Mothers completed this measure when their children were 7 years of age. The CCTI measures maternal perceptions of child temperamental characteristics (e.g., emotionality, activity level, shyness). For this study, the subscale of *Shyness* was used, which included 5 items rated from 1 to 5 such as "child makes friends easily" or "child takes a long time to warm up to strangers." Items were reverse scored when necessary and averaged to form a subscale where scores ranged from 1.0 to 4.0 (M = 2.33, SD = .82) with higher scores indicating greater shyness.

The Conners' Parent Rating Scale (CPRS-48; Conners, 1990)—Mothers completed this measure when their children were 7 years of age. The CPRS-48 measures maternal perceptions of child behavior problems (e.g., impulsivity, hyperactivity, anxiety). For this study, the *Anxiety* subscale was used, which included 4 items rated from 0 to 3 such as "fearful of new situations, people, etc." or "worries more than others." Items were summed to form a subscale where scores ranged from 0 to 8 (M = 1.92, SD = 2.10) with higher scores indicating greater anxiety.

Maternal and Child Care Measures

Child care survey—When children were 2 years of age, mothers completed a child care survey, in which they provided information on the current and previous types of child care arrangements their children had experienced since birth. Mothers also were asked to indicate how many siblings and non-siblings were cared for in the same setting. Using this survey, children were classified as being in *parental* care throughout infancy or *non-parental* care with at least one non-sibling child for at least 10 hours per week during the first 2 years of life. Of the 54 children in *non-parental* child care, 23 were boys and 31 were girls, and of the 23 children in *parental* child care, 12 were boys and 11 were girls.

Maternal solicitous behavior—During a laboratory visit when the children were 4 years old, mothers were told that their children were free to play with any of the various toys spread about in the room. The task lasted 15 minutes. Maternal behavior during this task was coded using the Maternal Warmth, Responsiveness, and Control taxonomy (Rubin et al., 2001). Behaviors assessed included: *Proximity/Orientation* - the mother's physical attention and attentional focus towards the child; *Positive Affect* - maternal emotional expressions and behaviors that indicated warmth, positivity, and enjoyment towards the child; *Negative Control* - maternal behavior that is excessive or inappropriately controlling relative to the child's behavior and *Positive Control* - maternal behavior that facilitated the child's behavior. Each scale was coded on a 3-point scale for each 1-minute epoch of the task, with higher scores designating greater proximity to the child, expressions of positive affect, negative control, and positive control. The codes were then summed across epochs and divided by the total number of epochs in order to create an average score for each scale. Four independent observers coded 20 percent of the sample for reliability. Cohen's Kappa for the scales ranged from .81 to .93. Also, as reported in Rubin et al. (2001), during freeplay, the four scales *Proximity/Orientation*, *Positive Affect*, *Negative Control* and *Positive Control* were intercorrelated, average $r = .39$, $p < .01$ (range: .22 – .55). The scores were standardized and summed to form a composite of *maternal solicitousness*, which ranged from −11.68 to 6.08 (M = −.92, SD = 2.27) with higher scores indicating greater overall concern and anxious attentiveness to the child (Rubin et al., 2001).

The Eysenck Personality Questionnaire-Revised (EPQ-R; Eysenck, Eysenck, & Barrett, 1985)—Mothers completed this measure when their children were either 4 or 7 years of age. Average scores were not significantly different by age of measurement, $t(100) = .10$, $p = .92$, and relations with the 7-year outcome measure also did not differ by age of measurement, z difference = .27, $p = .79$. The EPQ-R is a widely accepted personality trait measure that assesses extraversion, neuroticism, and psychoticism. For this study, the *Neuroticism* scale from the short scale EPQ-R was used, which includes 12 items rated yes (2) or no (1) such as "does your mood often go up and down," or "would you call yourself a nervous person." This scale measures an individual's tendency to display depression, guilt, anxiety, low self-esteem, and moodiness. Items were summed to create a total *Neuroticism* score that ranged from 12 to 24 (M = 16.31, SD = 3.10) with higher scores indicating greater neuroticism.

The Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996)—Mothers completed this measure when their children were 4 years of age. The BDI-II is a widely utilized scale to assess depressive symptomatology. For this study, the *Total* score was used, which included 21 groups of statements rated from 0 to 3 such as 0) "I do not feel sad," 1) "I feel sad," 2) "I am sad all the time and I can't snap out of it," and 3) "I am so sad or unhappy that I can't stand it." Mothers were instructed to select the statement in each group that best described the way they had been feeling the past week. Items were summed to create a *Total depression scale* where scores ranged from 0 to 18 (M = 5.38, SD = 4.48) with higher scores indicating greater depressive symptoms.

Data Reduction

In order to simplify analyses, maternal personality and child outcome measures were aggregated to create summary composites. For instance, the BDI-II total score and the EPQ-R neuroticism score were standardized and averaged (r = .45, p <.001) to create an overall *Maternal Negativity* composite (α = .62). Scores on this composite ranged from −1.20 to 2.06 (M = −.04, SD = .85). Additionally, the CCTI shyness score, the CPRS-48 anxiety score, and the 7-year observed social reticence score were standardized and averaged (mean r = .40, p = .01) to create an overall 7-year *Social Wariness* composite (α = .67). Scores on this composite ranged from −1.32 to 3.51 (M = .01, SD = .84).

Results

Overall, the analyses examined whether the maternal and child care measures moderated the relations between the measures of infant temperament, preschool social reticence and childhood social wariness. The first step in data analysis was to inspect the data to ensure normality of distributions of the variables in question. All of the measures were relatively normally distributed (skewness values ranged from −.50 to 1.89). However, a visual inspection of the distributions suggested one outlier on 4-year social reticence. Data were analyzed with and without the outlier and there were no differences of significance between the two sets of results. Therefore, the outlier was included in the results presented below. Next, given the theoretical links between and among the maternal and child care measures, inter-correlations and *t*-tests were examined. However, maternal negativity and maternal solicitous behavior were not significantly correlated, r = .02, p = .85; and neither maternal negativity, t (75) = −.92, p = .36, nor maternal solicitous behavior, t (74) = 1.71, p = .09, was related to child care history.

Finally, a series of hierarchical multiple regression analyses was computed in order to examine whether maternal or child care factors moderated the relations between infant temperamental reactivity, preschool social reticence and childhood social wariness. Due to the small sample size, two separate regression analyses predicting 7-year social wariness were computed. For the first analysis, infant temperamental reactivity group was entered first, followed by child care history, maternal negativity and maternal solicitousness. In the second step, the two-way interactions between child care history and temperament, maternal negativity and temperament, and maternal solicitousness and temperament were entered. For the second analysis, preschool social reticence was entered first, followed by maternal negativity and maternal solicitousness. In the second step, the two-way interactions between preschool social reticence and maternal negativity and between preschool social reticence and maternal solicitousness were entered. For both analyses, possible three-way interactions were examined. As no three-way interactions significantly predicted 7-year social wariness, they are not reported below.

To test and interpret the two-way interactions, we followed procedures outlined by Aiken and West (1991). Each continuous variable was standardized before the interaction terms were calculated (product terms were computed) in order to reduce possible multicollinearity among the independent variables and interactions terms and to facilitate interpretation. To interpret the interactions, the moderator variables (child care history, maternal negativity, or maternal solicitousness) were categorized by splitting the variable into high and low values (continuous measures were split at the median). Graphs of each significant interaction show the continuity in child behavior for high and low values of the moderator, one standard deviation above and below the mean, respectively.

Do child care history, maternal negativity, or maternal solicitous behavior moderate the relations between infant temperamental reactivity and childhood social wariness?

This model included infant temperament group, child care history, maternal negativity, maternal solicitous behavior, the interaction of infant temperament and child care history, the interaction of infant temperament and maternal negativity, and the interaction of infant temperament and maternal solicitous behavior. The temperament group variable was contrast coded so that positively reactive infants were coded as 1, negatively reactive infants were coded as −1, and low reactive infants were coded as 0. Overall, the model accounted for 29% of the variance in 7-year social wariness and was significant, F (5, 75) = 3.89, p = .001. Child care history and maternal solicitous behavior did not significantly predict 7-year social wariness, nor did these variables moderate the relation between infant temperamental reactivity and social wariness. However, maternal negativity did moderate the continuity between infant temperament and 7-year social wariness, β = −.34, t (75) = −2.92, p = .01 (Table 1).

Exploring the moderation effect of maternal negativity—Simple effects were calculated in two separate ANOVAs, one for children with mothers above the median in maternal negativity (> −0.22) and one for children with mothers below the median (≤ −0.22) in maternal negativity (Figure 1). Each test included 7-year social wariness as the dependent variable and 4-month temperament group as the between subjects independent variable. For children with mothers low on negativity, infant temperament group was not significantly related to 7-year social wariness, F (2, 37) = .18, p = .84. However, for children with mothers high on negativity, infant temperament group was significantly related to 7-year social wariness, F (2, 38) = 4.38, p = .02. Post-hoc analyses revealed that children whose mothers were highly negative had higher 7-year social wariness if they had been rated as negatively reactive in infancy as compared to those that were rated as positively reactive, t (25) = 2.66, p = .01. Therefore, when mothers were higher on negativity, negatively reactive infants were more likely to exhibit greater social wariness in childhood than positively reactive infants. When mothers were lower on negativity, infant temperament was not related to the children's display of social wariness.

Do maternal negativity and maternal solicitous behavior moderate the relations between preschool social reticence and childhood social wariness?

The model with child reticence, maternal negativity, maternal solicitous behavior, and the interactions between child reticence and maternal negativity and maternal solicitous behavior accounted for 42% of the variance in 7-year social wariness and was significant, F (3, 75) = 10.26, p < .001. The main effects of child reticence and maternal negativity significantly related to social wariness at age 7. In addition, maternal solicitous behavior moderated the continuity between preschool reticence and 7-year social wariness, β = .31, t (75) = 2.08, p = .04 (Table 2).

Exploring the moderation effect of maternal solicitous behavior—Simple slopes were calculated in two separate regressions; one for children with mothers high on solicitousness and another for children with mothers low on solicitousness (Figure 2). For children with mothers rated low on solicitousness, 4-year reticence was not significantly related to 7-year social wariness, β = .26, t (39) = 1.69, p = .10. However, for children with mothers rated as highly solicitous, 4-year reticence was positively related to 7-year social wariness, β = .75, t (35) = 6.53, p < .001. Looking at the cell sizes in Table 3, 70% of 4-year olds high in social reticence remained high in social wariness at age 7. However, this was mainly due to children with mothers were above the median on solicitousness. Of these children, 78% of children high on reticence at age 4 were also displaying high social wariness by age 7. In contrast, when mothers were below the median on solicitousness, only 64% of children high on reticence at age 4 were also displaying high social wariness by age 7. Therefore, while there

is a great deal of continuity in reticence across childhood, for children whose mothers were highly solicitous, their level of reticent behavior in preschool was significantly more likely to continue into middle childhood.

Discussion

This study investigated the roles of child care history, maternal personality, and maternal behavior as moderators of the relation between early inhibition and social wariness in 7-year old children. Behaviors such as inhibition, shyness, and social anxiety are often thought to be rather stable characteristics; however, an examination of children's inhibited behavior over time suggests that many children exhibit discontinuity in these behaviors (Fox et al., 2005). Given that stable behavioral inhibition is a risk factor for anxiety disorders (Biederman et al., 1990; Gladstone et al., 2005; Schwartz et al., 1999), understanding the factors that may play a role in the continuity and discontinuity of this construct represents an important focus of developmental research.

The first goal of the current study was to examine the role of child care history in the continuity of infant temperamental reactivity and childhood social wariness. It has been suggested that non-parental child care may provide children with exposure to peers, thereby allowing them to learn social skills that may enable competent social interaction (Fox et al., 2005). However, the results of this study did not support this notion. The NICHD Early Child Care Research Network (2004) has suggested that whereas non-parental child care itself may have implications for positive child development, the specific mechanisms supporting these effects may be related to the quality of the care. Although the current study assessed the extent to which children were involved in non-parental child care, the quality of the care was not measured. Researchers have shown that qualitative aspects of non-parental child care and school classrooms, such as the physical, educational and socio-emotional characteristics of the settings, may influence child behavioral outcomes (Gazelle, 2006; NICHD, 2004). Other work has shown that it may be stability in child care that has a more profound influence on behavioral inhibition, rather than the status of child care (Arcus & McCartney, 1989). In future research on stability of inhibited behavior, more comprehensive measures of the child care context should be assessed.

The second goal of the present study was to examine maternal personality as an influential factor in the continuity between infant and early child temperamental characteristics and childhood social wariness. The current measure of maternal negativity included neuroticism and depressive symptomatology because both exhibit a similar negative emotional core and may have common genetic underpinnings. In addition, previous studies have found maternal depression to be related to inhibited child behavior (Kochanska, 1991; Rosenbaum et al., 1988; Rubin et al., 1991) and child social anxiety (Suveg, Zeman, Flannery-Schroeder, & Cassano, 2005), but there are fewer direct relations between maternal neuroticism and child internalizing spectrum behaviors. We found that when mothers reported higher depression and neuroticism, their children's temperamental style in infancy continued into childhood; infants rated as negatively reactive displayed greater social wariness at age 7 than infants rated as positively reactive. However, when mothers reported lower depression and neuroticism, infant temperament was unrelated to later social wariness. In addition, children with highly negative mothers were more likely to display social wariness at age 7 in general. These results further support the links between maternal personality (i.e., neuroticism and depression) and internalizing behaviors across childhood.

Several mechanisms may explain how maternal negativity influences children's internalizing behaviors. For one, mothers who report a combination of depression and neuroticism might display negative and anxious approach behaviors during family interaction. The children may

imitate this behavioral style by reacting to novelty with inhibition and wariness, and mothers may reinforce their children's social fears by displaying overprotective behavior in an attempt to shield the children from negative experiences. Although this mediational model has been discussed in the literature on children's inhibition (Fox et al., 2005), it was not supported in the current study. Indeed, self-reported maternal negativity was not significantly related to observed maternal solicitous behavior when the child was 4 years of age.

Despite the lack of a relation between maternal negativity and over-protectiveness, maternal behavior itself had an effect on the continuity of child behavior. When mothers were observed to be highly solicitous during a free play situation, preschool children's social reticence was likely to remain stable at 7 years of age. However, when mothers were observed to be low on solicitous behavior children's social reticence tended to dissipate. This finding replicates and extends the results of Rubin and colleagues (Rubin, Burgess, & Hastings, 2002) who found greater continuity in behavioral inhibition, from 2 to 4-years of age, when mothers were highly intrusive and solicitous. It also supports Arcus and colleagues' (Kagan et al., 1993) finding that there was greater continuity in behavioral inhibition from infancy to toddlerhood when mothers displayed fewer directives and more affection. Although maternal behavior that is oversolicitous and intrusive or highly directive may be well-intended, it also may inhibit children's ability to develop skills to overcome their reactivity to novelty (Rubin, Burgess, & Coplan, 2002). In fact, parenting an inhibited child may involve understanding the child's social developmental needs and supporting more independent behavior across childhood. Highly solicitous mothers may attempt to guard children from negative experiences while limiting their children's opportunities to accomplish tasks on their own (Hastings & Rubin, 1999). This protection may have negative social developmental outcomes when combined with a child's dispositional proneness to inhibition and wariness. In contrast, children who do not exhibit inhibition may not elicit protection and intrusive behavior from parents; Thus, they are better able to reach their own goals and display well-adapted, socially competent behavior (Rubin, Burgess, & Coplan, 2002).

In summary, the current study highlights the roles of maternal personality and behavior in the continuity and discontinuity of inhibited behavior from infancy to middle childhood. Whereas maternal negativity (i.e., neuroticism and depression) was found to play a role in the stability of inhibition from infancy to age 7, maternal solicitous behavior was found to maintain this behavior from preschool to age 7. It is somewhat puzzling that maternal negativity would affect the continuity from infancy onward and maternal behavior would only influence the continuity between preschool and middle childhood. One possibility is that maternal behavior is a factor specific to context and the age of the child (in this case, childhood) and maternal negativity is a stable within-parent factor that is exhibited throughout the child's life (in this case, from infancy onward). Unfortunately, this explanation cannot be fully examined with the current data because of measurement limitations. However, different aspects of maternal behavior may have different effects on internalizing behaviors over the course of children's development. Furthermore, these effects should be tested in another, larger sample before concrete assumptions are made about the roles of maternal personality and maternal behavior in the continuity of internalizing behavior problems.

Therefore, given past and current findings, future work should examine longitudinal measures of maternal personality and intrusive/solicitous behavior and their influence on behavioral inhibition throughout infancy and childhood. Additionally, this work suggests a closer investigation of the specific socialization mechanisms that underlie continuity in behavioral inhibition. Although we did not find links between measures of maternal personality and observed parenting behaviors, an examination of these factors earlier in infancy or toddlerhood might explain the specific mechanisms involving both of these environmental factors and their influence on child internalizing spectrum behaviors. Moreover, measuring both of these

maternal factors by self-report or using different observational contexts than those included here might yield relations between the two constructs. Finally, examining the links between maternal personality factors and more responsive or sensitive maternal behavior might illuminate the environmental mechanisms that influence the developmental pathways of children's inhibited behavior over time.

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References

Aiken, LS.; West, SG. Multiple regression: Testing and interpreting interactions. Newbury Park, California: Sage; 1991.

Arcus, D.; McCartney, K. When baby makes four: Family influences in the stability of behavioral inhibition. In: Resnick, JS., editor. Perspectives on behavioral inhibition. Chicago, IL: University of Chicago Press; 1989. p. 197-218.

Beck, AT.; Steer, RA.; Brown, GK. Beck Depression Inventory—Second Edition manual. San Antonio: The Psychological Corporation; 1996.

Belsky, J.; Barends, N. Personality and parenting. In: Bornstein, MH., editor. Handbook of parenting: Vol 3, being and becoming a parent. Hillsdale, NJ: Erlbaum; 2002. p. 415-438.

Biederman J, Rosenbaum JF, Hirshfield DR, Faraone SV, Bolduc EA, Gersten M, Meminger SR, Kagan J, Snidman N, Reznick JS. Psychiatric correlates of behavioral inhibition in young children of parents with and without psychiatric disorders. Archives of General Psychiatry 1990;47:21–26. [PubMed: 2294852]

Brook JS, Tseng LJ, Whiteman M, Cohen P. A three-generation study: Intergenerational continuities and discontinuities and their impact on the toddler's anger. Genetic, Social, & General Psychology Monographs 1998;124(3):335–351.

Buss, AH.; Plomin, RA. Temperament: Early developing personality traits. Hillsdale, NJ: Erlbaum; 1984.

Conners, CK. Manual for Conners' Rating Scales. Toronto: Multi-Health Systems; 1990.

Cummings EM, Davies PT. Maternal depression and child development. Journal of Child Psychology & Psychiatry 1994;35:73–112. [PubMed: 8163630]

Davis M. Pharmacological and anatomical analysis of fear conditioning using the fear-potentiated startle paradigm. Behavioral Neuroscience 1986;100:814–824. [PubMed: 3545257]

Ellenbogen MA, Hodgins S. The impact of high neuroticism in parents on children's psychosocial functioning in a population at high risk for major affective disorder: A family-environmental pathway of intergenerational risk. Development and Psychopathology 2004;16:113–136. [PubMed: 15115067]

Eysenck SB, Eysenck HJ, Barrett P. A revised version of the Psychoticism scale. Personality & Individual Differences 1985;6:21–29.

Fish M, Stifter CA. Mother parity as a main and moderating influence on early mother infant interaction. Journal of Applied Developmental Psychology 1993;14:557–572.

Fox, NA.; Henderson, HA.; Marshall, PJ. The biology of temperament: An integrative approach. In: Nelson, CA.; Luciana, M., editors. The handbook of developmental cognitive neuroscience. Cambridge, MA: Springer; 2001. p. 631-645.

Fox NA, Henderson HA, Marshall PJ, Nichols KE, Ghera MM. Behavioral Inhibition: Linking biology and behavior within a developmental framework. Annual Reviews of Psychology 2005;56:235–262.

Fox NA, Henderson HA, Rubin KH, Calkins SD, Schmidt LA. Continuity and discontinuity of behavioral inhibition and exuberance: Psychophysiological and behavioral influences across the first four years of life. Child Development 2001;72(1):1–21. [PubMed: 11280472]

Gazelle H. Class climate moderates peer relations and emotional adjustment in children with an early history of anxious solitude: A child × environment model. Developmental Psychology 2006;42:1179–1192. [PubMed: 17087551]

Ginsburg G, Grover RL, Ialongo N. Parenting behaviors among anxious and non-anxious mothers: Relation with concurrent and long-term child outcomes. Child and Family Behavior Therapy 2004;26:23–41.

Gladstone GL, Parker GB, Mitchell PB, Wilhelm KA, Malhi GS. Relationship between self-reported childhood behavioral inhibition and lifetime anxiety disorders in a clinical sample. Depression and Anxiety 2005;22:103–113. [PubMed: 16149043]

Hastings PD, Rubin KH. A longitudinal study of the development of mothers' beliefs about preschool-aged children's social behavior. Child Development 1999;70:722–741. [PubMed: 10368918]

Hettema JM, Neale MC, Myers JM, Prescott CA, Kendler KS. A population-based twin study of the relationship between neuroticism and internalizing disorders. American Journal of Psychiatry 2006;163:857–864. [PubMed: 16648327]

Kagan, J. Temperamental contributions to affective and behavioral profiles in childhood. In: Hoffmann, SG.; Dibartolo, PM., editors. From social anxiety to social phobia: Multiple perspectives. Needham Heights, MA: Allyn & Bacon; 2001. p. 216-234.

Kagan, J.; Arcus, D.; Snidman, N. The idea of temperament: Where do we go from here?. In: Plomin, R.; McClearn, GE., editors. Nature, nurture & psychology. Washington, DC: American Psychological Association; 1993. p. 197-210.

Kagan J, Snidman N. Infant predictors of inhibited and uninhibited profiles. Psychological Science 1991;2:40–44.

Kochanska G. Patterns of inhibition to the unfamiliar in children of normal and affectively ill mothers. Child Development 1991;62:250–263. [PubMed: 2055122]

Kochanska G, Clark LA, Goldman MS. Implications of mothers' personality for their parenting and their young children's development outcomes. Journal of Personality 1997;65:387–420. [PubMed: 9226943]

Kurdek LA. Correlates of parents' perceptions of behavioral problems in their young children. Applied Developmental Psychology 2003;24:457–473.

LeDoux JE, Iwata J, Cicchetti P, Reis DJ. Different projections of the central amygdaloid nucleus mediate autonomic and behavioral correlates of conditioned fear. Journal of Neuroscience 1988;8:2517–2529. [PubMed: 2854842]

Marshall PJ, Stevenson-Hinde J. Behavioral inhibition, heart period, and respiratory sinus arrhythmia in young children. Developmental Psychobiology 1998;33:283–292. [PubMed: 9810478]

Mills, RSL.; Rubin, KH. Socialization factors in the development of social withdrawal. In: Rubin, KH.; Asendorpf, J., editors. Social withdrawal, inhibition, and shyness in childhood. Hillsdale, N.J.: Erlbaum; 1993.

Moore PS, Whaley SE, Sigman M. Interactions between mothers and children: Impacts of maternal and child anxiety. Journal of Abnormal Psychology 2004;113:471–476. [PubMed: 15311992]

NICHD Early Child Care Research Network. Familial factors associated with the characteristics of nonmaternal care for infants. Journal of Marriage and the Family 1997;59:389–408.

NICHD Early Child Care Research Network. Type of child care and children's development at 54 months. Early Childhood Research Quarterly 2004;19:203–230.

Perez-Edgar KE, Fox NA. Temperament and anxiety disorders. Child and Adolescent Psychiatric Clinics of North America 2005;14:681–706. [PubMed: 16171698]

Rosenbaum JF, Biederman J, Gersten M, Hirshfeld DR, Meminger SR, Herman JB, Kagan J, Reznick S, Snidman N. Behavioral inhibition in children of parents with panic disorder and agoraphobia. Archives of General Psychiatry 1988;45:463–470. [PubMed: 3358645]

Rothbart, MK.; Bates, JE. Temperament. In: Damon, W.; Lerner, RM.; Eisenberg, N., editors. Handbook of child psychology: Vol. 3, Social, emotional, and personality development. New York: Wiley; 2006. p. 99-166.

Rothbart, MK.; Derryberry, D.; Posner, MI. A psychobiological approach to the development of temperament. In: Bates, JE.; Wachs, TD., editors. Temperament: Individual differences at the interface of biology and behavior. American Psychological Association; 1994. p. 83-116.

Rubin, KH. The Play Observation Scale (POS). Ontario, Canada: University of Waterloo; 2001.

Rubin KH, Both L, Zahn-Waxler C, Cummings EM, Wilkinson M. Dyadic play behaviors of children of well and depressed mothers. Development and Psychopathology 1991;3:243–251.

Rubin, KH.; Burgess, KB. Social withdrawal and anxiety. In: Vasey, MW.; Dadds, MR., editors. The Developmental Psychopathology of Anxiety. New York: Oxford University Press; 2001. p. 407-434.

Rubin, KH.; Burgess, KB.; Coplan, RJ. Social withdrawal and shyness. In: Smith, PK.; Hart, CH., editors. Handbook of Childhood Social Development. Malden, MA: Blackwell Publishers; 2002. p. 329-352.

Rubin KH, Burgess KB, Hastings PD. Stability and social-behavioral consequences of toddlers' inhibited temperament and parenting behaviors. Child Development 2002;73:483–495. [PubMed: 11949904]

Rubin KH, Cheah CSL, Fox NA. Emotion regulation, parenting, and display of social reticence in preschoolers. Early Education and Development 2001;12:97–115.

Rubin KH, Hastings PD, Stewart SL, Henderson HA, Chen X. The consistency and concomitants of inhibition: Some of the children, all of the time. Child Development 1997;68:467–483. [PubMed: 9249961]

Rubin, KH.; Mills, RSL. Parents' ideas about the development of aggression and withdrawal. In: Sigel, I.; Goodnow, J.; McGillicuddy-deLisi, A., editors. Parental Belief Systems. Hillsdale, N.J.: Erlbaum; 1992. p. 41-68.

Rubin KH, Nelson LJ, Hastings P, Asendorpf J. The transaction between parents' perceptions of their children's shyness and their parenting styles. International Journal of Behavioral Development 1999;23:937–957.

Sanson A, Pedlow R, Cann W, Prior, Oberklaid F. Shyness ratings: Stability and correlates in early childhood. International Journal of Behavioral Development 1996;19:705–724.

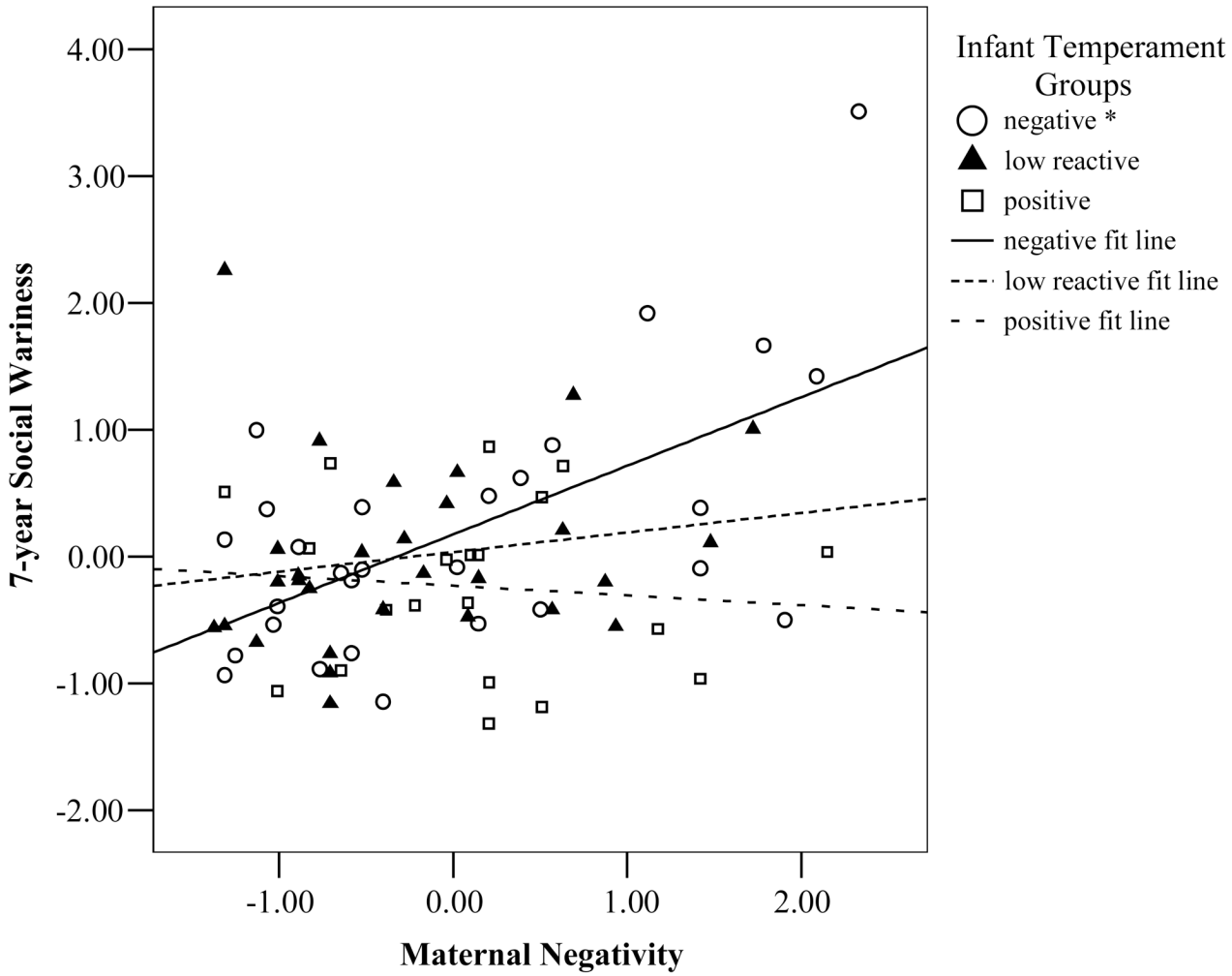
Scalzo C, Williams PG, Holmbeck GN. Maternal self-assessed health and emotionality predict maternal responses to child illness. Children's Health Care 2005;34:61–79.

Schwartz CE, Snidman N, Kagan J. Adolescent social anxiety as an outcome of inhibited temperament in childhood. Journal of American Academy of Child and Adolescent Psychiatry 1999;38:1008–1015.

Shamir-Essakow G, Ungerer JA, Rapee RM, Safier R. Caregiving representations of mothers of behaviorally uninhibited preschool children. Developmental Psychology 2004;40:899–910. [PubMed: 15535746]

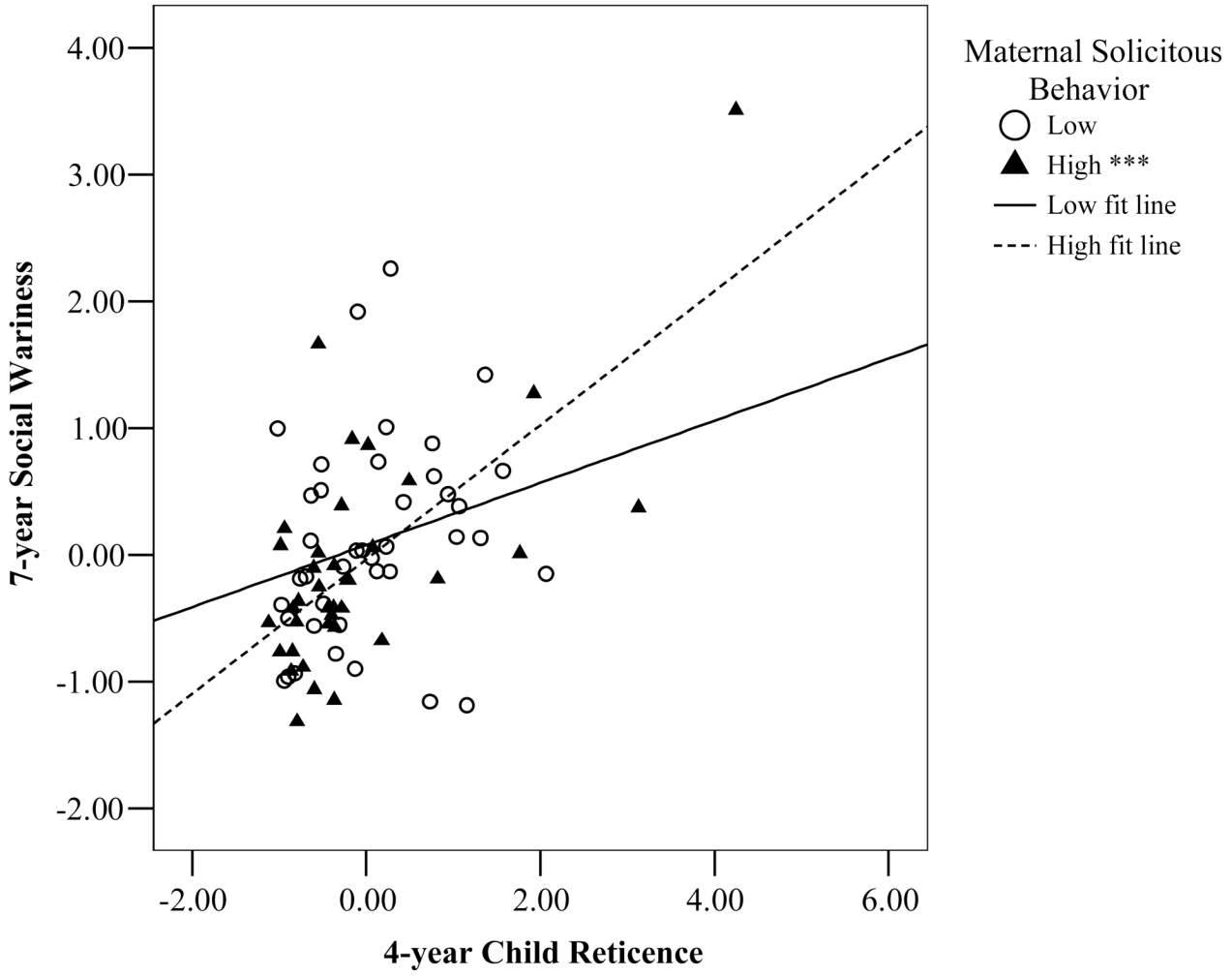
Steunenberg B, Beekman ATF, Deeg DJH, Kerkhof JFM. Personality and the onset of depression in late life. Journal of Affective Disorders 2006;92:243–251. [PubMed: 16545466]

Suveg C, Zeman J, Flannery-Schroder E, Cassano M. Emotion socialization in families of children with an anxiety disorder. Journal of Abnormal Child Psychology 2005;33:145–155. [PubMed: 15839493]



* $p < .05$

Figure 1.
Infant Temperament by Maternal Negativity Predicting 7-year Social Wariness



*** $p < .001$

Figure 2.
Preschool Social Reticence by Maternal Solicitousness Predicting 7-year Social Wariness

Table 1

Infant Temperament, Child care History, Maternal Negativity, and Maternal Solicitous Behavior Predicting 7-year Social Wariness

Variable	R^2	ΔR^2	B	SE B	β
Step 1 (df 3/75)	.16*				
Temperament Groups			−.20	.12	−.19
Child Care			.16	.21	.09
Maternal Negativity			.28	.09	.33**
Maternal Solicitous Behavior			.04	.09	.04
Step 2 (df 5/75)	.29	.13*			
Temperament × Child Care			−.45	.24	−.26
Temperament × Maternal Negativity			−.34	.12	−.33**
Temperament × Maternal Solicitous Behavior			.04	.14	.03

* $p < .05$,

** $p < .01$

Table 2

Child Reticence, Maternal Negativity, and Maternal Solicitous Behavior Predicting 7-year Social Wariness

Variable	R^2	ΔR^2	B	SE B	β
Step 1 (df 2/75)	.34*				
Child Reticence			.41	.08	.48***
Maternal Negativity			.21	.09	.24*
Maternal Solicitous Behavior			.03	.08	.03
Step 2 (df 3/75)	.42	.09**			
Child Reticence × Maternal Negativity			.09	.06	.14
Child Reticence × Maternal Solicitous Behavior			.31	.15	.22*

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 3

Cell Sizes for median splits of Maternal Solicitousness, 4-year Child Reticence, and 7-year Social Wariness (Total N = 77)

4-yr Social Reticence	7-year Social Wariness	
	Low	**High**
Low Maternal Solicitousness (N = 40)		
Low	13	5
High	8	14
*High Maternal Solicitousness (N = 36)**		
Low	16	2
High	4	14

* significant effect: 4-yr reticence and 7-yr social wariness