



Shyness trajectories in slow-to-warm-up infants: Relations with child sex and maternal parenting

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ARTICLE INFO

Article history:

Received 20 November 2010
Received in revised form 1 November 2011
Accepted 9 November 2011
Available online 29 December 2011

Keywords:

Slow-to-warm-up temperament
Shyness
Maternal parenting
Inhibition
Infancy

ABSTRACT

Little is known about slow-to-warm-up temperament in infancy. This study examined the trajectory of shyness in children who were slow-to-warm-up in infancy in comparison to children with other temperament profiles in infancy. Participants were 996 mothers and children in the NICHD SECC studied from 6 months to first grade. Latent growth curve modeling showed that children who were slow-to-warm-up in infancy tended to be shy in early childhood, but with increasing age these children became indistinguishable from children who were easy or intermediate. In comparison, children who were difficult in infancy remained more shy than children with other temperament profiles. Maternal sensitive and stimulating/supportive parenting was associated with less shyness in early childhood for boys who were slow-to-warm-up in infancy. Findings support the distinctiveness of the slow-to-warm-up temperament in comparison to other temperament profiles as well as its potential usefulness for predicting later child outcomes.

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From birth, infants demonstrate an inherited, consistent behavioral style, or temperament, in their responses to their environment. This characteristic behavioral style is believed to influence parent–child relationships and the child's social development. Much of what we know about the social and behavioral correlates of infant temperament stems from the early research of Thomas and Chess and their colleagues (Thomas, Chess, & Birch, 1970; Thomas, Chess, Birch, Hertzog, & Korn, 1963). Thomas et al. (1963) outlined nine dimensions that describe infant temperament: activity level, approach/withdrawal, adaptability, mood, threshold of responsiveness, intensity, distractibility, rhythmicity, and attention span/persistence. They then defined three broad profiles of infant temperament: easy, difficult, and slow-to-warm-up (Chess & Thomas, 1999; Thomas et al., 1970). Each profile is defined by a specific constellation of dimensions. The difficult infant (about 10% of Thomas et al.'s sample) is low in rhythmicity, approach, and adaptability, high in intensity, and negative in mood. The easy infant (about 40% of Thomas et al.'s sample) is high in rhythmicity, approach, and adaptability, mild in intensity, and positive in mood. The slow-to-warm-up infant (about 15% of Thomas et al.'s sample) is low in adaptability and approach, low to moderate in activity, mild in intensity, variable in rhythmicity and distractibility, and slightly negative in mood. The remainder of Thomas et al.'s sample (35%) did not fit into one of the three profiles and was labeled intermediate.

Subsequent temperament theoretical work has expanded upon the Thomas and Chess (e.g., Chess & Thomas, 1999) conceptualization of

temperament, but research has typically focused on children who display behaviors consistent with the Thomas and Chess difficult temperament profile. For example, the dimensions of poor self-regulation and high reactivity that are the focus of Rothbart's research (Putnam & Stifter, 2008) are similar to those included in the Thomas and Chess difficult temperament category. Bates (e.g., Lee & Bates, 1985) has also focused on temperamental difficulty in his research, although he defines it predominately in terms of negative emotionality and fussiness (i.e., social demandingness), which is only one part of Thomas and Chess's definition of difficult temperament. Kagan and Fox (2006) and their colleagues (e.g., Fox, Henderson, Rubin, Calkins, & Schmidt, 2001; Fox et al., 2005; Hane, Fox, Henderson, & Marshall, 2008; Kagan, Snidman, & Arcus, 1998; Kagan, Snidman, Kahn, & Towsley, 2007) have focused on physiological and neurological substrates and specific gene–environment combinations as predictors of behavioral inhibition, shyness, and exuberance in childhood. Unlike other researchers, Kagan and Fox and their colleagues (e.g., Fox et al., 2005; Kagan et al., 1998) have examined some of the behavioral traits (i.e., high motor and emotional reactivity to novelty) that may distinguish the slow-to-warm-up profile from the difficult profile. However, in general, the slow-to-warm-up temperament profile has not been explicitly studied, despite its similarity to difficult temperament and its conceptual link to social inhibition or shyness.

Although researchers have defined and studied temperament somewhat differently, they generally agree that infants characterized by one set of temperament characteristics may be more susceptible to certain later behavior patterns than infants with another set of characteristics. Specifically, researchers have suggested that infants characterized by behaviors typical of both the classic slow-to-warm-up

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and difficult temperament profiles are at risk for poor parent–child fit (Carey & McDevitt, 1995) and for the development of poor social competence (Houck, 1999; Houck & LeCuyer-Maus, 2002) and high inhibition and shyness (Kagan et al., 1998). Most recent research has focused on the behavioral outcomes of difficult temperament (as summarized below). The primary purpose of the present study was to test the usefulness of slow-to-warm-up temperament, as conceptualized by Thomas and Chess, in predicting later child shyness. We also sought to test if maternal parenting and child sex combine with slow-to-warm-up temperament to modify the link between this early temperament and later shyness.

Difficult temperament

Much research has documented the poor developmental outcomes of infants who demonstrate behaviors consistent with the Thomas and Chess difficult temperament. For example, Thomas and Chess reported that individuals who were difficult in infancy accounted for the largest proportion of behavior problems in early childhood (Thomas et al., 1970). Moreover, whereas both stability and change in temperament were observed as children became older, children who were difficult in infancy consistently demonstrated poorer adaptation than children who were easy in infancy (Chess & Thomas, 1990). Overall, Thomas and Chess's (Chess & Thomas, 1990) findings suggest that the difficult temperament profile is a risk factor for poor developmental outcomes. More recent work has confirmed Thomas and Chess's conclusion, demonstrating associations between difficult temperament and similar temperament constructs (e.g., poor effortful control) in infancy and internalizing and externalizing behaviors in early childhood (Bates, Maslin, & Frankel, 1985; Crockenberg & Leerkes, 2006; Rothbart, 2007; Sanson, Oberklaid, Pedlow, & Prior, 1991; Warren & Simmens, 2005). Links have also been shown between difficult or dysregulated temperament and poor social competence (Houck, 1999) and high social withdrawal (Booth-LaForce & Oxford, 2008).

Slow-to-warm-up temperament

According to Thomas et al. (1970) slow-to-warm-up infants are typically less fussy than difficult babies but are more negative and less predictable than easy infants. Like difficult infants, slow-to-warm-up infants are hesitant to approach others and are slow to adapt to new situations, but in general they are less demanding than difficult infants. In contrast to the substantial and conclusive research findings concerning developmental outcomes for difficult infants, little is known about what happens to slow-to-warm-up infants in toddlerhood and childhood. However, it is important to investigate the usefulness of the slow-to-warm-up temperament in predicting later child behaviors for several reasons. First, slow-to-warm-up temperament is conceptually very similar in makeup to difficult temperament. The slow-to-warm-up infant and the difficult infant both withdraw from new situations, are slow to adapt, and are negative in mood. Thus, the established relation between difficult temperament and specific later child behaviors may also be evident with slow-to-warm-up temperament. Conceptually, both the slow-to-warm-up and difficult temperaments are associated with inhibition (Kagan, 1994; Kagan et al., 1998) and infant behaviors characteristic of difficult and slow-to-warm-up infants (i.e., high negativity and low positivity) have been linked to later child inhibition (Park, Belsky, Putnam, & Crnic, 1997). The term slow-to-warm-up has been equated with the construct of shyness, a form of inhibition specific to social situations (i.e., social inhibition; Schmidt & Buss, 2010), in previous literature (Coplan & Rubin, 2010). Even introductory psychology textbooks (e.g., Bernstein, Penner, Clarke-Stewart, & Roy, 2003; Kalat, 2002) and other publications directed toward parents and practitioners (e.g., Kristal, 2007) often assume that slow-to-warm-up temperament in infancy will lead to shyness and inhibition in

childhood, but this link between early slow-to-warm-up temperament and later shyness (i.e., social inhibition) has yet to be empirically tested.

Moreover, Carey and McDevitt (1995) proposed that, along with difficult temperament, slow-to-warm-up temperament is a “temperament risk factor” (p. 13) for a poor parent–child fit as well as for later problem behaviors. In their report on the behavioral outcomes of children who were difficult and easy in infancy, Thomas et al. (1970) also noted that some of the children in their slow-to-warm-up group demonstrated behavior problems in childhood, but did not provide specific comparisons of children with slow-to-warm-up and other temperaments. Additional evidence supporting Carey and McDevitt's (1995) proposal is lacking.

Second, although slow-to-warm-up and difficult infants are similar on several dimensions of temperament, the dimensions that distinguish the two groups may lead to different risks and vulnerabilities. Specifically, the two temperament profiles differ on the dimensions of intensity, activity, and rhythmicity. Whereas difficult infants are high in intensity, vary in activity, and are low in rhythmicity, slow-to-warm-up infants are mild in intensity, are low to moderate in activity, and vary in rhythmicity. Because of these differences, slow-to-warm-up infants may be at even higher risk for shyness than difficult infants. For example, research suggests that young children with low activity levels adapt to novel social situations, such as attending preschool for the first time, more slowly than young children with high activity levels (Fox & Field, 1989). Slow-to-warm-up temperament is often considered to be simply a more moderate variant of difficult temperament. Although slow-to-warm-up children may demonstrate more mild behavioral tendencies in infancy and less severe behavioral problems in childhood than difficult children, they also likely differ in their behavioral trajectory from easy and intermediate children, who typically experience positive outcomes. It is therefore important to understand differential outcomes in slow-to-warm-up infants as compared to difficult, easy, and intermediate infants.

A final rationale for studying the behavioral outcomes of slow-to-warm-up infants is that children who are slow-to-warm-up in infancy may be uniquely influenced by parenting, particularly because of the conceptual link between slow-to-warm-up temperament and shyness. Shyness is characterized by fearful or inhibited responses to social novelty, and recent research suggests that the trait of fear is more susceptible to maternal influence than are other traits. In a study by Braungart-Rieker, Hill-Soderlund, and Karrass (2010), all infants demonstrated an increase in fear between 4 and 16 months, but this increase was less for infants whose mothers were more sensitive compared to infants whose mothers were less sensitive. Conversely, maternal sensitivity was unrelated to the trajectory of anger across infancy (Braungart-Rieker et al., 2010). Other research (reviewed below) suggests that the behavioral outcomes of children who are more difficult in infancy are more affected by parenting behaviors than are the outcomes of children who are less difficult (e.g., Stright, Gallagher, & Kelley, 2008; Warren & Simmens, 2005). However, similar relations between early parenting and later child outcomes have not been tested among children who are slow-to-warm-up in infancy.

Parenting and temperament

Chess and Thomas (Chess & Thomas, 1999; Chess, Thomas, & Birch, 1965) proposed that child outcomes vary depending on whether there is a good or poor fit between parenting strategies and the child's temperament. For example, mothers of slow-to-warm-up children who attempt to force their initially hesitant child to quickly approach other children on the playground are pressuring their children to behave in a manner that is inconsistent with their temperament. Numerous unsuccessful attempts may result in the children avoiding the playground entirely. In contrast, mothers who avoid taking their slow-to-warm-up children to the grocery store because they know

that the social unfamiliarity prevalent in such an environment may distress their children are limiting their children's opportunities to learn to cope with their fearful reactions to new people. In both scenarios, the mothers' behaviors demonstrate a poor fit with their children's slow-to-warm-up temperament. These maternal behaviors can ultimately restrict their slow-to-warm-up children's social interactions with new peers and their children's opportunities to change their hesitant, timid responses to new people and things.

Consistent with the goodness-of-fit perspective, most researchers acknowledge that infant temperament in combination with parenting behaviors better predicts behavioral outcomes than does child temperament alone (see Gallagher, 2002, for a review). For example, a study investigating relations among infant temperament, sex, and toddler anxiety/depressive (internalizing) symptoms found that children who were rated as temperamentally difficult in infancy and who received sensitive parenting in toddlerhood demonstrated fewer anxiety/depressive symptoms than children who were rated as temperamentally difficult in infancy but who received less sensitive parenting (Warren & Simmens, 2005). Parental sensitivity was unrelated to child outcomes among children rated as less difficult in infancy (Warren & Simmens, 2005). In another study, among children who were difficult in infancy, sensitive parenting predicted more social competence when interacting with their peers and teachers, more affectionate and warm relationships with their teachers, and higher peer status ratings in first grade (Stright et al., 2008). Moreover, children who were difficult in infancy but who received sensitive parenting academically and socially outperformed children who were less difficult in infancy (Stright et al., 2008). Combined, these findings suggest that the behavioral outcomes of children who are more difficult in infancy are more affected by sensitive parenting behaviors than are children who are less difficult as infants. Similar relations between early sensitive parenting and later child outcomes may be demonstrated among slow-to-warm-up infants.

Additional research suggests that shy children may benefit from receiving stimulation and support in the everyday home environment. For example, Bayer, Sanson, and Hemphill (2006) found that children who were shy at age 2 were less likely to demonstrate anxiety-related problems at age 4 when their mothers provided more structure and were positive and warm toward their children during activities. Kertes et al. (2009) showed that socially inhibited children whose parents' behaviors lacked structure and support demonstrated increased stress responses (measured as a cortisol response) in the presence of a novel social stimulus. Hastings, Nuselovici, Rubin, and Cheah (2010) suggest that when parents' prompt the shy child to engage in everyday tasks and activities, even those that make the shy child uncomfortable, the shy child may better learn to cope with everyday challenges. It is thus plausible that parenting that provides stimulation, structure, and support in the everyday home environment can reduce associations between slow-to-warm-up in infancy and shyness in childhood.

Child sex and temperament

Overall, research has demonstrated the utility of considering child sex when evaluating relations between early temperament and later child behavior (Henderson, Fox, & Rubin, 2001; Simpson & Stevenson-Hinde, 1985; Stevenson-Hinde & Glover, 1996) and relations among parenting, early temperament, and later child behavior (Warren & Simmens, 2005), particularly among children who are shy or fearful (Eggum et al., 2009; Simpson & Stevenson-Hinde, 1985; Stevenson-Hinde & Glover, 1996). Simpson and Stevenson-Hinde (1985) demonstrated that although the incidence rate of fearfulness or shyness is similar for girl and boy toddlers, parents' responses to shy or fearful behaviors in their children differ by sex. Maternal and paternal sensitive behaviors were negatively associated with shyness in boys but positively associated with shyness in girls (Simpson & Stevenson-Hinde, 1985). Also, mothers tended to be

overprotective of their shy boys. Coplan, Prakash, O'Neil, and Armer (2004) found a positive association between shyness in boys and maternal overprotective parenting, but these constructs were not related in girls. However, other research suggests that extremely shy boys receive more positive maternal parenting in unstructured interactions in the home than extremely shy girls (Stevenson-Hinde & Glover, 1996). Additional findings from Stevenson-Hinde and Glover's (1996) research suggest that moderately shy boys receive less positive interactions and more instructions during a structured task with their mothers than moderately shy girls, indicating that more research is needed to fully understand the roles of maternal parenting and child sex in the development of shy children.

Additional research suggests that maternal sensitive parenting influences boys and girls differently. Specifically, continuity in shyness across early childhood was strongest for boys who received insensitive maternal parenting; in comparison, continuity in shyness was demonstrated for girls who received maternal sensitive parenting (Eggum et al., 2009). This finding suggests that shy girls, but not boys, may actually benefit from less sensitive parenting. However, again, findings have been inconsistent, with other studies showing benefits of maternal sensitivity for both boys and girls who are shy or inhibited (e.g., Hane, Cheah, Rubin, & Fox, 2008).

Moreover, research has generally shown that the consequences of early shyness differ for boys and for girls. For example, Coplan et al. (2004) found that shyness in boys, but not shyness in girls, was associated with teacher-rated peer exclusion at preschool, suggesting that identifying variables that mediate or moderate the relation between infant temperament and later child shyness may be especially valuable in predicting negative peer relations for boys more so than for girls.

The present study

The primary aims of the present study were to determine if slow-to-warm-up temperament in infancy predicts later shyness, and if slow-to-warm-up and difficult temperaments in infancy differentially predict shyness trajectories in childhood. It was hypothesized that slow-to-warm-up infants would be more shy in toddlerhood and early childhood than easy and intermediate infants. Based on previous research on the risks associated with difficult temperament, difficult temperament in infancy also was expected to be related to later shyness.

A secondary aim was to determine how maternal parenting and child sex combine with slow-to-warm-up temperament to modify children's shyness trajectories. Based on research supporting the benefits of maternal sensitivity and support for children with difficult temperament, it was expected that children who were slow-to-warm-up in infancy and received highly sensitive and supportive parenting would demonstrate less shyness in toddlerhood and early childhood than slow-to-warm-up children who received less sensitive and supportive parenting. We also examined child sex. Boys and girls were not expected to differ in their initial level of shyness in toddlerhood; however boys may decrease in shyness over time because shyness comes with a greater cost for boys than for girls (Rubin, Coplan, & Bowker, 2009). Because recent findings suggest that girls and boys may differ in how maternal parenting affects their shyness trajectories (e.g., Eggum et al., 2009), additional exploratory analyses evaluated if boys' and girls' shyness trajectories differentially responded to maternal parenting behaviors. However, due to seemingly inconsistent findings in the literature (e.g., Eggum et al., 2009; Hane, Cheah et al., 2008; Hane, Fox et al., 2008) and the exploratory nature of these analyses no specific predictions were made.

A subsidiary aim was to determine if experience in early nonparental care modified slow-to-warm-up infants' risk for shyness. Although much of the recent literature supports the consideration of *quality* of care rather than *quantity* of care, particularly when evaluating

difficult or anxious child temperament (e.g., Gunnar, Kryzer, Van Ryzin, & Phillips, 2010; Pluess & Belsky, 2010), we were simply interested in whether or not children who were slow-to-warm-up in infancy benefit from early and consistent exposure to novel social situations, such as may be provided in a nonparental care setting with other children. Such exposure may help them learn to cope with their temperamental reactions to social unfamiliarity.

Method

Participants and procedure

Data from the National Institute of Child Health and Human Development Study of Early Child Care (NICHD SECC) were employed. The NICHD SECC is a longitudinal study that followed over 1200 children and their families from their birth in 1991. Additional information on participants, procedures, methods, and materials is available at <http://secc.rti.org>. For the purpose of the present study, mothers' ratings of their infants' temperament and observations of their parenting behaviors were related to their subsequent ratings of their child's shyness. Mothers and children were included in analyses if temperament data were available and if shyness data were available for at least one time point (i.e., 24 months, 36 months, 54 months, or first grade). Data on these measures were available from 996 mothers. These mothers were less likely to be identified as Black or "Other," were less likely to be Hispanic, and were more likely to be identified as White ($\chi^2(4) = 23.19, p < .001$) than mothers for whom child data were missing ($N = 368$). Children included in analyses were less likely to be in nonparental care ($\chi^2(1) = 16.75, p < .001$) than children for whom data were missing. Additional means, standard deviations, and comparisons of participants on other demographic and study variables by attrition are reported in Table 1. Mothers whose data were included in the analyses ranged in age from 18 to 46 years (mean age 28.4 years) at the beginning of the study, with 50% of the mothers between 25 and 32 years of age. Eighty-five percent of the mothers were Caucasian American, 11.3% were African American, 1.7% were Asian American, 0.5% were American Indian, and 1.4% were identified as "Other." Four percent of the mothers were Hispanic. Approximately half (50.3%) of the infants were male.

Measures

Infant temperament

Mothers were asked to rate their 6-month-old infants on 56 of the 95 original items of the Revised Infant Temperament Questionnaire (RITQ;

Carey & McDevitt, 1978). The selected items are from five of Thomas and Chess's nine dimensions of infant temperament: activity, approach, adaptability, mood, and intensity. Children rated below the sample mean in adaptability (i.e., adaptable), approach (i.e., approaching), mood (i.e., positive), and intensity (i.e., mild) were classified as easy. In contrast, children rated above the sample mean in adaptability (i.e., non-adaptable), approach (i.e., withdrawing), and intensity (i.e., intense) and were more than one standard deviation above the sample mean in mood (i.e., negative) were classified as difficult. Children classified as slow-to-warm-up were similar to the children classified as difficult in that they were above the mean in both adaptability (i.e., non-adaptable) and approach (i.e., withdrawing), but they differed from children classified as difficult in that they were rated below the mean in intensity (i.e., mild), had mood scores between the mean and one standard deviation above the mean (i.e., slightly negative), and were no more than one standard deviation above the mean in activity (i.e., moderate to low activity). All remaining infants were classified as intermediate in temperament.

Our approach is slightly modified from that of Carey and McDevitt (1978) and designed to avoid overlap in scores on any of the dimensions that distinguish the slow-to-warm-up and difficult groups (i.e., mood, intensity, and activity). It clearly selects the infants of interest in the present study (i.e., those who are both inclined to withdraw and slow to adapt) and then sorts them into the slow-to-warm-up profile (i.e., mild intensity, slightly negative mood, and low to moderate activity) and the difficult profile (i.e., high intensity, negative mood, and variable activity). The means and standard deviations for each dimension were similar to those reported by Carey and McDevitt (1978) (see Table 2). As outlined by Carey (1970), only participants missing fewer than 20% of the items on any dimension of the RITQ were included in analyses. Sixty-two infants (6.2%) were classified as difficult, 91 (9.1%) as slow-to-warm-up, 149 (15.0%) as easy, and 694 (69.7%) as intermediate. Temperament categories were also calculated using Carey and McDevitt's (1978) approach. Analyses yielded similar results. Results are available from the authors.

Child shyness

Mothers were asked to rate their children's behavioral and emotional characteristics on the Child Behavior Checklist/2-3 (CBCL/2-3; Achenbach, 1992) when their children were 24 and 36 months of age and on the Child Behavior Checklist/4-18 (CBCL/4-18; Achenbach, 1991) when their children were 54 months of age and when they were in first grade. Five items from the CBCL that seemed to capture behaviors typical of shy children in early childhood based on prior research (e.g., Garcia Coll, Kagan, & Reznick, 1984; Putnam & Stifter,

Table 1
Mean differences in demographic and study variables by attrition.

	Included in analyses			Excluded from analyses			<i>t</i>	<i>df</i>	<i>p</i>
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>			
Mother variables									
Education	996	14.36	2.41	367	13.88	2.74	-3.14**	1361	.002
Income-to-needs	933	3.01	2.60	340	2.47	2.60	-3.23**	1371	.001
Age	996	28.39	5.56	368	27.35	5.80	-3.02**	1362	.003
Stim/support	983	37.54	4.32	251	36.41	5.81	-3.43**	1232	.001
Sensitivity	985	9.43	1.64	255	9.25	1.66	-1.53	1238	.13
Child variables									
Activity	996	4.40	.54	76	4.38	.53	-.26	1070	.80
Approach	996	2.40	.70	76	2.54	.68	1.92	1070	.06
Adaptability	996	2.22	.61	76	2.39	.69	2.24*	1070	.03
Intensity	996	3.63	.64	76	3.60	.63	-.44	1070	.66
Mood	996	2.88	.65	76	2.89	.74	.15	1070	.88
24 m. shy	971	.35	.29	218	.38	.31	1.40	1187	.16
36 m. shy	955	.38	.31	220	.39	.32	.27	1173	.79
54 m. shy	855	.37	.31	199	.40	.33	1.16	1052	.25
First grade shy	829	.31	.28	180	.32	.31	.51	1007	.61

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

Table 2

Means and scores at +1 and -1 standard deviations for revised infant temperament questionnaire subscales obtained by the NICHD SECC.

	Activity	Approach	Adaptability	Intensity	Mood
Carey and McDevitt^a					
	(high)	(withdr.)	(non-ada.)	(intense)	(negative)
+1 SD	4.96	3.05	2.61	4.13	3.49
Mean	4.40	2.27	2.02	3.42	2.81
-1 SD	3.84	1.49	1.43	2.71	2.13
	(low)	(app.)	(adapt.)	(mild)	(positive)
NICHD SECC^b					
	(high)	(withdr.)	(non-ada.)	(intense)	(negative)
+1 SD	4.94	3.08	2.84	4.27	3.54
Mean	4.40	2.38	2.23	3.63	2.88
-1 SD	3.86	1.68	1.62	2.99	2.22
	(low)	(app.)	(adapt.)	(mild)	(positive)

^a From "Revised Infant Temperament Questionnaire: Profile Sheet for 4-11-Month-Old Infants," by W. B. Carey and S. C. McDevitt, 1977-1995.

^b $N = 996$.

2005; Schmidt, Fox, Schulkin, & Gold, 1999) and that were available on both versions of the CBCL were selected to create a measure of child shyness for the present study. These items included “clings to adult or too dependent,” “self-conscious or easily embarrassed,” “shy or timid,” “too fearful or anxious,” and “withdrawn, does not get involved with others.” Mothers rated their children on each item using a scale from 0 to 2, with 2 indicating that the item was *very true* for their children. The shyness score was calculated as a mean rating on the selected items for each age. Participants for whom data were missing for more than two of the selected items at any age were not included in analyses. Cronbach's α for shyness was .60 at 24 months, .63 at 36 months, .63 at 54 months, and .60 at first grade. Shyness scores were moderately stable across ages, ranging from $r = .35$ (24 months to first grade) to .57 (54 months to first grade), all $ps < .001$. Although to our knowledge no other researchers have created a shyness composite score using the CBCL measure, other researchers (Booth-LaForce & Oxford, 2008) also utilizing the NICHD SECC data created a social withdrawal composite score from selected items on the Teacher Report Form.

Maternal sensitivity

During the 15-month home visit, mothers' behaviors were videotaped and coded during a 15-minute semi-structured mother–child interaction procedure. The mother–child interaction procedure was developed with the intention of eliciting and measuring the mother's typical behaviors when interacting with her child, especially her ability to sensitively and warmly stimulate her child (NICHD Early Child Care Research Network, 2008). During the semi-structured procedure, the mother was instructed to present her child with three identical bags, and to either play or not play with her child, at her own discretion (NICHD Study of Early Child Care, 1992a). Observers rated the mothers' behaviors during the observation period on a 4-point scale, from *not at all characteristic and highly characteristic*. A composite sensitivity score based on observers' ratings of the interaction was developed and used by NICHD SECC researchers in previous studies (e.g., NICHD Early Child Care Research Network, 1999) and was used in the current study. Ratings of sensitivity to nondistress, intrusiveness (reverse scored), and positive regard were summed to create the composite score. Sensitivity to nondistress ratings reflected the degree to which the mother was “tuned in” to her child during the interaction procedure; ratings were based on observations of the mother's contingent responses to her child and the mother's awareness of her child's mood. Intrusiveness ratings reflected the degree to which the mother dictated the pace and activities of the child during the interaction procedure and, in general, the degree to which the mother's actions were adult-focused instead of child-centered. Ratings of positive regard for the child included the mother's tone of voice (i.e., warm tone) with smiling at, physical affection toward, and enthusiasm for her child (NICHD SECC, 1992a). Inter-rater reliability (calculated as the intraclass correlation) was .83 as reported by the NICHD Early Child Care Research Network (1999).

Maternal stimulation/support

The Home Observation for Measurement of the Environment (HOME) Inventory (Caldwell & Bradley, 1984; as cited in NICHD Early Child Care Research Network, 2008) is a 45-item measure designed to assess the amount of sensitive and stimulating support available in the home environment. NICHD SECC observers completed the HOME Inventory Infant/Toddler version (IT-HOME) during the 15-month home interview. Various items (45 items total) related to parenting were coded by observers in six broad subscales: responsiveness, acceptance, organization, learning materials, involvement, and variety. Sample items include the parent's spontaneously talking to or praising the child, the parent's verbally responding to child vocalizations, and the child's access to specific types of toys (e.g., muscle activity toys, cuddly toys, toys with music). The focus of each of the ratings is on the child in the home environment, and includes

observers' evaluation of the physical objects and materials present in the home environment as well as the caregivers' behaviors during the observation period (NICHD SECC, 1992b). Each of the 45 items was rated as present (scored as 1) or not present (scored as 0) during the observation period. The total score (i.e., the sum of the 45 items) was used in the present study, with higher values indicating higher levels of stimulation/support. Cronbach's α for the total scale was .89 (NICHD Early Child Care Research Network, 2008).

Experience in nonparental care

At the 15-month assessment, mothers reported whether their children received parent care, center-based care, home-based care by someone other than a parent, or care in some other arrangement. Children who were reported as receiving home-based nonparental care or center-based nonparental care were classified as having experienced nonparental care, and all other children were classified as not having experienced nonparental care.

Results

Correlations among variables are reported in Table 3. Necessary statistical assumptions were tested before conducting analyses and, with the exception of normality, were met. Shyness was positively skewed at each age point. However, the maximum likelihood robust estimation used in the current analyses is a maximum likelihood estimation that has standard errors and a chi square test that are robust to deviations from normality so no transformations were made. Missing data for participants' shyness scores ($N = 25, 41, 141,$ and 167 at 24 months, 36 months, 54 months, and first grade, respectively) were also handled using the maximum likelihood robust estimation. The maximum likelihood robust estimation method has been previously implemented by researchers using the NICHD SECC data (e.g., Booth-LaForce & Oxford, 2008; Crosnoe et al., 2010).

To address hypotheses, we compared shyness means and trajectories across temperament groups in a series of analyses. First, we assessed differences among the temperament groups on 24-month child shyness, 15-month maternal parenting, 15-month experience with nonparental care, and child sex. Second, multi-group latent growth curve analyses examined if shyness slopes (24 months to first grade) varied by temperament group. Third, multi-group analyses examined if maternal parenting and nonparental care differentially predicted shyness slopes and intercepts for the four temperament groups. Additional multi-group analyses examined if the above associations varied as a function of child sex. We assessed growth curve models with AMOS 16.0 software. When evaluating the models, we first provide the χ^2 difference test indicating if fit was different when parameters were allowed to be free by temperament group (the unconstrained model) than when temperament group intercepts and slopes were constrained to be equal across groups (the constrained model). Similar to previous research which has used AMOS to test multi-group models (e.g., Sturge-Apple, Davies, & Cummings, 2006), we used the critical ratios for differences statistic to determine if the means and parameters obtained from the unconstrained growth curve models were significantly different across temperament groups; significance was interpreted as scores of $z > 1.96$. When assessing model fit, a) a comparative fit index (CFI) of greater than or equal to .90 was considered to indicate good fit (in line with McDonald & Ho, 2002), b) a root mean square error of approximation (RMSEA) of less than .05 was considered a “good” fit and an RMSEA of less than .08 was considered an “acceptable” fit (according to McDonald & Ho, 2002), and c) a χ^2/df ratio with values between 1 and 3 was considered an acceptable fit (in line with Arbuckle, 2007). Because the CFI values are indices of incremental rather than absolute model fit and may be inaccurate in latent growth models with multiple groups (Widaman & Thompson, 2003), the CFI

Table 3
Correlations among variables.

	24 mo. shy	36 mo. shy	54 mo. shy	First grade shy	Sensitivity	Stim/supp	Child sex	Child care	Activity	Approach	Adapt.	Intensity	Mood
24 mo. shy	1.00												
36 mo. shy	.55***	1.00											
54 mo. shy	.39***	.50***	1.00										
First grade shy	.35***	.40***	.57***	1.00									
Sensitivity	-.15***	-.12***	-.01	-.05	1.00								
Stim/supp	-.11**	-.09**	-.04	-.09*	.38***	1.00							
Child sex	-.01	-.07*	-.05	-.06	-.04	-.07*	1.00						
Child care	-.12***	-.03	-.001	-.03	.11**	.11***	-.03	1.00					
Activity	-.04	-.03	.03	.004	.03	.07*	.02	.03	1.00				
Approach	.27***	.21***	.10**	.09**	-.11**	-.14***	-.10**	-.10**	-.01	1.00			
Adapt.	.26***	.18***	.07*	.10**	-.18***	-.24***	-.03	-.09**	.06*	.67***	1.00		
Intensity	.01	.02	.02	.02	-.08*	-.02	-.004	.01	.45***	.05	.11***	1.00	
Mood	.18***	.17***	.10**	.06	-.09**	-.15***	-.04	-.04	.16***	.52***	.53***	.09**	1.00

Note. *N* = 966. Child sex was coded as 0 = female and 1 = male. Child care was coded as 0 = children who did not experience nonparental care and 1 = children who did experience nonparental care.
p* < .05. *p* < .01. ****p* < .001.

values were considered in the context of other fit indices (i.e., RMSEA, χ^2/df ratio).

Standardized regression coefficients and *R*² values were inflated for some models when the intercept was centered at 24 months. To correct for this inflation, maintain consistency, and because any point in a growth model can be set as the intercept (Raudenbush & Bryk, 2002), we centered the intercept at 36 months for all reported models, which corrected the inflated parameter values. The overall pattern of findings (parameters and model fit indices) for all models did not differ when the intercept was centered at 24 months compared to when the intercept was centered at 36 months. However, the intercept for the slow-to-warm-up group differed significantly from the difficult group when the intercept was centered at 24 months (*z* = 1.90, *p* > .05), but not when the intercept was centered at 36 months (*z* = 2.45, *p* < .05), though the magnitude of this difference was very modest.

Does the slow-to-warm-up temperament group differ from the other temperament groups in 24-month child shyness, 15-month maternal parenting, 15-month nonparental care, and child sex?

A multivariate analysis of variance (MANOVA) compared temperament groups on 24-month child shyness, 15-month maternal sensitivity, and 15-month maternal stimulation/support. This analysis addressed if children's shyness in toddlerhood and maternal parenting in toddlerhood differed by temperament group membership. Compared to children in the other temperament groups, were children in the slow-to-warm-up group more shy in toddlerhood and did they receive less sensitive and stimulating/supportive parenting? Combined, these variables were significantly predicted by the temperament groups, *F*(9, 2856) = 8.22, *p* < .001, η_p^2 = .03. Univariate analyses showed mean differences by temperament group in 24-month child shyness, *F*(3, 956) = 15.92, *p* < .001, η_p^2 = .05, 15-month maternal sensitivity, *F*(3, 956) = 7.50, *p* < .001, η_p^2 = .02, and 15-month maternal stimulation/support, *F*(3, 979) = 8.40, *p* < .001, η_p^2 = .02.

Table 4
Means and standard deviations for shyness at 24 months, maternal sensitivity at 15 months and maternal stimulation/support at 15 months as a function of temperament.

Variable	Temperament									
	STWU (<i>n</i> = 83)		Difficult (<i>n</i> = 58)		Easy (<i>n</i> = 142)		Intermediate (<i>n</i> = 673)		Total (<i>n</i> = 956)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Mean shyness	.45 _{a,b}	.35	.55 _{c,d}	.35	.29 _{a,c}	.27	.33 _{b,d}	.27	.35	.29
Maternal sensitivity	9.54 _a	1.52	8.69 _{a,b,c}	1.61	9.82 _{b,d}	1.42	9.45 _{c,d}	1.55	9.47	1.55
Maternal stimulation/support	37.30 _a	4.40	35.41 _{a,b,c}	5.05	38.56 _b	3.30	37.67 _c	4.07	37.64	4.12

Note. *N* = 956 with complete data for the three dependent variables. Means in each row with the same subscript differ significantly at *p* < .05 with the Bonferroni's correction for multiple comparisons. STWU = slow-to-warm-up.

Means and standard deviations are presented in Table 4. Children in the slow-to-warm-up temperament group were significantly more shy than children in the easy and intermediate groups but did not differ from children in the difficult group. Children in the slow-to-warm-up temperament group received more maternal sensitivity and maternal stimulation/support than children in the difficult group. Children in the different temperament categories did not differ from each of the other temperament groups in their likelihood of experiencing nonparental care, $\chi^2(3) = 3.09$, *p* = .38. Nonparental care was not predictive of slope or intercept in the slow-to-warm-up group in any of the models below and was therefore excluded from reported models. Analyses showed that the distribution of boys and girls was not significantly different across temperament groups, $\chi^2(3) = 7.40$, *p* = .06.

Does slow-to-warm-up temperament in infancy predict later shyness trajectories?

First, an unconditional growth curve model assessed shyness scores at 24 months, 36 months, 54 months, and first grade as indicators of a shyness intercept and linear slope. The model fit was poor, as indicated by a χ^2/df ratio of 12.27 and RMSEA of .11, although the CFI value was adequate ($\chi^2(5) = 61.37$, *p* < .001, CFI = .94). This poor model fit indicates that significant heterogeneity (i.e., individual differences among children) remained unaccounted for in the model. Overall, children decreased in shyness from 24 months to first grade (*B* = -.05, *SE B* = .003, *p* < .001).

Next, a multiple-group analysis examined if the four temperament groups differed in their shyness trajectories over time. The unconstrained model in which all parameters were allowed to vary across temperament groups was tested against a model in which the intercepts and slopes for the four temperament groups were constrained to be equal to test if adding temperament groups as predictors significantly improved model fit (i.e., intercept and slope means for shyness significantly differed across temperament group). The unconstrained

model, presented in Fig. 1, fits the data well, $\chi^2(20) = 77.22, p < .001$, with CFI = .94, RMSEA = .05, and $\chi^2/df = 3.86$, and the fit for the unconstrained model was better than the fit for the model in which temperament group intercepts and slopes were constrained to be equal, χ^2 difference (6) = 39.84, $p < .001$. This result indicates that the temperament groups accounted for a significant portion of the heterogeneity in shyness intercepts and slopes in the model. Means and standard errors for the four temperament groups across time are presented in Fig. 2. Pairwise comparisons of the slopes indicated that the shyness scores in the slow-to-warm-up temperament group ($B = -.05, SE B = .01, p < .001$) decreased significantly more across time than the shyness scores in the easy ($B = -.004, SE B = .006, p = .51$), $z = 3.53, p < .001$, and intermediate temperament groups ($B = -.01, SE B = .003, p = .02$), $z = 3.57, p < .001$, but did not differ in slope from the difficult group ($B = -.04, SE B = .01, p = .002$), $z = .63, n.s.$

We conducted additional comparisons of the means to determine if the slow-to-warm-up group differed at first grade from the other temperaments groups. Contrary to differences at 24 months (reported in the MANOVA), at first grade the shyness scores in the slow-to-warm-up temperament group did not differ from the easy ($z = 0.50, n.s.$) or intermediate temperament groups ($z = 1.37, n.s.$) but were significantly lower than the difficult temperament group ($z = 2.90, p < .05$). By first grade, children who were slow-to-warm-up in infancy were indistinguishable from children who were easy or intermediate in terms of their shy behaviors. In comparison, children who were difficult remained more shy than children who were easy ($z = 2.68, p < .05$) and intermediate ($z = 2.42, p < .05$).

Are maternal parenting and child sex differentially associated with shyness trajectories for children with slow-to-warm-up temperament in infancy?

Building on the previous multi-group model, maternal sensitivity, maternal stimulation/support, and child sex were added to the multi-group model as predictors of shyness intercepts and slopes by temperament group (see Fig. 1). The model fit the data well, $\chi^2(56) = 144.38, p < .001$, with CFI = .92, RMSEA = .04, and $\chi^2/df = 2.58$. The fit for the unconstrained model did not differ from the fit for the model with parameters to shyness intercepts and slopes from maternal parenting and child sex constrained across temperament groups, χ^2 difference (18) = 21.73, $p = .24$. However, the fit for the unconstrained model was better than the fit for the model with

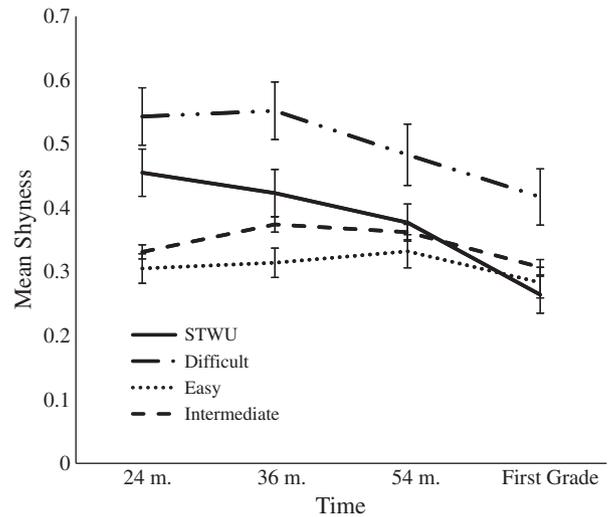


Fig. 2. Mean shyness scores and standard errors by temperament group and time. Means and standard errors were estimated using the full information maximum likelihood method, which adjusts for incomplete data. Unstandardized regression coefficients for the slope parameter were $-.062$ ($SE B = .01$), $-.045$ ($SE B = .01$), $-.015$ ($SE B = .006$), and $-.021$ ($SE B = .003$) for slow-to-warm-up, difficult, easy, and intermediate temperament groups, respectively. STWU = slow-to-warm-up temperament group. $N = 91, 62, 149$, and 694 for the slow-to-warm-up, difficult, easy, and intermediate groups, respectively.

just the parameters to shyness slopes constrained to be equal, χ^2 difference (9) = 17.99, $p = .04$. The model with just the parameters to the intercepts constrained was not significantly different from the unconstrained model, χ^2 difference (9) = 3.76, $p = .93$. These results suggest that predictions of shyness slopes but not intercepts from maternal parenting and child sex differed for the temperament groups. The parenting variables and child sex accounted for 11% and 9% of the variance in shyness intercepts and 37% and 7% of the variance in shyness slopes in the slow-to-warm-up and difficult temperament groups, respectively. In the easy and intermediate temperament groups, these variables accounted for 1–2% of the variance in shyness intercepts and 1–18% of the variance in shyness slopes. Combined, these effect sizes suggest that the maternal parenting and child sex variables accounted for a portion of the variance in child shyness, particularly for the slow-to-warm-up group. Additional findings from the model are reported below.

Maternal parenting

Higher maternal sensitivity was associated with a lower shyness intercept for the slow-to-warm-up group ($B = -.04, SE B = .02, p = .02$) but not for the difficult ($B = -.04, SE B = .02$) easy ($B = -.01, SE B = .01$), or intermediate temperament groups ($B = -.01, SE B = .01$), all $ps > .05$. Higher maternal sensitivity was also associated with increases in shyness over the time period from 24 months through first grade for the slow-to-warm-up temperament group ($B = .01, SE B = .01, p = .02$), but not for the difficult ($B = .01, SE B = .01$), easy ($B = .002, SE B = .004$), or intermediate temperament groups ($B = .002, SE B = .002$), all $ps > .05$. Sensitivity was associated with less shyness at 36 months but increased shyness from 24 months to first grade for children who were slow-to-warm-up in infancy (but not children who were difficult, easy, or intermediate).

Maternal stimulation/support was not associated with the shyness intercept for any of the temperament groups. However, higher maternal stimulation/support was associated with decreases in shyness over time for the slow-to-warm-up temperament group ($B = -.01, SE B = .002, p = .004$) but not for the difficult ($B = -.002, SE B = .003$), easy ($B = .003, SE B = .002$), or intermediate temperament groups ($B = .000, SE B = .001$), all $ps > .05$. Stimulating/supportive parenting was associated with less shyness from 24 months to first

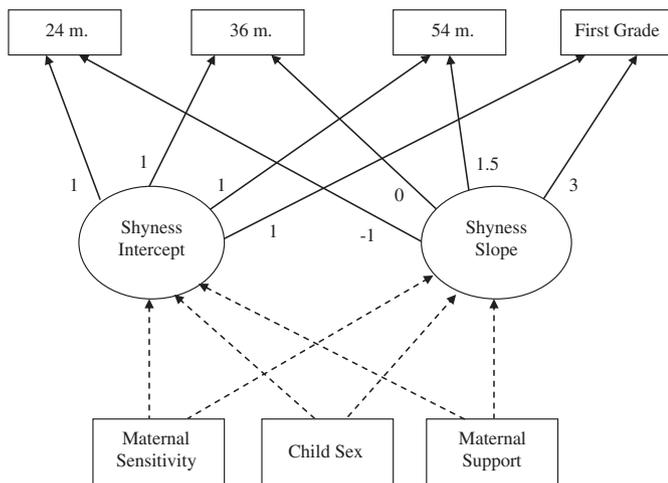


Fig. 1. Multi-group model predicting shyness at 24 months, 36 months, 54 months, and first grade from maternal parenting, child sex, and the interaction of maternal parenting and child sex by temperament group. Parameters represented by straight lines (—) were included in all models. Parameters represented by dotted lines (---) were added in the final model.

grade for children who were slow-to-warm-up in infancy (but not children who were difficult, easy, or intermediate).

Child sex

Shyness intercepts for the four temperament groups did not vary by sex. However, shyness trajectories did vary across the groups by sex. Boys in the slow-to-warm-up temperament group decreased in shyness from 24 months to first grade more than girls in this temperament group ($B = -.04$, $SE B = .02$, $p = .03$) (see Fig. 3). However, child sex was not associated with shyness trajectories in the difficult ($B = -.01$, $SE B = .03$), easy ($B = .02$, $SE B = .01$), or intermediate temperament groups ($B = -.01$, $SE B = .01$), all $ps > .05$. Boys decreased in shyness across early childhood faster than girls among children who were slow-to-warm-up in infancy but not among children who were difficult, easy, or intermediate.

Child sex as a moderator of the relation between maternal parenting and child shyness among slow-to-warm-up infants

Additional analyses examined if maternal parenting predicted shyness scores within each temperament group differentially for boys and girls. These analyses were exploratory based on the size of the sex sub-samples within each temperament. Separate multiple-group growth curve models were assessed for each temperament group. Fit indices among the four models ranged from CFI = .85 to .99, RMSEA = .02 to .10, $\chi^2/df = 1.08$ to 3.78, with $\chi^2 ps = .00$ to .37. For each temperament group, the unconstrained model was compared to a model in which shyness intercepts and slopes were constrained to be equal. These two models were significantly different at $p < .10$ for the slow-to-warm-up group only, χ^2 difference (2) = 5.87, $p = .05$, suggesting slight moderation of maternal parenting by child sex among children who were slow-to-warm-up in infancy. Among children in the slow-to-warm-up temperament group, higher maternal sensitivity was associated with lower levels of shyness at 36 months for boys ($B = -.10$, $SE B = .02$, $p < .001$), but not for girls ($B = .03$, $SE B = .03$, $p = .22$). Higher maternal sensitivity also predicted a slower decline in shyness from 24 months to first grade for boys in the slow-to-warm-up group ($B = .03$, $SE B = .01$, $p < .001$) but not girls in the slow-to-warm-up group ($B = -.004$, $SE B = .01$, $p = .60$). Maternal stimulation/support was not significantly associated with significant differences in shyness trajectories for boys ($B = -.005$, $SE B = .003$, $p = .06$) or girls in the slow-to-warm-up temperament group ($B = -.004$, $SE B = .003$, $p = .13$). In summary, whereas all boys who were slow-to-warm-up in infancy decreased in shyness from 24 months to 6 years, increased maternal sensitivity, but not increased maternal stimulation and support, slowed this decrease (see Fig. 3).

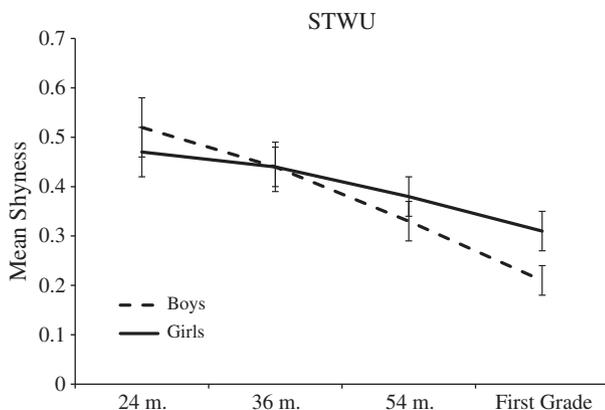


Fig. 3. Mean shyness scores and standard errors by child sex and time among children in the slow-to-warm-up temperament group ($N = 91$).

Discussion

Despite the conceptual link between slow-to-warm-up infant temperament, characterized by low adaptability and a hesitant approach to new things, and child shyness, past research has not evaluated the relation between these constructs. A primary goal of the present study was to empirically evaluate this conceptual link. Summarizing across analyses, findings from this study indicate that children who are slow-to-warm-up in infancy are at increased risk for shyness at 24 months compared to infants with easy and intermediate temperaments, but that this risk disappears by first grade. Despite their early risk, slow-to-warm-up infants appeared to be on a developmental trajectory away from shyness. However, children who were difficult in infancy remained higher in shyness than children who were slow-to-warm-up, easy, and intermediate in infancy across the entire time period of this study.

These initial similarities and eventual differences between slow-to-warm-up and difficult infants in vulnerability to shyness in childhood may be related to similarities and differences in the temperament dimensions that define each profile. Infants in both profiles are characterized by low approach and low adaptability. These tendencies, identified by mothers when the infants were 6 months old, seemed to persist for the next year and a half or longer, leading many of these infants to become socially inhibited as 2-year-olds. During this age period when many children have their first extended interactions with peers and social environments outside the familiarity of their homes, these children react with reluctance and adapt only slowly to these novel experiences. However, many children characterized by low approach and low adaptability eventually do become accustomed to new environments and experiences. By the time they are in first grade, children who were initially slow to approach and adapt appear to have overcome much of their tendency to show inhibition or wariness. These children may simply need consistent exposure to other children and environments outside their homes in order to adapt. Thus the term “slow-to-warm-up” may be especially apropos for these children; they initially react negatively but eventually “warm up” and overcome their initial wariness. Although we did not find a relation between exposure to early nonparental care and slow-to-warm-up children’s shyness, other everyday exposure, such as at a grocery store or playground, may be more influential on slow-to-warm-up children’s ability to overcome their initial hesitancy than experience in early nonparental care.

Difficult and slow-to-warm-up infants differ most distinctly on the dimensions of intensity and mood. Slow-to-warm-up infants are less intense and less negative in mood than difficult infants. These traits may cause slow-to-warm-up infants to have less risk for later shyness than difficult infants. In line with a goodness-of-fit perspective (Chess & Thomas, 1999), perhaps these traits improve these children’s fit with their caregiving environment by reducing negative interactions with their parents. According to Chess and Thomas (1999), temperamental vulnerabilities, which by themselves are normative variations in behavior, can result in poor adaptation if paired with a specific environmental stressor. Parenting a slow-to-warm-up child is likely less stressful for parents than parenting a difficult child because of the difficult child’s negativity and intensity. High levels of infant negative affect have been observed to be associated with low levels of maternal sensitivity (Mills-Koonce et al., 2007). Thus, parents of slow-to-warm-up children may be better able than parents of difficult children to provide sensitive and supportive parenting to help their children overcome their initial withdrawal tendencies. This interpretation is bolstered by the finding that children who were slow-to-warm-up in infancy received more sensitivity and stimulation/support from their mothers at 15 months than children who were difficult in infancy.

Previous researchers have documented the beneficial impact of high maternal sensitivity on problem behavior outcomes in children who were difficult in infancy (e.g., Warren & Simmens, 2005). The results

of the current study suggest that the benefits of high maternal sensitivity toward children who are difficult or slow-to-warm-up in infancy are limited to boys, consistent with recent findings by Eggum et al. (2009). However, although increased maternal sensitivity was beneficial for boys' outcomes in early childhood, sensitive parenting was also associated with a more modest decrease in shyness over time for boys who were slow-to-warm-up. These results suggest that children, particularly boys, at risk for shyness may show a benefit in toddlerhood, but less benefit at later ages, from increased sensitivity when interacting with their mothers. In contrast, maternal stimulation/support was not differentially associated with shyness in boys and girls who were slow-to-warm-up. Thus, early sensitivity in the everyday home environment appears to be beneficial for both boys and girls with slow-to-warm-up tendencies as they grow older.

Previous findings regarding the effects of maternal parenting on boys at risk for later shyness or inhibition have been inconsistent. Park et al. (1997) found that high negativity in infant boys was positively associated with behavioral inhibition in toddlerhood if their mothers were less intrusive and their fathers were more sensitive. However, in Eggum et al.'s (2009) study, continuity in shyness and fearfulness across early childhood was stronger for boys parented insensitively than for boys parented with average or high sensitivity. These seemingly contradictory findings may be partly explained by the context in which parenting was assessed in each of these studies. In Park et al.'s (1997) study, parenting was observed naturalistically in the home environment during daily caregiving tasks and an in-home interaction task, whereas in Eggum et al.'s (2009) study, maternal sensitivity was observed during tasks in a laboratory. A particular strength of the present study was our assessment of parenting in two contexts: during a mother–child interaction procedure and in the everyday home environment. Consistent with Eggum et al.'s (2009) findings, we demonstrated that boys who were slow-to-warm-up in infancy were less shy in childhood when parented sensitively during a specific interaction task. However, we did not replicate Park et al.'s (1997) findings that inhibited boys benefited from *less* supportive (more intrusive and less sensitive) parenting in the everyday home environment. Instead, both slow-to-warm-up boys and girls seemed to benefit from *more* sensitive and supportive parenting. This failure to replicate Park et al.'s (1997) findings may be due to the exploratory nature of this particular set of analyses due to the present study's limited sample sizes within each sex and temperament sub-group. Additional findings should add to a growing literature that suggests that the context in which parents' behaviors are observed must be considered when evaluating relations among child sex, maternal parenting, and child shyness in infants who are temperamentally vulnerable for later shyness and associated outcomes.

In our study, sensitive parenting was positively associated with shyness from toddlerhood to early childhood and stimulating/supportive parenting was negatively associated with shyness across the same ages among children who were slow-to-warm-up in infancy. This differential impact of seemingly similar and correlated parental behaviors is consistent with the recent argument by Grusec and Davidov (2010) for socialization as a domain-specific learning process. Grusec and Davidov (2010) proposed five separate domains of socialization and provided evidence that parental competence in each domain has different implications for child outcomes. For example, parental competence in the reciprocity domain fosters children's development of empathy, whereas parental competence in the group participation domain facilitates children's understanding of cultural norms. Mothers' sensitive behaviors while interacting with their slow-to-warm-up and difficult children in a semi-structured interaction task may fit into the reciprocity domain, whereas mothers' sensitive support in the everyday home environment may fit into another domain, such as the guided learning domain or the group participation domain, which has stronger links with children's later social behaviors. What is unclear is why we and others (Eggum et al., 2009)

found differences in how boys and girls respond to parenting in the same domain.

Limitations

The current study's findings are limited by reliance on maternal report for measures of both early temperament and later child behaviors. The high stability and predictive utility of mothers' ratings across wide age periods suggest that, despite their limitations (e.g., Mangelsdorf, Schoppe, & Buur, 2000; Seifer, 2005), these measures can still be useful when evaluating and predicting these child behaviors. Additional research using observational methodology would further expand our understanding of the moderating role of maternal sensitivity among boys and girls who are at temperamental risk for later shyness or inhibition. Also, our lack of significant findings for nonparental care and our sole focus on maternal parenting caution against the generalization of our findings to caregivers other than the mother. Generalization of study findings is also limited due to higher attrition among mothers who were non-White, younger, and less educated, and who had lower income-to-needs ratios. Also important to note is that mothers' sensitivity and stimulation/support were measured using different methods (i.e., observation and interview), which constrains comparisons of the roles of these two maternal parenting behaviors. Finally, due to small cell sizes in the multiple-group growth curve models that assessed child sex as a moderator of the relation between maternal parenting and child shyness separately for each temperament group and the unstable R^2 when the intercept was centered at 24 months in the model that assessed the temperament groups, maternal parenting, and child sex as predictors of child shyness, results from these models must be interpreted with caution.

Conclusion

Despite its identification as a temperament category in the work by Thomas et al. (1963, 1970), the slow-to-warm-up temperament was excluded from the original version of the Infant Temperament Questionnaire because of its "uncertain usefulness" (Carey & McDevitt, 1978, p. 736). Later research seemed to go along with this conclusion, overlooking the slow-to-warm-up category. The findings of the present study suggest that the slow-to-warm-up temperament category is indeed useful as a predictor of later child behaviors, specifically child shyness, and should continue to be explored as a predictor of later child behaviors. These results suggest that infants and young children who demonstrate a slow-to-warm-up temperament profile, including the tendency to withdraw from and adapt slowly to new situations, but without the additional trait of high negative mood, are likely to outgrow their initial recalcitrance, particularly in the case of boys parented sensitively. In contrast, children with a difficult temperament profile remain at increased risk for shyness across early childhood. Perhaps if parents could be taught skills to decrease their difficult infants' negativity through shaping or another type of behavioral intervention, their developmental trajectory would parallel that of slow-to-warm-up infants, leading them away from shyness and its associated poor outcomes. For example, a behavioral skills training procedure for parents of difficult infants may help parents learn to reinforce their temperamentally difficult children's positive affective behaviors and to avoid reinforcing their children's fussy behaviors. Parent sensitivity interventions such as that implemented by van den Boom (1994) and Bakermans-Kranenburg, Breddeels-van Baardewijk, Juffer, Klein Velderman, and van Ijzendoorn (2008) among mothers of temperamentally irritable and reactive infants may also be relevant for parents of difficult and slow-to-warm-up infants. However, more study is needed to determine additional similarities and differences between children with slow-to-warm-up

and difficult temperaments and the role of positive parenting in helping children overcome these early slow-to-warm-up tendencies.

In general, the present study's findings suggest that optimal outcomes for children and especially boys with slow-to-warm-up tendencies may be promoted by mothers' sensitive behaviors when interacting with their children in the toddler years in both everyday settings like the home environment and in more structured task-oriented settings. Overall, the fact that slow-to-warm-up children seem to get better over time in terms of their outcomes in childhood despite their initial risk in infancy is encouraging.

Acknowledgments

This study was conducted by the NICHD Early Child Care Research Network supported by NICHD through a cooperative agreement that calls for scientific collaboration between the grantees and the NICHD staff.

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