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Infant Temperament Moderates Relations Between Maternal Parenting in Early Childhood and Children's Adjustment in First Grade

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A differential susceptibility hypothesis proposes that children may differ in the degree to which parenting qualities affect aspects of child development. Infants with difficult temperaments may be more susceptible to the effects of parenting than infants with less difficult temperaments. Using latent change curve analyses to analyze data from the National Institute of Child Health and Human Development Study of Early Child Care, the current study found that temperament moderated associations between maternal parenting styles during early childhood and children's first-grade academic competence, social skills, and relationships with teachers and peers. Relations between parenting and first-grade outcomes were stronger for difficult than for less difficult infants. Infants with difficult temperaments had better adjustment than less difficult infants when parenting quality was high and poorer adjustment when parenting quality was lower.

A child's adjustment to formal elementary school marks a critical juncture in developing academic and social competence. Teachers expect children to be ''ready'' for first grade, with ''readiness'' defined as demonstrating a set of academic and social competencies that facilitate adjustment to a large-group learning context that is quite different from most family interactions. Children must demonstrate cooperation, assertive behavior, and self-control while developing relationships with teachers and peers. When children lack experiences and competencies necessary for success in school contexts, they often experience academic and social difficulties in the adjustment to school.

Bioecological systems theory (Bronfenbrenner & Morris, 1998) proposes that features of the developing child interact with proximal processes and contexts over time, shaping the child's developmental competence. Important proximal processes during infancy and early childhood are parent–child interactions. An aspect of parent–child interactions consistently related to children's school adjustment is parenting style (Ryan & Adams, 1995) which has two dimensions: emotional support (including warmth, sensitivity, hostility, and intrusiveness) and autonomy support (Baumrind, 1967; Grolnick & Gurland, 2002). Mothers' emotional and autonomy support during parent–child interactions are associated with children's academic achievement (Grolnick & Ryan, 1989; Pianta & Harbers, 1996; Stright & Neitzel, 2003), social skills (work habits, social competence) (Grolnick & Ryan, 1989; Pianta, Nimetz, & Bennett, 1997; Pianta, Smith, & Reeve, 1991), teacher–child relationships (Barth & Parke, 1993; Pianta et al., 1997), and peer relationships (Parke & Ladd, 1992). However, direct associations among parenting processes and school outcomes are modest (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Vandell, 2000), suggesting that an interacting third variable (such as child temperament) may be operant (Bates & McFayden-Ketchum, 2000; Gallagher, 2002). In this study, we consider how associations between parenting style and children's adjustment to elementary school are moderated by infant temperament.

Parenting During Infancy and Early Childhood

In the data set used in the present study, the National Institute of Child Health and Human Development

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(NICHD) Study of Early Child Care, observations of mothers' parenting style were made at six different times from infancy to first grade. Previous research using longitudinal observations of parenting have found that parenting behaviors are moderately stable across childhood (Belsky, Domitrovich, & Crnic, 1997; Bradley, Caldwell, & Rock, 1998; Forehand & Jones, 2002; Kennedy, Rubin, Hastings, & Maisel, 2004; see Holden & Miller, 1999, for a meta-analysis). Previous analyses of changes in mothers' parenting using the NICHD Study of Early Child Care data set have used several different approaches. First, a longitudinal Poisson regression analysis was used to examine changes in maternal parenting across the first 3 years of life for mothers differing in depressive symptoms (NICHD Early Child Care Research Network, 1999). Maternal sensitivity changed little across the first 3 years of life for mothers who had little or no depressive symptoms. In contrast, for mothers who reported chronic depression, maternal sensitivity declined from 6 to 24 months and then rebounded to the same level as mothers with little or no depressive symptoms. Second, Dallaire and Weinraub (2005) used Pearson product–moment correlations, repeated measures analyses of variance, and structural equation modeling to determine that positive parenting behaviors (sensitivity and stimulation) were relatively stable and negative parenting behaviors (negative regard, detachment) were not stable across the first 6 years of childhood. The present study uses latent curve models to explore changes in parenting style across early childhood. Parenting style is predicted to be relatively stable across early childhood.

Infant Temperament and Differential Susceptibility

Infants who are prone to negative emotional expression, low adaptability, high activity, and low emotional regulation may be described as having a ''difficult'' temperament style (Chess & Thomas, 1989). Over time, children with these characteristics are more likely to develop behavior problems (Bates, 1989; Chess & Thomas, 1989; Martin, 1989), including social inhibition (Kagan, 1994) and aggressive behavior (Bates, Maslin, & Frankel, 1985). Child temperament is more strongly related to developmental outcomes for children experiencing poor quality parenting than children experiencing better quality parenting (Bates, Pettit, Dodge, & Ridge, 1998; Paterson & Sanson, 1999; Rubin, Burgess, & Hastings, 2002; Rubin, Hastings, Chen, Stewart, & McNichol, 1998).

Belsky's (1997, 2005) differential susceptibility hypothesis proposes that children may differ in the degree to which parenting experiences may affect development. The concept of differential susceptibility arises from a basic evolutionary premise: Parents' inability to predict the future limits their ability to prepare their children for numerous unknown potentialities. It may be evolutionarily adaptive for humans to vary in how plastic or susceptible they are to experiences such as parents' socialization efforts. Children vary in the degree to which their nervous systems are sensitive to environmental inputs, with more sensitive systems more likely to become dysregulated. Children with more sensitive systems may be more difficult to regulate but also may respond more to parents' efforts to socialize them, such that parenting may have stronger effects on these children's development than other children. This differential susceptibility may be limited to certain domains of development (domain specific) or may play a role across domains (domain general). Past approaches focusing on the interaction between genetics and experience have emphasized the vulnerability of some children to negative experiences. The differential susceptibility hypothesis suggests that children with more sensitive systems may do worse than less sensitive children when exposed to negative experiences but also may do better than less sensitive children when exposed to positive experiences.

Several studies provide evidence that supports the concept of differential susceptibility to parenting influence, particularly for infants prone to temperamental difficulty or dysregulation. In a classic study that paved the way for thinking about differential susceptibility, mothers who reported experiencing low levels of social support were more likely to have children who were insecurely attached when their infants were irritable but not when their infants were not irritable (Crockenberg, 1981). Similarly, Mangelsdorf, Gunnar, Kestenbaum, Lang, and Andreas (1990) reported that a maternal personality type, characterized by inflexibility and severity, was associated with insecure attachment but only for infants described as ''prone to distress.'' Using growth modeling, Landry, Smith, Miller-Loncar, and Swank (1997) reported that higher quality parenting during infancy predicted greater improvement in children's cognitive–language and social development across infancy and early childhood for infants who were at high risk (one or more medical problems) than for low-risk infants. Kochanska (1995, 1997) found that maternal gentle discipline with preschoolers was associated with better moral development when children were fearful as toddlers but not when they were less fearful. Finally, parenting quality and children's internalizing and externalizing problems were more strongly related for children with difficult/negative temperaments than for children

with easier temperaments (Belsky, 2005; Belsky, Hsieh, & Crnic, 1998; Colder, Lochman, & Wells, 1997; Lengua, Wolchik, Sandler, & West, 2000; Morris et al., 2002; Stoolmiller, 2001).

Parenting, Temperament, and Adjustment to School

In the current study, we hypothesize that infants with difficult temperaments will be more susceptible to mothers' parenting than less difficult infants, such that relations between maternal parenting style and first-grade outcomes will be greater for more difficult infants than less difficult infants. We examine this question for four different but related domains of development: academic competence, social skills (cooperation, assertion, and self-control), teacher–child relationships, and peer status.

Possible interactions between temperament and parenting and academic competence or teacher–child relationships have not been reported. There is some evidence for interactions between temperament and parenting for children's social skills, inhibition, and social withdrawal. Two studies have found stronger relations between parenting and toddlers' social skills for infants with more difficult temperaments. First, Kochanska, Aksan, and Carlson (2005) found that mother's responsiveness during infancy was associated with higher toddler receptive cooperation when infants were prone to anger but not when they were less anger prone. Second, Feldman, Greenbaum, and Yirmiya (1999) found stronger relations between synchrony during mother–infant interactions and toddler self-control for infants with difficult temperaments than less difficult temperaments. Belsky and colleagues found that for infants with more negative emotionality, negative parenting (intrusion, negative affect, and detachment) during early childhood was related to less child inhibition at 3 years, whereas for infants with less negative emotionality there was no relation between parenting and inhibition (Belsky et al., 1998; Park, Belsky, Putnam, & Crnic, 1997). Early et al. (2002) found higher maternal sensitivity at 15 months was associated with more active engagement and less social withdrawal in kindergarten for children described as highly fearful in the Strange Situation at 15 months but not for children who were less fearful.

The present study uses the same longitudinal data set as the Belsky (2005) and Early et al. (2002) studies. In contrast to these studies, parenting style was assessed from infancy to first grade (at 6, 15, 24, 36, 54 months, and first grade), and different child outcomes were used. Two analytical approaches were used to examine whether infant temperament moderates the relations between parenting style and first-graders' academic competence, social skills, and relationships with teachers and peers. First, the traditional method of testing for a moderator was used. An overall score of parenting style across early childhood was calculated, and hierarchical regressions were used to test whether temperament moderates the relations between parenting and first-grade outcomes (Baron & Kenny, 1986).

Second, latent curve models (e.g., McArdle & Epstein, 1987; McArdle & Nesselroade, 2003; Meredith & Tisak, 1990) were used to examine whether temperament interacts with parenting style in infancy (the intercept) and with changes in parenting style across early childhood (the slope) for predicting first-grade adjustment. Although the idea of latent interactions was introduced some time ago (Kenny & Judd, 1984), only relatively recently have the estimation procedures been such that latent interactions can be appropriately modeled and tested in the latent variable model framework as well as implemented in software (e.g., Marsh, Wen, & Hau, 2004; Moulder & Algina, 2002; Li et al., 2001; Schumacker & Marcoulides, 1998). The methodological developments of latent interactions are important because they provide a way to map a theoretical model that involves an interactive effect onto the fit of the model to data. We know of no other work that has looked at the relations between parenting and temperament on child outcomes with latent interactions.

Method

Participants

Children who were born in hospitals at 10 geographic sites across the United States were followed from birth to first grade. Families were recruited through hospital visits to mothers shortly after their child's birth in 1991. During selected 24-hr intervals, all women giving birth were screened for eligibility and willingness to be contacted again. Of the 8,986 mothers who gave birth during the sampling period, 5,416 (60%) agreed to be telephoned in 2 weeks and met the eligibility requirements (mother over 18, spoke English, healthy baby, not multiple birth or released for adoption, lived within 1 hour of research site, and neighborhood not unsafe). Of that group, a conditionally random sample of 3,015 was selected (56%) for the phone call; the conditioning assured adequate representation (at least 10%) of mothers without partners, mothers without a high school diploma, and ethnic minority mothers. At the time of these calls, families were excluded if the infant had been in the hospital more than 7 days, the family expected to move in the next 3 years, or they could not

be reached after at least three attempts. A total of 1,526 mothers who were selected for the call were eligible and agreed to an interview. Of these, 1,364 completed a home interview when the infant was 1 month old and became the study participants. These families were similar to the eligible hospital sample in terms of years of maternal education, percentage in different ethnic groups, and presence of partner in home. The resulting sample was diverse, including 24% ethnic minority children (13% African American, 6% Hispanic, and 5% Asian, Native American, or other ethnicities), 11% mothers not completing high school, and 14% single mothers. The mean years of education for mothers was 14.2 years (SD = 2.5). At 6 months, 1,279 families participated, at 15 months n = 1,240, at 24 months n = 1,172, at 36 months n = 1,161, at 54 months n = 1,040, and at first grade n = 1,007.

At the time of the assessment of first-grade outcomes, 78.7% of the sample was White and 21.3% was ethnic minorities (10.6% African American, 5.9% Hispanic, 4.8% Asian American, Native American, and other ethnic minorities). There were 503 male and 504 female children.

Measures

Infant temperament

At 6 months, mothers completed an adaptation of Carey and McDevitt's Infant Temperament Questionnaire (1978). Mothers rated 55 items from five of the nine subscales from the original questionnaire. The rating scale was 1 = *almost never*, 2 = *rarely*, 3 = *usually does not*, 4 = *usually does*, 5 = *frequently*, 6 = *almost always*. The five subscales were as follows: approach to new situations and people (e.g., "My baby accepts right away any change in place or position of feeding or person giving it"; M = 2.4, SD = 0.77), activity level (e.g., "My baby moves about much [kicks, grabs, squirms] during diapering and dressing"; M = 4.4, SD = 0.55), intensity of emotions (e.g., "My baby displays much feeling [vigorous laugh or cry] during diapering or dressing"; M = 3.6, SD = 0.65), negative mood (e.g., "My baby is fussy [frowns, cries] on waking up or going to sleep; M = 2.9, SD = 0.66), and adaptability (e.g., "My baby accepts his/her bath any time of the day without resisting it"; M = 2.3, SD = 0.62). An overall score of difficult temperament was created by averaging the 55 items (after reflecting appropriate items; α = .81, M = 3.2, SD = 0.40, range = 1.5–4.7).

Parenting

Mothers' parenting style was assessed using a semi-structured mother–child play session at 6, 15, 24, 36, 54 months, and first grade. Mother and child were videotaped at home at 6 and 15 months and in the lab at 24, 36, 54 months, and first grade. At 6 months, mothers were asked to play with their infants using any toys they chose for 7 min and then were given a standard set of toys to use for 8 min. At 15 months through first grade, mothers were asked to show their children toys in three containers in a set order for 15 min (Vandell, 1979).

All tapes were coded at a central location by coders who were blind to all other data. At 6, 15, and 24 months, composite maternal parenting style scores based on emotional support were created from the sums of three 4-point ratings with intrusiveness reflected: maternal sensitivity to child nondistress (Ms = 2.9, 3.0, and 3.0 at 6, 15, and 24 months, respectively), intrusiveness (Ms = 1.6, 1.4, and 1.5 at 6, 15, and 24 months, respectively), and positive regard (M = 2.8 at 6, 15, and 24 months). At 36 and 54 months, and at first grade, the parenting style composite based on emotional and autonomy support included the sums of three 7-point ratings with hostility reflected: supportive presence (Ms = 5.3 and 5.2 at 36 and 54 months, respectively, 5.2 at first grade), hostility (Ms = 1.4 at 36 and 54 months, 1.5 at first grade), and respect for autonomy (Ms = 5.3 and 5.2 at 36 and 54 months, respectively, 5.3 at first grade). The parenting style scores were internally consistent (αs = .70 to .84). Intercoder agreement was acceptable, and intraclass correlations across pairs of coders ranged from .83 to .88 (Winer, 1971).

The parenting scores were transformed to have the same range with a linear transformation. For the parenting scores at 6, 15, and 24 months (sums of three 4-point ratings with a possible range from 3 to 12), 3 was subtracted from each of the scores, and then the new score was multiplied by 2. For the parenting scores at 36 months, 54 months, and first grade (sums of three 7-point ratings with a possible range from 3 to 21), 3 was subtracted from each of the scores. These linear transformations resulted in all the parenting scores being measured on a metric where the minimum score was 0, and the maximum score was 18. It should be noted that no type of transformation can compensate for the fact that the parenting scores for 6, 15, and 24 months have 12 possible values, whereas the scores for 36 months, 54 months, and first grade have 28 possible values. After the initial transformation, the variables were standardized across the sample. Thus, the mean is 0 and the standard deviation is 1 for the full sample across all time points. Standardization was across the full sample so that the relative differences in variability across time and/or across any grouping structure were preserved.

School adjustment

In first grade, the study children's teachers completed questionnaires focusing on the children's adjustment to school. Academic adjustment was assessed using the academic competence subscale from the Social Skills Rating System (Gresham & Elliott, 1990). The teacher was asked to rate (1–5) the child compared to other children in the classroom on nine items focusing on academic performance. An overall score was created by summing the items ($\alpha = .94$).

Children's social skills with teachers and peers were assessed using the social skills subscale from the Social Skills Rating System (Gresham & Elliott, 1990). Social skills included cooperation (paying attention to teacher's instruction, putting away materials properly), assertion (initiating behaviors such as starting conversations with peers, introducing oneself, and volunteering to help peers with classroom tasks), and self-control (e.g., controls temper when arguing with other children; $\alpha = .93$). Ratings (0–2) for the 30 items were summed.

Teachers' perceptions of the quality of their relationships with the study child were assessed using the Student–Teacher Relationship Scale (Pianta, 2001). A positive relationship score was created by summing the ratings (1–5) for the eight closeness (''I share a warm, affectionate relationship with this child'') and the seven conflict items (''This child and I always seem to be struggling with each other''; with the conflict items reflected; $\alpha = .86$).

Children's peer status in the first-grade classroom was assessed using a four-item questionnaire designed for the study. Teachers rated (1–5) whether there are children who like or do not like to play or work with the study child and whether the study child was well liked by children of the same sex and by children of the opposite sex. An overall score of peer status was created by summing the items (after reflecting the ''don't like'' item; $\alpha = .88$).

Results

Means, standard deviations, correlations, and covariances for the variables are reported in Table 1. As expected, teachers' reports of children's first-grade academic competence, social skills, teacher–child relationships, and peer status were moderately correlated ($r = .34$ to .64). Social skills were not collapsed with the teacher and peer relationship variables despite higher intercorrelations, ($r = .64$ for social skills and peer status, $r = .62$ for social skills and teacher–child relationships) because the variables were hypothesized to be assessing related but distinct

Table 1
Means, Standard Deviations, Bivariate Correlations, and Covariances for All Variables

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. Temperament 6	3.2	0.40	—	−.06	−.05	−.06	−.05	−.04	−.05	−.06	−0.32	−0.18	−0.20	−0.04
2. Parenting 6	−0.26	1.08	−.14*	—	.42	.34	.38	.32	.33	.55	2.59	2.17	1.02	0.23
3. Parenting 15	−0.15	1.00	−.13*	.39*	—	.42	.33	.30	.35	.51	2.54	2.09	0.85	0.24
4. Parenting 24	−0.17	1.07	−.15*	.30*	.40*	—	.44	.41	.41	.56	2.32	2.45	1.08	0.38
5. Parenting 36	0.28	0.85	−.14*	.42*	.41*	.48*	—	.38	.37	.46	2.72	2.66	1.12	0.46
6. Parenting 54	0.20	0.89	−.12*	.35*	.35*	.44*	.52*	—	.38	.45	2.55	2.54	0.95	0.38
7. Parent first grade	0.18	0.92	−.13*	.34*	.38*	.42*	.50*	.49*	—	.46	2.07	2.01	0.61	0.31
8. Overall parent first grade	−0.04	0.74	−.20*	.69*	.71*	.73*	.77*	.72*	.73*	—	2.51	2.43	0.96	0.35
9. Academic competence	98.3	11.7	−.07*	.21*	.22*	.19*	.29*	.26*	.19*	.31*	—	90.4	32.3	15.0
10. Social skills	103.2	13.7	−.03	.15*	.16*	.17*	.25*	.22*	.16*	.26*	0.57*	—	70.0	27.5
11. Teach relation	65.0	8.2	−.06	.12*	.11*	.13*	.17*	.14*	.08*	.17*	0.34*	0.62*	—	14.3
12. Peer status	16.1	3.2	−.03	.07*	.08*	.12*	.18*	.14*	.11*	.17*	0.41*	0.64*	0.56*	—

Note. Correlations are below the principal diagonal and covariances are above the principal diagonal.
*$p < .05$.

domains of development. Parenting from 6 months to first grade was positively related to all aspects of first-grade adjustment. Difficult temperament at 6 months was related negatively to children's academic competence but not to other aspects of adjustment.

The hypothesized interaction between temperament and parenting was tested using Baron and Kenny's procedure (1986). In four regression equations predicting the four first-grade outcomes, parenting style (mean parenting score from 6 months to first grade) and infant temperament were entered in the first step of the multiple regression model and the interaction term (Parenting × Temperament) was added in the second step. (The predictor variables were centered.) A significant change in R^2 indicates a significant interaction. There were significant interactions between parenting style and temperament for predicting each of the first-grade outcomes (see Tables 2 and 3).

To interpret the meaning of the interactions, conditional regression lines for the parenting by temperament relation for each of the outcomes were plotted for children at the mean (n = 986), 1 *SD* above (n = 180), and 1 *SD* below (n = 198) for difficult temperament (Aiken & West, 1991). For children at each of the levels of temperament, parenting style positively predicted each of the outcomes; however, the relations between parenting style and children's outcomes were greater for infants with more difficult temperaments than for infants with less difficult temperaments (see the estimated conditional slopes, β, for each of the levels of temperament in Figures 1–4).

Latent Curve Models of Temperament, Parenting, and First-Grade Outcomes

Four latent curve models were used to map the conceptual relations between temperament, parenting style, and the four outcomes onto statistical models (see Figures 5–8). The latent curve analysis fit for the parenting data consisted of two distinct components that combined to form the full model. The first level of the model postulated that the transformed parenting scores followed a straight line (i.e., a linear trajectory) over time. Unique effects (i.e., random effects) for each individual's intercept and slope were an explicit part of the model. These unique effects for each individual's intercept and slope were part of the latent change model so that the extent to which interindividual differences in change existed could be examined. The error variance conformed to a heterogeneous uncorrelated structure, where each time point had a unique variance with no covariation between errors across time. In this model, the age in months was scaled such that the predicted score at the start of the study was equal to the intercept, and the predicted score at the end of the study was equal to the intercept plus the slope ($\mathbf{a}_t$ = [0, 0.115, 0.231, 0.385, 0.615, 1], where $\mathbf{a}_t$ is the vector of time values common to all individuals).

Table 2
Hierarchical Regression Analyses for Temperament, Parenting, and the Interaction Between Temperament and Parenting Predicting First-Grade Academic Competence and Social Skills

	B	*SE B*	β	Adjusted R^2	ΔR^2
Academic Competence					
Step 1				.098**	.100**
Temperament	−0.36 [−2.1, 1.4]	0.89	−.01		
Parenting	5.3 [4.3, 6.3]	0.52	.31**		
Step 2				.104**	.007*
Temperament	−0.56 [−2.3, 1.2]	0.89	−.02		
Parenting	5.0 [4, 6.1]	0.52	.30**		
Temperament × Parenting	3.5 [1, 6]	1.3	.08**		
Social skills					
Step 1				.066**	.068**
Temperament	0.44 [−1.6, 2.5]	1.1	.01		
Parenting	5.1 [3.9, 6.3]	0.61	.26**		
Step 2				.073**	.008**
Temperament	0.18 [−1.9, 2.2]	1.1	.01		
Parenting	4.8 [3.6, 6.0]	0.62	.25**		
Temperament × Parenting	4.4 [1.5, 7.4]	1.5	.09*		

Note. Bracketed values are lower and upper 95% confidence interval limits.
*$p < .05$. **$p < .01$.

Table 3
Hierarchical Regression Analyses for Temperament, Parenting, and the Interaction Between Temperament and Parenting Predicting First-Grade Teacher–Child Relationships and Peer Status

	B	*SE B*	β	Adjusted R^2	ΔR^2
Teacher–Child Relationships					
Step 1				.030**	.032**
Temperament	−0.66 [−1.9, .60]	.64	−.03		
Parenting	1.98 [1.2, 2.7]	.37	.17**		
Step 2				.034**	.005*
Temperament	−0.78 [−2.0, 0.48]	.64	−.04		
Parenting	1.83 [1.1, 2.6]	.38	.16**		
Temperament × Parenting	2.10 [.29, 3.9]	.92	.07*		
Peer status					
Step 1				.027**	.029**
Temperament	0.01 [−0.48, 0.50]	.25	.01		
Parenting	0.77 [0.49, 1.1]	.15	.17**		
Step 2				.030**	.004*
Temperament	−0.04 [−0.53, 0.45]	.25	−.01		
Parenting	0.73 [0.44, 1.0]	.15	.16**		
Temperament × Parenting	0.76 [0.04, 1.5]	.36	.07*		

Note. Bracketed values are lower and upper 95% confidence interval limits.
*$p < .05$. **$p < .01$.

Although the straight line change model for parenting across time was an integral part of the full model investigated, it was only one component. The second level of the model was that temperament would moderate the relations between parenting and first-grade outcomes. This research question was incorporated into the analysis by including direct effects and interaction effects from temperament and parenting (the intercept and the slope of parenting) to the four first-grade outcomes (in four separate analyses). The interactions in these models were latent interactions because the interaction was between temperament (a manifest variable) and the intercept (parenting at 6 months) and slope for parenting (the rate of change across time for parenting), both of which are latent variables. The first-grade outcomes

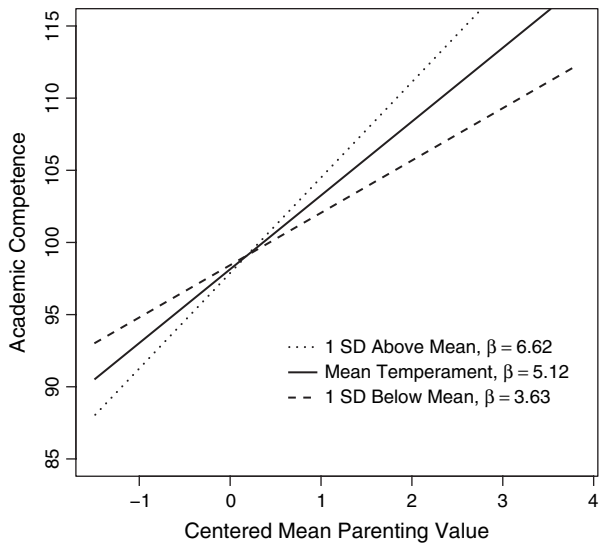

Figure 1. Linear relation between parenting style and academic competence in first grade as a function of parenting for infants who have difficult temperament scores at 6 months that are average, 1 *SD* above, and 1 *SD* below the mean.

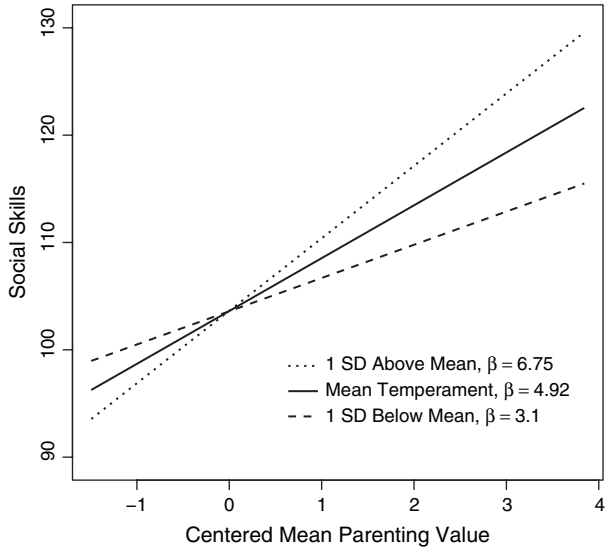

Figure 2. Linear relation between parenting style and social skills in first grade as a function of parenting for infants who have difficult temperament scores at 6 months that are average, 1 *SD* above, and 1 *SD* below the mean.

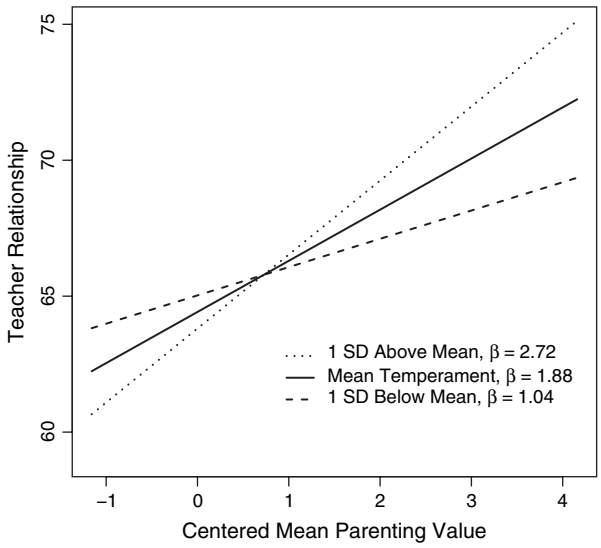

Figure 3. Linear relation between parenting style and positive teacher–child relationships in first grade as a function of parenting for infants who have difficult temperament scores at 6 months that are average, 1 *SD* above, and 1 *SD* below the mean.

were manifest variables. The model was fit using the Mplus software program (Version 3.12; Muthén & Muthén, 2004).

Parenting style. In all four latent change curves, the intercept and the slope for parenting style were significantly different than zero in a positive direction (see Figures 5–8). There was not a significant relation between the slope and the intercept, meaning that parenting style at 6 months was not significantly correlated with the change in parenting across time. Figure 9 provides the overall fixed effects (the mean intercept and slope) for parenting from ages 6 months to first grade for the entire sample (the bold line). In addition, Figure 9 includes the trajectories for a random sample of 15 individuals in order to provide a sense of the data in relation to the mean intercept and slope for the sample. The intercept of parenting positively predicted first-grade academic competence, social skills, teacher relationships, and peer status. The slope of parenting did not predict the four first-grade outcomes, possibly because parenting style did not change greatly from the initial starting point at 6 months (see Figure 9).

Temperament. Temperament negatively predicted the parenting intercept (see Figures 5–8). The more difficult the infant's temperament was at 6 months, the lower the 6-month parenting score was. Temperament did not significantly predict the parenting slope. The latent interaction of temperament and the parenting intercept was a significant predictor of first-grade academic competence, social skills, and teacher relationships but not of peer status, $p = .12$. The latent interaction of temperament and the parenting slope was not a significant predictor of first-grade outcomes.

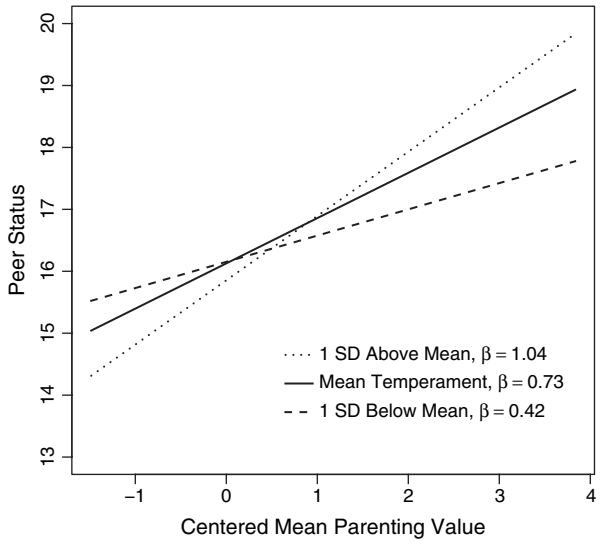

Figure 4. Linear relation between parenting style and positive peer status in first grade as a function of parenting for infants who have difficult temperament scores at 6 months that are average, 1 *SD* above, and 1 *SD* below the mean.

Discussion

This study makes theoretical, methodological, and applied contributions to the literature addressing parenting influences on children's adjustment to school. Consistent with the bioecological systems approach (Bronfenbrenner & Morris, 1998), the study supported the importance of parenting proximal processes over time for several domains of children's adjustment to school. Children who experienced higher quality parenting styles (emotional and autonomy support) during infancy and early childhood were more likely in first grade to have greater academic competence, better social skills, and better relationships with teachers and peers than children experiencing poorer quality parenting. These parenting proximal processes were moderated by child characteristics. Associations between maternal parenting and first-grade adjustment were stronger for infants with more difficult temperaments than for infants with less difficult temperaments, supporting the differential susceptibility hypothesis (Belsky, 1997, 2005).

The findings in this study should be distinguished from a typical Gene × Environment interaction

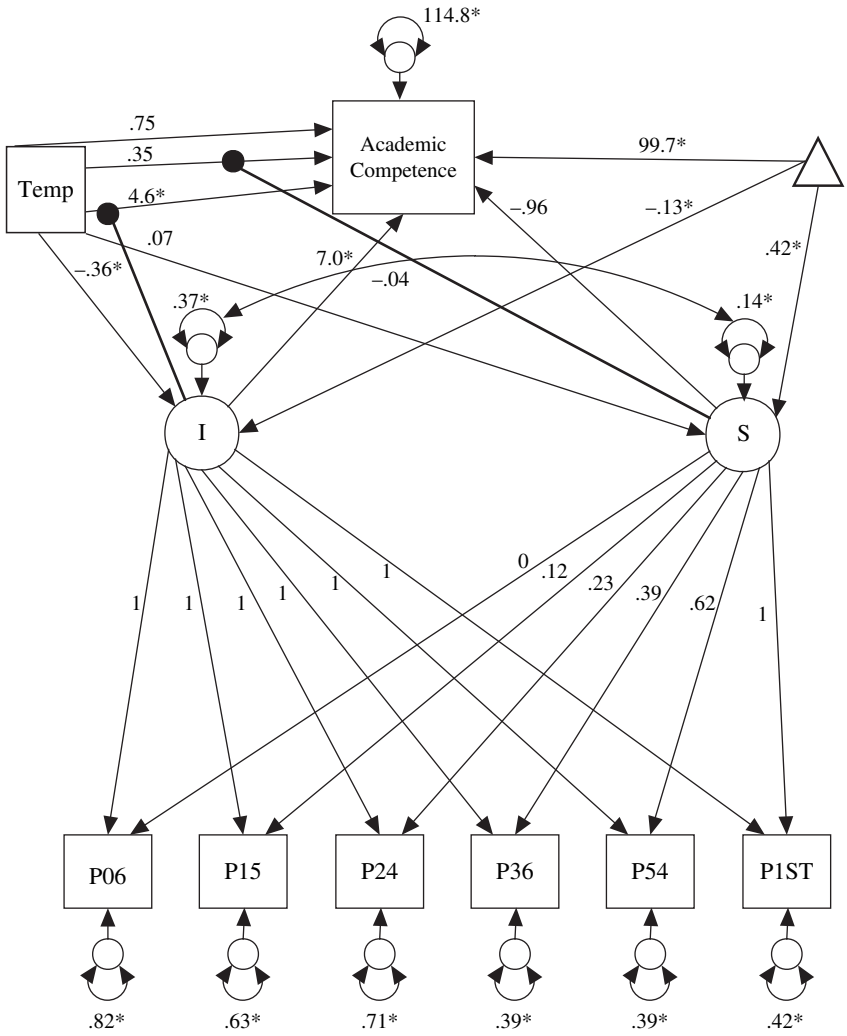

Figure 5. Latent curve model for academic competence in first grade as explained by the intercept and slope of parenting, temperament, and the interaction of the intercept and slope of parenting and temperament.

approach, in which infants with difficult temperaments are hypothesized to be more vulnerable to negative parenting. Supporting the differential susceptibility hypothesis, children with difficult temperaments in this study were not only more susceptible to poorer first-grade adjustment in the presence of negative parenting but also were more susceptible to better quality adjustment in the presence of positive parenting. Infants with difficult temperaments had lower first-grade outcome scores than infants with average or easy temperaments when parenting was poor. When parenting was excellent, infants with more difficult temperaments performed better in first grade than infants with less difficult temperaments (see Figures 1–4). This distinction has important implications for targeting interventions to children who may benefit most from positive proximal processes (and suffer most from negative ones).

In addition, it is possible that the theoretically optimal change model is one that follows an asymptotic regression model (i.e., negative exponential) where, regardless of the temperament of the child, very high levels of parenting quality lead to essentially the same result: better adjustment in first grade. Theoretically, the straight-line model is unlikely, as there is likely to be a point of diminishing returns, where regardless of parenting quality children do not continue to improve at a constant rate. When parenting quality becomes very high, the rate of change may decrease, and theoretically there would be asymptotic change. However, given the range of data available and the linear trend in the observed data for the current data set, the asymptotic regression hypothesis must be

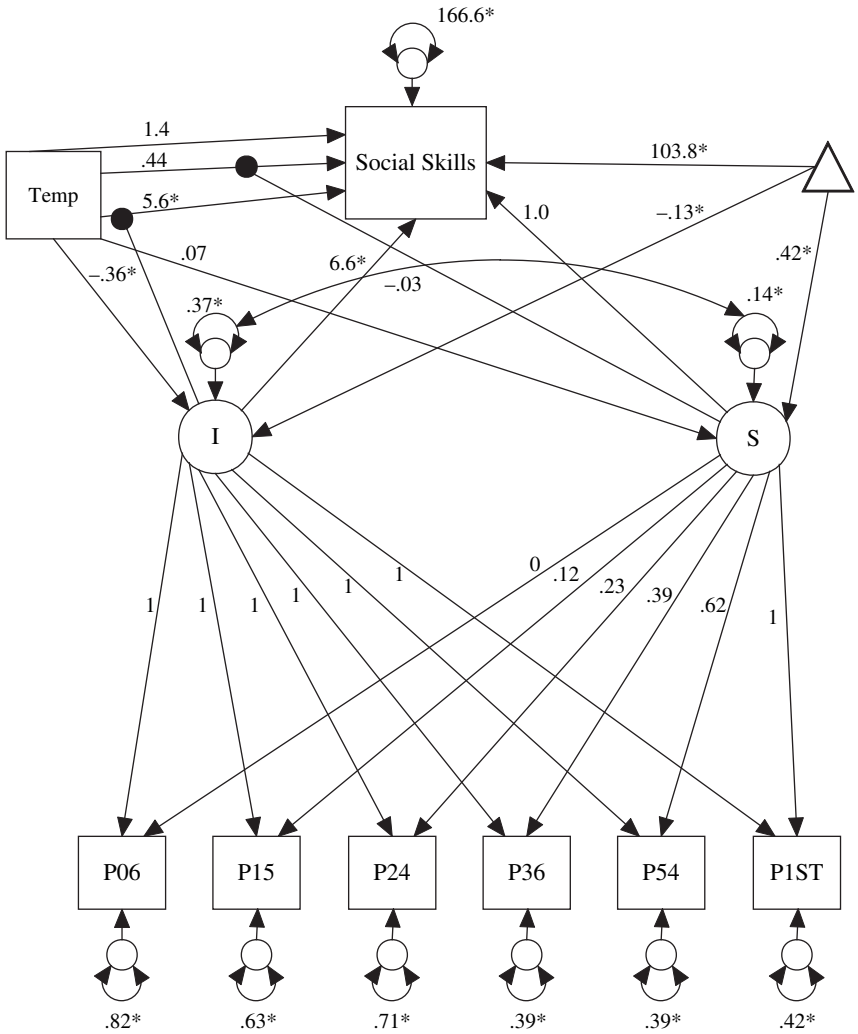

Figure 6. Latent curve model for social skills in first grade as explained by the intercept and slope of parenting, temperament, and the interaction of the intercept and slope of parenting and temperament.

tested using a richer data set (more closely spaced observations of parenting across development).

The study had several methodological strengths. First, parenting style was reliably observed during parent–child play interactions repeatedly across infancy and early childhood until elementary school began making it possible to explore the relations between parenting styles across infancy and early childhood and child adjustment to school. Although the linear change in parenting across time was significant, there was not a great deal of change in parenting across time. On average, parenting style across time was fairly stable from 6 months to first grade, increasing only slightly. A limitation of the assessment of parenting across time is that the metric used changed across time (from 4- to 7-point ratings). In addition, the codes used to assess parenting style changed as the child developed (hostility and respect for autonomy were added when the child was 3 years old). The correlation of the parenting slope with the parenting intercept, temperament on the slope, first-grade outcomes on the slope, and the interaction of slope and temperament on the outcomes were all nonsignificant. The results are consistent with the hypothesis that the slope of parenting across time was not a contributing factor in the latent curve model for explaining first-grade outcomes; however, it is difficult to ''confirm'' this null hypothesis in only a single study. In addition, a direction for future research should be to assess parenting styles during other types of parent–child interactions (such as contexts when parent intrusiveness or hostility would be more likely). Because of the play context of the parent–child interactions in the current study, intrusiveness

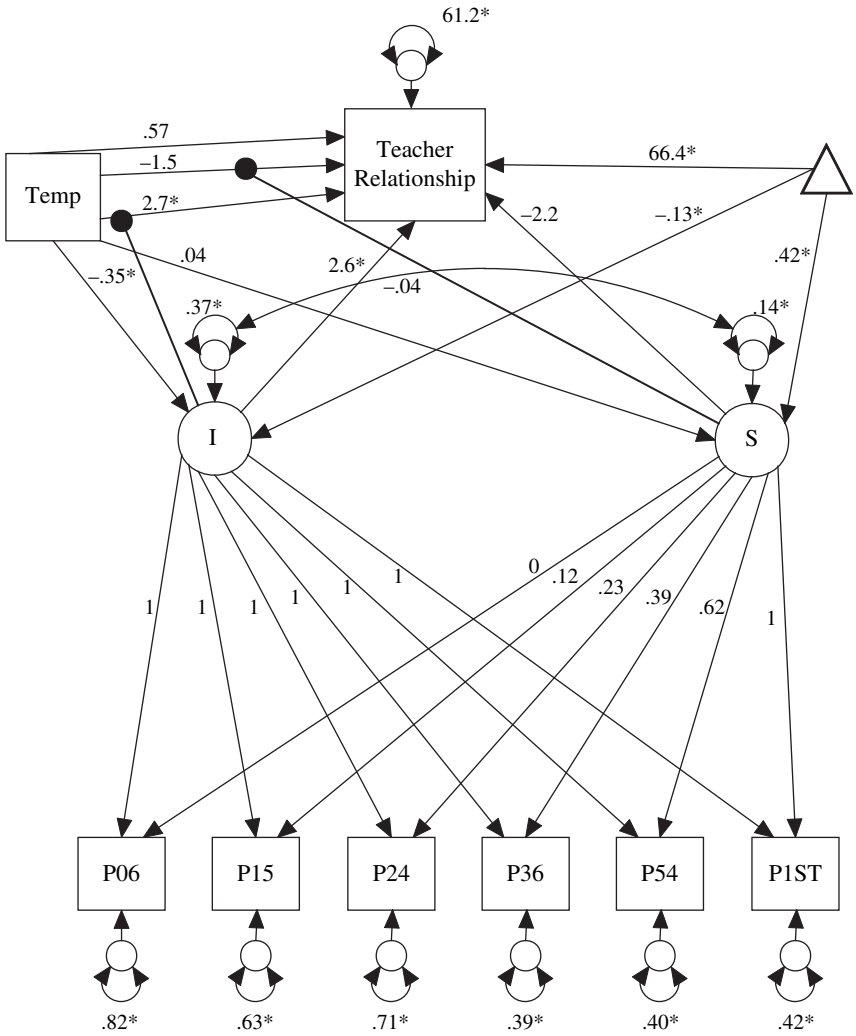

Figure 7. Latent curve model for positive teacher–child relationships in first grade as explained by the intercept and slope of parenting, temperament, and the interaction of the intercept and slope of parenting and temperament.

at 6, 15, and 24 months and hostility at 36, 54, and first grade occurred infrequently.

Second, both traditional and newer methods of analysis were used to test for interactions, leading ultimately to the same conclusions. The multiple regression analyses used the mean score of parenting across 6 months to first grade to represent parenting style. All the interactions between temperament and parenting style were significant for the four indicators of first-grade adjustment. In addition, latent curve models provided the means by which to examine the fit between our theoretical model and the longitudinal data. The results of the latent change curve analyses were in agreement with the multiple regressions. The intercept, which can be thought of as a main effect representing overall parenting style, was an important part of the model. In the latent change curves, all but one of the latent interactions between the intercept for parenting and temperament were significant. Therefore, the results from a rather involved latent curve analysis essentially tell the same story as the four regression results because the slope and the interaction of slope and temperament were not predictors of first-grade outcomes. Thus, with either approach the results are the same: There is a positive interaction between parenting style and temperament.

Effect sizes for parenting style and temperament predicting first-grade outcomes were adjusted R^2 = .10, .07, .03, and .03 for academic competence, social skills, teacher–child relationships, and peer status, respectively. Rosenthal (1990) suggests that seemingly modest effect sizes should not necessarily be considered modest. That is to say, a small effect can have a big impact. When the four hierarchical

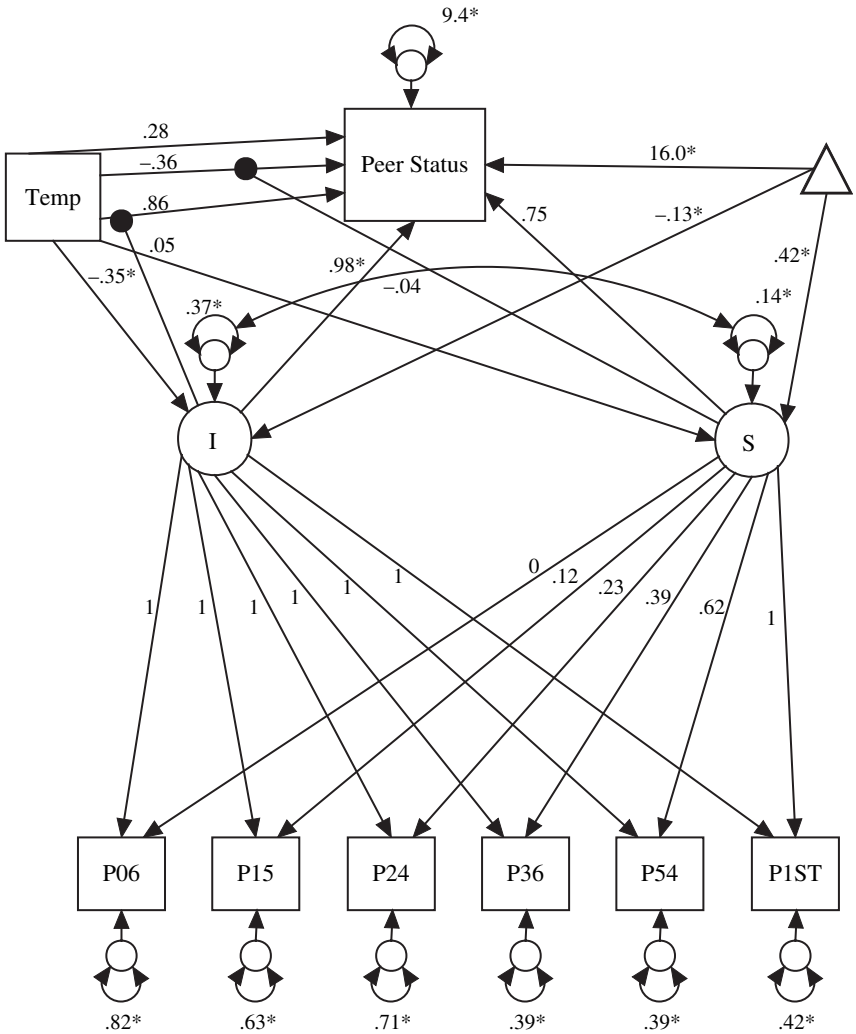

Figure 8. Latent curve model for positive peer status in first grade as explained by the intercept and slope of parenting, temperament, and the interaction of the intercept and slope of parenting and temperament. Temp = temperament; I = intercept; S = slope; P = parenting. *$p < .05$.

regression analyses were repeated using parenting style combined with a broader measure of parenting and the home environment (the Home Observation for Measurement of the Environment; Caldwell & Bradley, 1984), the interactions between temperament and parenting were still present for each of the four outcomes; however, the effect sizes for parenting and temperament predicting child outcomes were larger.

Child temperament was assessed using maternal report as was done in other studies reporting an interaction between temperament and parenting for predicting child outcomes (Bates et al., 1998; Belsky, 2005; Colder et al., 1997; Lengua et al., 2000; Morris et al., 2002; Paterson & Sanson, 1999; Stoolmiller, 2001). Another means of assessing child temperament is through observation and maternal report as was done in the following studies reporting an interaction between temperament and parenting: Belsky et al. (1998), Crockenberg (1981), Early et al. (2002), Feldman et al. (1999), Kochanska (1995), Kochanska et al. (2005), Mangelsdorf et al. (1990), Park et al. (1997), Rubin et al. (1998), and Rubin et al. (2002). The assessment of temperament using only mother report may be confounded by mother characteristics, such as personality. These characteristics may affect parenting style and consequently child outcomes. Mothers with particular characteristics may be more likely to describe their infants as difficult and less likely to provide emotional and autonomy support. In the present study, mothers' report of difficult temperament was negatively related to mothers' parenting across infancy and early childhood. However, this possible confound should not affect the interaction found in the present study—that for infants with

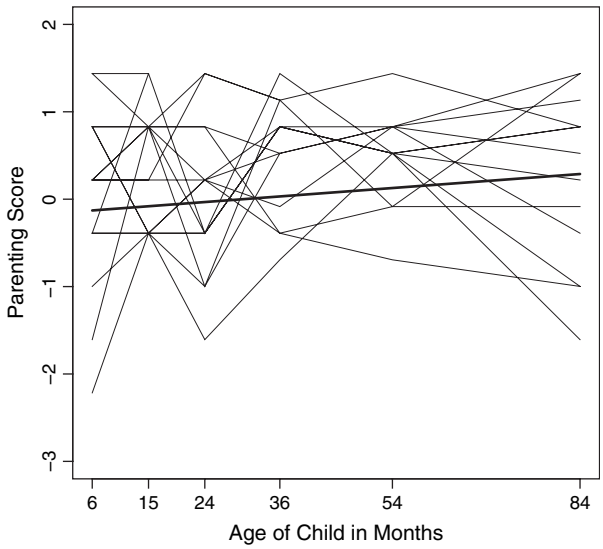

Figure 9. Trajectory plot of 15 randomly chosen individuals and the fixed effects regression line (bold) for parenting from 6 months to first grade (three of the individual plots are overlaid by other individuals' plots, which is why it appears there are only 12 trajectories).

more difficult temperaments (as reported by mother), there was a stronger positive relation between parenting style and children's first-grade outcomes.

Possible directions for future research would be to examine the interaction between temperament and parenting across development using repeated measures of parenting style and observed temperament. Temperament was assessed only once at 6 months. Although dimensions of temperament may be relatively stable across infancy and early childhood (Pedlow, Sanson, Prior, & Oberklaid, 1993), the interaction between temperament and parenting for younger infants or older children is not known. Another possible approach would be, instead of focusing on temperament across early childhood, to examine child and mother behavior during parent–child interactions across development to understand the ongoing interaction between child behavior and parent behavior for predicting developmental outcomes (Cook, 2001).

A limitation of the study is the use of overall scores of difficult temperament and parenting style instead of examining interactions between specific aspects of temperament and parenting styles. Overall scores were used in order to structure the analysis relatively conservatively because of difficulties finding interactions in nonexperimental studies (see McClelland & Judd, 1993, for a discussion of power issues when testing for interactions) and because of the complicated demands of testing for the interaction between temperament and parenting using longitudinal analytic methods. The overall score of parenting style represents the two important dimensions of parenting styles, emotional and autonomy support, but the study does not address how each of these dimensions interact with different dimensions of temperament.

Findings of differential susceptibility may have important implications for early intervention, and the study suggests that early identification of susceptibility to parenting may help to more effectively plan and implement interventions. For example, physicians can identify parents who perceive their children as temperamentally difficult in infancy and refer these parents for supportive services. Initial evidence suggests that such parenting interventions can productively improve parenting skills for parents of difficult infants (van den Boom, 1994). One such program (Cameron, Rice, Hansen, & Rosen, 1994) helps physicians and parents identify early temperamental difficulty and address the challenges of difficult temperament for parenting.

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