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Parenting Stress and Child Behavior Problems: A Transactional Relationship Across Time

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Abstract

Parenting stress and child behavior problems have been posited to have a transactional effect on each other across development. However, few studies have tested this model empirically. The authors investigated the relationship between parenting stress and child behavior problems from ages 3 to 9 years old among 237 children, 144 of whom were typically developing and 93 who were identified as developmentally delayed. Behavior problems and parenting stress covaried significantly across time for both groups of children. Cross-lagged panel analyses generally supported a bidirectional relationship between parenting stress and child behavior problems for mothers and fathers.

Key Words: *developmental delay; intellectual disability; parenting stress; behavior problems*

The transactional model of development asserts that development is not the sum of individual mechanisms but the product of ongoing interactions between the individual and the environment, with a particular focus on bidirectional or reciprocal effects (Belsky, 1984; Gottleib, 2007; Sameroff 2009). This conceptual perspective has been used frequently to understand the influence of parent–child interactions on child development. Reciprocal interactions between child and parent factors have been associated, for example, with the development of temperament (Pesonen et al., 2008), internalizing problems (Fanti, Henrich, Brookmeyer, & Kupermine, 2008), externalizing problems (Gross, Shaw, & Moilanen, 2008; Zhang, Chen, Zhang, Zhou, & Wu, 2008), emotional adjustment (VanderValk, de Goede, Spruijt, & Meeus, 2007), self-regulation (Brody & Ge, 2001), and substance use (Wills & Dishion, 2004). Parent and family factors that have been implicated in these developmental processes include parental depression (Gross et al., 2008), marital distress (VanderValk et al., 2007), parenting practices (Brody & Ge, 2001), and parent–child relationships (Fanti et al., 2008; Zhang et al., 2008). Most of these studies have focused on middle childhood and adolescence and used limited longitudinal data (i.e., two or three time points).

We sought to extend research examining this transactional model by (a) examining another critical parent factor, parenting stress, and (b) using substantial longitudinal data (seven time points) that included significant developmental transition points (e.g., preschool to late elementary school), generating a more complete understanding of this developmental process. We analyzed the transactional relationship between parental stress and child behavior problems across early and middle childhood (ages 3 to 9 years). Although it is likely that parenting stress and child behavior problems have a mutually escalating reciprocal interaction over time, few studies have examined this relationship. Our sample included not only children with typical development but also children with developmental delays, because the latter are more likely to have elevated levels of behavior problems as well as parents with high levels of stress, allowing us to examine the full spectrum of these constructs.

Children With Developmental Delays as a Risk Group

There is consistent evidence that children with cognitive delays are more likely to have significant behavior problems and to develop

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psychopathology. Studies have found heightened externalizing and internalizing behavior problems relative to typically developing children (Baker, Blacher, Crnic, & Edelbrock, 2002; Emerson & Einfeld, 2010; Merrell & Holland, 1997). In early analyses of the present longitudinal sample at child age 3 years, we found that 26.1% of the children with developmental delays exhibited clinical levels of behavior problems compared with 8.3% of children with typical development (Baker et al., 2002). Early behavior problems are a particularly important risk factor because they have been associated with the development of psychopathology among children with and without early developmental risk. In additional analyses with the present sample, 54% of typically developing children and 67% of children with developmental delays who had clinical levels of externalizing behavior problems at age 3 met diagnostic criteria for attention-deficit/hyperactivity disorder at age 5 (Baker, Neece, Fenning, Crnic, & Blacher, 2010).

The development of psychopathology is a significant concern for individuals with developmental delays. Epidemiological studies have found that from one third to one half of children and adolescents with delays meet criteria for a comorbid psychiatric disorder (Cormack, Brown, & Hastings, 2000; Dekker & Koot, 2003; Koskentausta, Iivanainen, & Almqvist, 2007). Evidence from several studies that have included a comparison group with typical cognitive development has suggested that about 2.5 to more than 4 times as many children with cognitive delays have serious behavior–emotional problems as those with typical development (Baker et al., 2010; Dekker, Koot, van der Ende, & Verhulst, 2002; deRuiter et al., 2008; Emerson & Hatton, 2007).

Thus, it is clear that high levels of behavior problems and psychopathology are significant risk factors for children with delays. It is likely that these child risk factors interact with the environment over time, which either intensifies the risk or serves as a protective factor. In the present study, we focused on one environmental variable, parenting stress, which is hypothesized to exacerbate the development of behavior problems over time.

Parenting Stress as an Environmental Risk Factor

High parenting stress is an important environmental risk variable. It has been associated with numerous undesirable outcomes, including parent depression (Anastopoulos, Guevremont, Shelton, & DuPaul, 1992; Deater-Deckard et al., 1998; Hastings, Daley, Burns, & Beck, 2006), marital conflict (Kersh, Hedvat, Hauser-Cram, Warfield, 2006; Suárez & Baker, 1997), poorer physical health (Eisenhower, Baker, & Blacher, 2009; Oelofsen & Richardson, 2006), less effective parenting (Coldwell, Pike, & Dunn, 2006; Crnic, Gaze, & Hoffman, 2005), and, of most importance to the present study, increased child behavior problems (Baker et al., 2003; Briggs-Gowan, Carter, Skuban, & Horwitz, 2001; Donenberg & Baker, 1993; Johnson & Mash, 2001).

Children with delays are more likely to have family environments with high levels of parenting stress. Parents of children with delays typically report more parenting stress than parents of typically developing children (Baker et al., 2003; Emerson, 2003; Hauser-Cram, Warfield, Shonkoff, & Kraus, 2001). Although there is some evidence that the stress experienced by parents of children with developmental delays can be chronic, there is marked individual variation in its trajectory over the life course (Glidden & Schoolcraft, 2003).

Transactional Model: Parenting Stress and Child Behavior Problems

Although there is some support for a transactional relationship between parenting stress and child behavior problems, very few studies have examined this relationship, even in families of children with typical cognitive development. Some studies of children with developmental delays have found that behavior problems mediated the relationship between child developmental status and parenting stress (Baker et al., 2002; Hauser-Cram et al., 2001; Herring et al., 2006). In these studies, when child behavior problems were accounted for, there was no longer a significant relationship between child cognitive delay and parenting stress.

In addition, limited longitudinal analyses have suggested that the relationship between behavior problems and parenting stress is bidirectional—that many elevations in behavior problems lead to increases in parenting stress over time, and high parenting stress leads to increases in behavior problems in children (Baker et al., 2003) and adults (Orsmond, Seltzer, Krauss, & Hong, 2003).

However, there is little known about the trajectories of behavior problems and parenting

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stress across time, and, to our knowledge, no study has examined the associations among these trajectories across multiple time points. Furthermore, previous studies have tested each direction of effect (early behavior problems to later parenting stress and early parenting stress to later behavior problems) independently rather than examining models where both directions of effect are tested simultaneously.

The general theory of psychological stress may be helpful in understanding the reciprocal relationship between parenting stress and behavior problems. The stress process includes four components: (a) an external, causal event or agent; (b) a cognitive appraisal of the event or agent to determine whether it is unpleasant; (c) coping mechanisms to reduce the unpleasant effect of the event or agent; and (d) consequential effects, or *stress reactions* (Lazarus, 1993). Child behavior problems are thought to be a causal agent of stress and, thus, are hypothesized to have a direct link to parents' level of stress. In contrast, the effect from parental stress to child behavior problems may be less direct. Parenting behavior is thought to be a stress reaction that mediates the relationship between stress and child behavior problems (Deater-Deckard, 1998). Parenting stress has been linked to less responsive, more authoritarian, and more neglectful parenting (Belsky, Woodward, & Crnic, 1996; Conger, Patterson, & Ge, 1996; Deater-Deckard & Scarr, 1996; McBride & Mills, 1994), which, in turn, has been associated with poorer developmental outcomes for the child (Rothbaum & Weisz, 1994). However, despite multiple studies supporting the associations among parental stress, parenting behavior, and child outcomes, little research has explicitly tested this full meditational model (Deater-Deckard & Scarr, 1996). This is an important direction for future research.

Differential Effects for Mothers and Fathers

The majority of studies examining child behavior problems and parenting stress have included only mothers. We have found high agreement among mother and father reports of behavior problems at child ages 3 and 4 years, particularly among the parents of children with delays, as well as similar relationships between child behavior problems and parenting stress for mothers and fathers (Baker et al., 2002, 2003). However, fathers can form different relationships with their children (Phares, 1996), have different opportunities to observe them (Hay et al., 1999), and have different experiences and associated outcomes of parenting stress (Roggman et al., 2004). Thus, we do not know whether the relationship between child behavior problems and parenting stress over time is the same for mothers and fathers. In the present study, we addressed the degree of similarity among mothers and fathers in assessment of child behavior problems in early and middle childhood, their experience of parental stress during this time, and the relationship between child behavior problems and parenting stress across development.

Current Study

In the current study, we analyzed the transactional relationship between parenting stress and child behavior problems across early and middle childhood (ages 3–9 years). The parenting stress variable was derived from a measure of how a particular child affects the family (Family Impact Questionnaire [FIQ]; Donenberg & Baker 1993); the score reflects parents' reports of negative feelings about parenting and negative impact on their relationships with others. The behavior problems variable was the total score on the parent-completed Child Behavior Checklist (CBCL; Achenbach, 2000; Achenbach & Rescorla, 2001). We examined (a) the trajectories of child behavior problems and parenting stress across seven time points, (b) whether child behavior problems and parenting stress were related across time, (c) the direction of effect between child behavior problems and parenting stress over time, and (d) whether these relationships differed for mothers and fathers.

Method

Participants included 237 families recruited into the Collaborative Family Study, a longitudinal study of young children, with samples drawn from southern California (n = 196) and central Pennsylvania (n = 41). The Collaborative Family Study was based at three universities: Pennsylvania State University, the University of California, Los Angeles, and the University of California, Riverside. Most families (n = 218) completed an intake assessment near the child's third birthday (M = 35.2 months; SD = 3.0). An additional 19

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families of children with developmental delays entered the study at child age 5 years; they did not differ from the original developmental delays sample on any study variable. We use the term *developmental delay* rather than the more formal diagnosis of intellectual disability for this sample because (a) the cognitive assessment was conducted on the children when they were young, likely resulting in a less stable classification over time than with older children and (b) the groupings were based on IQ alone.

Families of children with developmental delays were recruited primarily through agencies that provide and purchase diagnostic and intervention services for persons with developmental disabilities. In California, almost all families with young children with developmental delays register for services with one of a network of regional centers. Children in the developmental delays group at intake were all in the borderline to moderate ranges of cognitive delay on the Bayley Scales of Infant Development (Bayley, 1993); they were ambulatory and not diagnosed with autism. Families of children with typical development were recruited primarily through local preschools and daycare programs. Additional typical development selection criteria were that the child score in the range of normal cognitive development and not have been born prematurely or have any developmental disability. In recruiting participants, school and agency personnel mailed brochures describing the study to families who met selection criteria and interested parents contacted the research center.

In the present study, we classified children based on the Stanford-Binet Intelligence Scales (Thorndike, Hagen, & Sattler, 1986) at age 5 years. Children were classified as *having developmental delays* (IQ $\leq$ 70; n = 60), *borderline* (IQ = 71–84, n = 33), or *typically developing* (IQ $\geq$ 85; n = 144). Children categorized as *having developmental delays* or *borderline* were combined in the present analyses and referred to as *developmentally delayed*. The present sample was drawn from an initial total sample of 279 families. To be included in these analyses, families must have completed the two key measures (behavior problems and parenting stress) together at a minimum of two time points. The 237 families included in the study met these criteria. These families did not differ from the 42 families who did not meet these criteria on 16 variables examined: delay status, the initial behavior problem (CBCL total score), and stress (FIQ negative) scores, in addition to the demographic variables in Table 1. The sample size at each age was as follows: n, age 3 = 217; n, age 4 = 212; n, age 5 = 232; n, age 6 = 195; n, age 7 = 187; n, age 8 = 167; and n, age 9 = 171. Overall, 72% of families continued in the sample from their first assessment to the 9-year assessment. The families who continued did not

Table 1
Demographics by Delay Status Group at Child Age 3 (n = 237)

Demographic	Group: Delayed (n = 93)	Group: Typically developing (n = 144)	χ^2or t
Children			
Gender (% boys)	58.1	56.7	$\chi^2(1, N = 234) = 0.04$
Race (% Caucasian)	58.1	61.0	$\chi^2(1, N = 234) = 0.17$
M Stanford-Binet IQ at child age 5 (*SD*)	60.8 (15.4)	103.2 (11.4)	$t(232) = 22.79$***
Parent and family			
Marital status (% married)	81.1	87.2	$\chi^2(1, N = 234) = 1.45$
Mother's race (% Caucasian)	54.1	67.4	$\chi^2(1, N = 234) = 3.67$†
Mother's education (*M* grade in school) (*SD*)	14.4 (2.2)	15.6 (2.6)	$t(232) = 3.86$***
Mothers' *M* age (years) (*SD*)	32.3 (6.0)	34.1 (5.8)	$t(232) = 2.19$*
Family annual income (% >$50,000)	40.5	58.2	$\chi^2(1, N = 233) = 6.03$*
Father's education (*M* grade in school) (*SD*)	14.2 (2.7)	15.6 (3.0)	$t(210) = 3.19$**
Fathers' *M* age (years) (*SD*)	36.6 (7.1)	36.5 (6.2)	$t(210) = 0.10$

†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

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differ from dropout families on any of the 16 variables described above.

Table 1 shows the demographic characteristics at child age 3, by group status (developmental delays, typical development). In the combined sample, there were more boys (57.8%) than girls. The majority of the mothers were Caucasian, non-Hispanic (60.1%), whereas 16.5% were Hispanic, 6.9% African American, 2.8% Asian American, and 13.8% self-classified as "other". The socioeconomic status was generally high; 51.8% of families had an annual income above $50,000 (in 1998–2000 U.S. dollars), and the average years of schooling was 3 years of college for mothers and fathers. The two status groups did not differ significantly on child gender, child race–ethnicity, fathers' age, parents' race–ethnicity, parents' health, marital status, or family income. However, mothers and fathers in the typically developing group completed significantly more years of school, mothers of typically developing children were slightly older, and families of typically developing children had a higher family income on average. In addition, children in the typically developing group were reported to have better physical health compared with children in the developmental delays group.

Procedures

Procedures were approved by the Institutional Review Boards of the three universities involved. The primary data for this study were obtained though parent questionnaires at child ages 3–9 years. At child ages 3, 5, and 9 years, the family came into the center for an assessment, and at child ages 3, 4, 6, 7, and 8 years investigators conducted a home visit. During the center assessment at child age 5 years, measures were taken of child intelligence (Stanford-Binet Intelligence Scales, Thorndike et al., 1986) and family demographics (based on interview with the mother). The questionnaire on parenting stress was mailed to the family and completed prior to the home or center visit, whereas the measure of behavior problems was completed during the home or center visit. Thus, administration of the two measures was from several days to several weeks apart.

Measures

Stanford-Binet IV (SB-IV). Children's cognitive ability was evaluated with the Stanford-Binet IV (Thorndike et al., 1986), a widely used assessment instrument with sound psychometric properties. The SB-IV yields an IQ score with a normative mean of 100 and a standard deviation of 15. It is particularly well suited to the evaluation of children with delays because the examiner adapts starting points according to the child's developmental level. Child cognitive status grouping (developmental delays vs. typical development) was based on SB-IV scores at child age 5.

Family Impact Questionnaire. The FIQ (Donenberg & Baker, 1993) is a 50-item questionnaire that asks about the "child's impact on the family compared to the impact other children his/her age have on their families" (e.g., Item 1: "My child is more stressful"). Parents endorse items on a 4-point scale ranging from *not at all* (1) to *very much* (4). Although there are six scales, of interest here are two scales that are combined into a 20-item negative-impact composite score ($\alpha = .87$ each for mother and father reports at age 5). This FIQ negative-impact score is considered an indicator of parenting stress. It was designed to avoid the circular reasoning of stress measures that ask about child challenges and then infer parenting stress from these (e.g., Parenting Stress Index; Abidin, 1990). However, although conceptually different, FIQ negative-impact scores have been found to relate highly to the Parenting Stress Index Child Domain scores on the Parenting Stress Index ($r = .84$) obtained from mothers of young, typically developing children (Donenberg & Baker, 1993). This measure was administered annually from child ages 3–9 years.

CBCL for Ages 1½–5 years and Ages 6–18 years. Two versions of the CBCL were used (ages 1.5–5: Achenbach, 2000; ages 6–18: Achenbach & Rescorla, 2001). For the first three assessments (ages 3–5 years), the preschool version (for ages 1.5–5 years; 99 item) was used, and for the remaining four assessments (ages 6–9 years), the child version of the CBCL was used (for ages 6–18 years, 113 items). Each CBCL item indicates a child problem (e.g., fails to finish things he/she starts, temper tantrums or hot temper, sleeps more than most kids). The mother and father completed this questionnaire during the home or center visit, and for each item the respondent indicated whether it was *not true* (0), *somewhat or sometimes true* (1), or *very true or often true* (2), at that time point or within the previous 2 months. Items contained in the total problem score were used in

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the present analyses; alpha was 0.94 for mothers and fathers at age 3 years. The two CBCL versions have very high overlap in items, and previous studies have found them to be highly equivalent (e.g., Tan, 2011). However, because they differ in total number of items, we divided the sum score by the number of items and used this mean item score in analyses that included data from the CBCL.

Data Analytic Plan

Demographic variables listed in Table 1 that had a significant relationship ($p < .05$) with one or more of the independent variables and one or more of the dependent variables were tested as covariates in the analyses. Covariates were retained in the final model if they predicted the dependent variable at $p < .10$.

To examine the trajectories of child behavior problems and parenting stress over time, as well as the relationship between the two variables, multilevel growth model analyses were conducted using hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002). HLM analyses were used to examine (a) whether there was a significant change in child behavior problems and/or parenting stress over time, (b) whether the two variables changed in similar ways over time, and (c) whether there were status-group differences in the slope of each variable and the covariation of the two variables over time.

To examine the first question (i.e., significant change over time in each group), we first examined the best model of the rate of change. A linear slope term was first added to the model, and, then, quadratic and cubic terms were added in a stepwise hierarchical fashion to examine whether they significantly improved the fit of the model (i.e., the deviance parameter). In all cases, the best fit model was that which included only the intercept and linear slope term. Thus, we conducted growth models by including only an intercept (representing the dependent variable at Time 1), slope (representing the linear rate of change of the dependent variable across ages 3–9), and status (typical development vs. developmental delays). To examine the second question, conditional time-varying predictor growth models were run to test whether parenting stress and behavior problems covaried significantly over time (ages 3–9). The conditional time-varying predictor models differed from the initial growth models in that they included either behavior problems as a covariate of parenting stress over time or parenting stress as a covariate of behavior problems over time. A significant finding would indicate that the two variables (parenting stress and child behavior problems) covaried across time. The conditional models also included relevant demographic covariates. Specifically, family income was included as a covariate in the model examining father-reported stress as a time-varying covariate of child behavior problems; no other covariates were significant at $p < .1$ in any of the time-varying models.

In both the initial growth models and the conditional time-varying models, status was coded such that the *typically developing group* = 0 and the *developmental delays group* = 1, so that intercept coefficients pertained to the significance for the typically developing group, and the Intercept × Status interactions tested whether there was a significant difference between groups. When analyses showed a significant difference between groups (i.e., a significant interaction term), follow-up analyses were conducted with status recoded as *developmental delays group* = 0 and *typically developing group* = 1 to test for a significant relationship between the predictor and outcome variables in the developmental delays group.

Cross-lagged panel analyses were conducted to investigate the direction of the relationship between child behavior problems and parenting stress across seven time points (annual assessments at ages 3–9). Child developmental status was included in these analyses as a covariate in predicting stress and behavior problems at Time 1 (age 3). Cross-lagged analyses allowed simultaneous examination of the two pathways of interest (early child behavior problems to later parenting stress and early parenting stress to later child behavior problems). There were six sets of cross-effects tested in these models (e.g., behavior problems at age 3 predicting stress at age 4 and stress at age 3 predicting behavior problems at age 4; behavior problems at age 4 predicting stress at age 5 and stress at age 4 predicting behavior problems at age 5). This approach differs from a regression analysis in that both dependent variables (behavior problems and parenting stress) are entered into the model and allowed to correlate. This is a more conservative analysis that accounts for the multicollinearity between the two dependent variables, leaving less variance in the dependent variables to be explained by the

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independent variables. Models were run separately for mother-report and father-report data across the seven time points. To address the problem of shared method variance, two additional models were conducted that mismatched informants of parenting stress and child behavior problems (mother report of stress and father report of children behavior problems, father report of stress and mother report of child behavior problems). Similar to the HLM analyses described above, to be included in the cross-lagged analyses families had to have at least two time points of data for both the CBCL and the FIQ. Cross-lagged models are often used in social science research and have been used in previous research with families of children with intellectual disabilities (Greenberg, Seltzer, Hong, Orsmond, 2006; Neece & Baker, 2008; Neece, Blacher, & Baker, 2010).

Results

The distributions of the primary child behavior problem and parenting stress variables were examined at each time point. Data points that were more than three standard deviations above or below the mean of a variable were considered to be outliers. As suggested by Cohen, Cohen, West, and Aiken (2002), all outliers were set equal to plus or minus 3 standard deviations from the mean to reduce the influence of extreme data points on the results. Across all 28 behavior problem and stress variables (i.e., mother and father data for each of seven time points for both variables) and all participants, there were 26 outliers and all were adjusted downward. In addition, preliminary analyses examined the descriptive statistics for the behavior problems and stress variables, which are reported in Table 2.

Multilevel Growth Model Analyses

Child behavior problems. First, growth models were used to examine the linear slope of child behavior problems across seven yearly time points for each status group. As in regression analyses, because Time 1 (age 3 years) was set to 0, the intercept (initial start point of the trajectory) of each model indicated the mean score at child age 3 for either child behavior problems or parenting stress. Results of the growth models are displayed in Table 3.

Table 2
Descriptive Statistics for Stress and Behavior Problem Variables

	Mother report			Father report		
Age (years)	Developmental delays group: *M* (*SD*)	Typically developing group: *M* (*SD*)	*t*	Developmental delays group: *M* (*SD*)	Typically developing group: *M* (*SD*)	*t*
			Child behavior problems			
3	47.31 (22.64)	33.74 (19.29)	4.61***	45.97 (23.42)	32.76 (18.32)	3.84***
4	48.12 (25.25)	31.13 (19.31)	5.02***	45.87 (24.37)	29.83 (19.56)	4.44***
5	47.86 (29.41)	27.20 (19.61)	5.89***	47.51 (26.26)	27.61 (22.16)	5.58***
6	37.42 (22.07)	25.01 (17.28)	4.38***	36.92 (21.06)	21.57 (17.74)	4.90***
7	38.21 (22.77)	25.92 (18.93)	4.00***	34.31 (19.16)	22.26 (19.05)	3.72***
8	39.92 (22.56)	24.07 (19.88)	4.74***	35.95 (20.16)	19.30 (14.58)	4.76***
9	30.48 (26.38)	27.14 (19.74)	0.87	33.20 (19.27)	18.87 (17.69)	4.30***
			Parental stress			
3	18.17 (11.48)	11.56 (8.88)	4.32***	15.61 (10.23)	10.98 (8.21)	3.06***
4	18.41 (11.15)	12.03 (9.20)	4.17***	15.71 (8.85)	10.02 (6.42)	4.41***
5	19.09 (11.22)	10.81 (8.87)	5.95***	17.48 (10.88)	9.53 (6.85)	5.54***
6	18.66 (10.65)	9.92 (8.12)	6.19***	16.05 (8.97)	9.07 (6.72)	5.21***
7	17.70 (9.71)	10.28 (8.21)	5.43***	15.29 (8.59)	8.83 (6.42)	4.84***
8	19.55 (10.92)	8.95 (8.20)	6.66***	16.45 (9.71)	8.64 (6.90)	4.22***
9	17.98 (10.14)	9.58 (8.94)	5.63***	15.15 (9.06)	8.61 (6.96)	4.28***

***$p < .001$.

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Table 3
Results of Unconditional Growth Models

Variable	Mother CBCL	Father CBCL	Mother FIQ	Father FIQ
Intercept parameter (g_{00})	0.32*** (.02)	0.32*** (.02)	11.72*** (0.73)	10.42*** (0.59)
By status (g_{01})	0.19*** (.03)	0.16*** (.03)	7.17*** (1.37)	5.94*** (1.22)
Slope parameter (g_{10})	−0.02*** (.00)	−0.03*** (.00)	−0.33* (0.13)	−0.33** (0.10)
By status (g_{11})	−0.02** (.01)	−0.00 (.01)	0.23 (0.24)	0.24 (0.21)
Intercept variance component (d_0)	0.04***	0.03***	84.25***	52.42***
Slope variance component (d_1)	0.001***	0.00***	1.74***	0.85***

Note. CBCL = Child Behavior Checklist (Achenbach, 2000; Achenbach & Rescorla, 2001); FIQ = Family Impact Questionnaire (Donenberg & Baker 1993). Intercept and slope parameters are presented with standard error in parentheses.
*$p < .05$. **$p < .01$. ***$p < .001$.

Both mother and father models had significant negative slope parameters, indicating that behavior problems decreased significantly over time. In both models the developmental delays group had higher initial behavior problems than the typically developing group, but, only in the mother model, the developmental delays group had a significantly different slope (i.e., CBCL scores rated by mothers decreased more each year for the developmental delays group). There was significant individual variability in both the initial behavior problem scores and the trajectory of behavior problems, as shown by the significant variance parameters.

Conditional time-varying predictor growth models (see Table 4) were used to examine additional predictors of child behavior problems across time. For these analyses, family income was included as a covariate in the father-report model. For the mother-report model, initial analyses showed that time-varying parenting stress did not have a significant variance component (i.e., did not randomly vary across individuals) after accounting for variance due to change in time, so stress was entered as a fixed (not randomly varying) variable in this model. However, parenting stress did have a significant variance component for the father-report model, so the variance component was included in this model. Both mother- and father-reported stress significantly covaried over time with child behavior problems after controlling for the change over time in behavior problems.

In summary, results supported covariation between parenting stress and behavior problems across time, in addition to the decrease in behavior problems across time. Figure 1 depicts the CBCL and FIQ scores from ages 3 to 9 years old. To have both measures on a similar scale, the CBCL average item scores, which were quite small, were multiplied 100; therefore, they do not represent true raw scores. There was not a significant difference between the developmental delays and typically developing groups in the covariation over time of behavior problems and stress.

Parenting stress. Unconditional growth models for parenting stress are displayed in Table 3. In predicting parenting stress, both mother- and

Table 4
Multilevel Growth Model Results for Mother- and Father-Reported Stress as Time-Varying Covariates of Child Behavior Problems (n=237)

Parent	Model	Coefficient (*SE*)
Mothers	Intercept	0.200 (.014)***
	By status	0.089 (.029)**
	Slope	−0.020 (.003)***
	By status	−0.017 (.005)**
	Time-varying mother stress	0.011 (.001)***
	By status	−0.001 (.001)
Fathers	Intercept	0.182 (.014)***
	By status	0.072 (.030)*
	By family income	−0.015 (.008)†
	Slope	−0.025 (.002)***
	By status	−0.005 (.005)
	By family income	0.004 (.001)**
	Time-varying father stress	0.013 (.001)***
	By status	0.0002 (.001)
	By family income	−0.0003 (.0004)

†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

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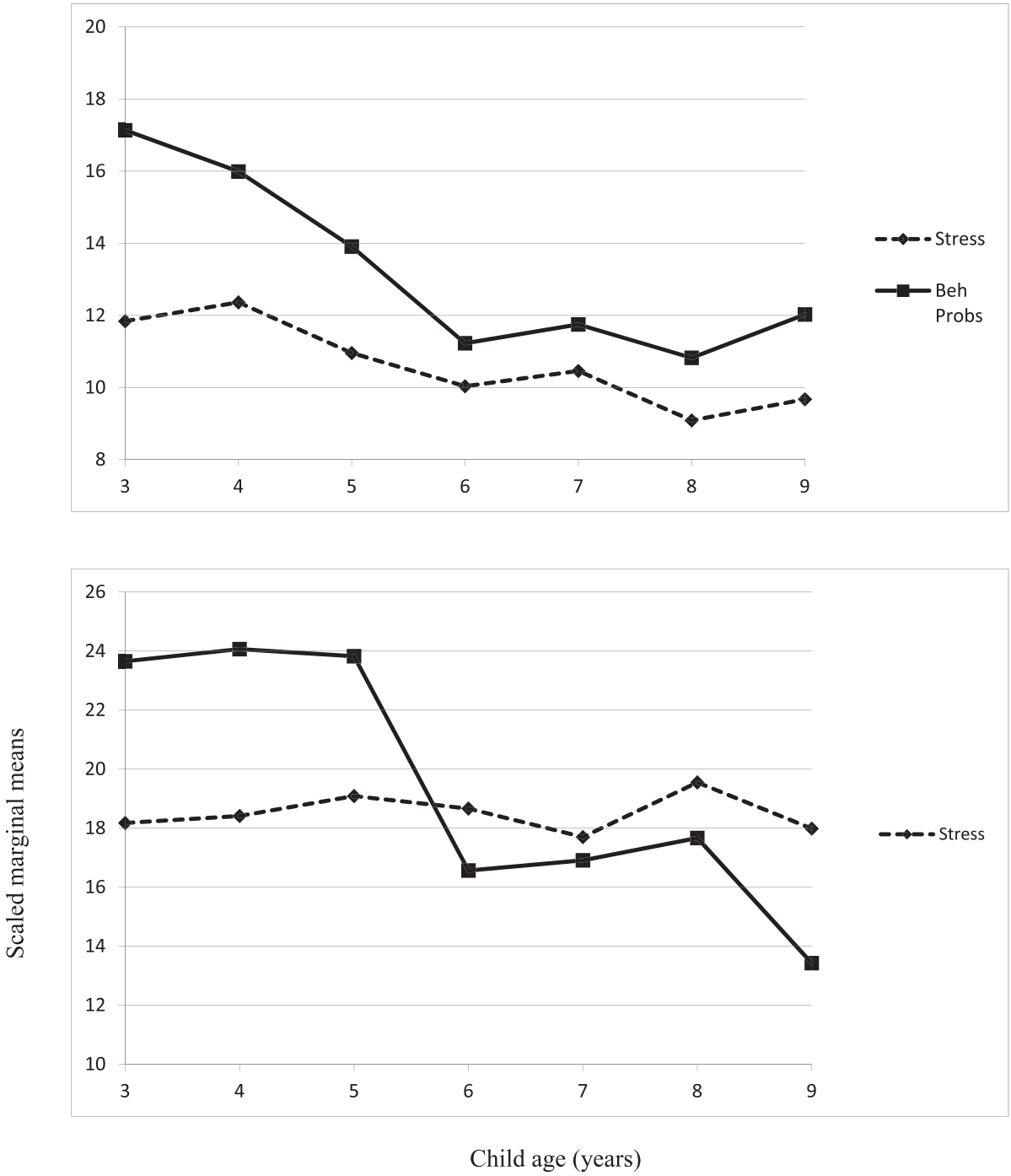

Figure 1. Marginal means of maternal parenting stress and child behavior problems for ages 3–9 years in the typically developing and developmental delays groups. Top panel: typically developing group; bottom panel: developmental delays group. Beh probs = behavioral problems.

father-report models had significant negative slope parameters, indicating a significant decrease in parenting stress over time. The developmental delays group had significantly higher initial levels of parenting stress than the typically developing group did. There were no significant group differences in slope.

Conditional growth models (see Table 5) were then conducted to examine additional predictors of parenting stress across time. Initial

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Table 5
Multilevel Growth Model Results for Child Behavior Problems as Time-Varying Covariates of Mother- and Father-Reported Stress (n =237)

Parent	Model	Coefficient (*SE*)
Mothers		
	Intercept	5.86 (0.52)***
	By status	4.38 (1.28)**
	Slope	0.10 (0.13)
	By status	0.49 (0.23)*
	Time-varying mother CBCL	16.50 (1.69)***
	By status	−0.96 (2.72)
Fathers		
	Intercept	6.19 (0.55)***
	By status	1.62 (1.07)
	Slope	−0.05 (0.11)
	By status	0.44 (0.20)*
	Time-varying father CBCL	13.24 (1.50)***
	By status	4.52 (2.33)†

Note. CBCL = Child Behavior Checklist (Achenbach, 2000; Achenbach & Rescorla, 2001).
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

analyses showed that time-varying behavior problems had a significant variance component for the mother but not the father model after accounting for variance due to change in time, so behavior problems was entered as a fixed (not randomly varying) variable for the father model. Child behavior problems significantly covaried over time with both mother- and father-reported stress after controlling for the change over time in parenting stress. In the father model only, this relationship was stronger for the developmental delays group at the trend level.

After the additional predictor of time-varying child behavior problems was entered into the models, the slope of parenting stress was no longer significant, and, in fact, the slope of the developmental delays group significantly differed from that of the typically developing group. Follow-up analyses indicated that the developmental delays group slope was significant and positive, suggesting that, for this group, parenting stress not accounted for by behavior problems was found to increase over time. In other words, parenting stress decreased over time for both groups in the unconditional model, but after behavior problems were entered into the model, the residual of the parenting stress slope increased for the developmental delays group. However, for the typically developing group, time did not predict changes in parenting stress in addition to child behavior problems. As in the previous model, results supported covariation between behavior problems and parenting stress across time, in addition to the effect of time on parenting stress.

Cross-lagged panel analyses. Cross-lagged panel analyses were used to examine the bidirectional effects of parenting stress and child behavior problems over time. Mplus was used to test two 7-wave cross-lagged models, one for mother reports and one for father reports. Child intellectual status was included as a covariate in predicting both the stress and behavior problems at Time 1. The dependent variables, parenting stress and children's behavior problems, were measured at child ages 4–9 years. Predictor variables included parenting stress and child behavior problems from the preceding time point (e.g., when dependent variables were stress and behavior problems at age 4, predictor variables were stress and behavior problems at age 3). None of the tested covariates predicted either dependent variable at $p < .10$, and, thus, no covariates were included in the final cross-lagged models.

Figure 2 shows the cross-lagged panel analysis for the model using mother-report data. There was high stability for maternal parenting stress across all seven time points (ages 3–4: $\beta = .78$, $p < .001$; ages 4–5: $\beta = .83$, $p < .001$; ages 5–6: $\beta = .62$, $p < .001$; ages 6–7: $\beta = .76$, $p < .001$; ages 7–8: $\beta = .78$, $p < .001$; and ages 8–9: $\beta = .74$, $p < .001$). Child behavior problems were also highly stable across time, with the exception of ages 8–9, where the stability effect was nonsignificant (ages 3–4: $\beta = .62$, $p < .001$; ages 4–5: $\beta = .57$, $p < .001$; ages 5–6: $\beta = .70$, $p < .001$; ages 6–7: $\beta = .63$, $p < .001$; ages 7–8: $\beta = .71$, $p < .001$; and ages 8–9: $\beta = .02$, $p = ns$).

Table 6 reports the cross-lagged effects from early child behavior to later parenting stress (in boldface). Three out of the six cross-lagged effects were significant. Regarding the effect from early parenting stress to later behavior problems, four of the six cross-lagged effects were significant. These results are reported in Table 7 (in boldface).

Results using father-report data are shown in Figure 3. All stability effects were significant for father's parenting stress (ages 3–4: $\beta = .71$, $p < .001$; ages 4–5: $\beta = .68$, $p < .001$; ages 5–6: $\beta = .79$,

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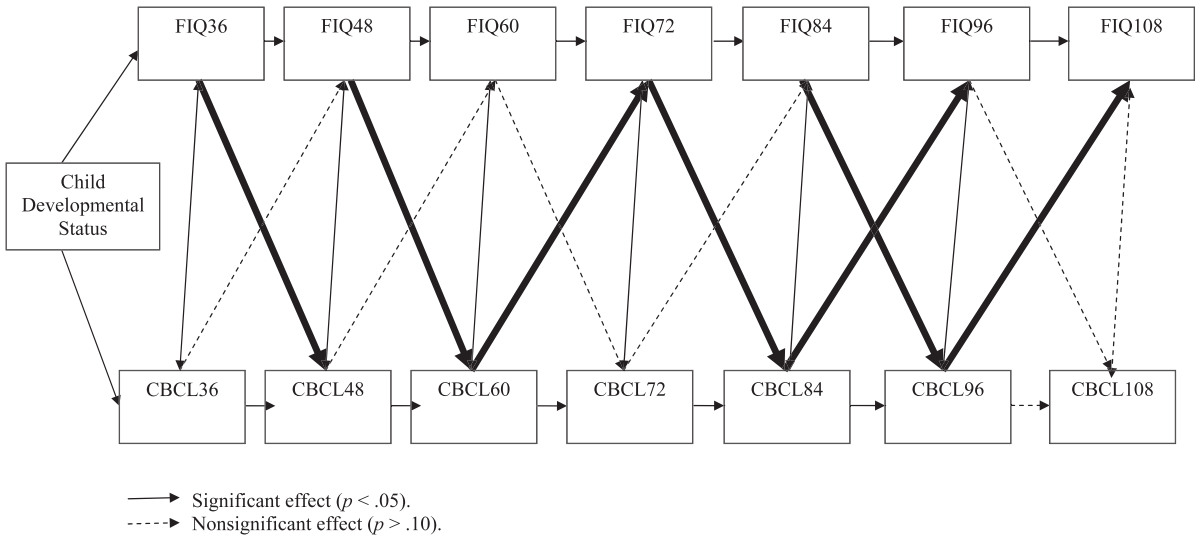

Figure 2. Cross-lagged panel analysis model predicting child behavior problems and mother stress from child ages 3–9 years. FIQ = Family Impact Questionnaire (Donenberg & Baker 1993); CBCL = Child Behavior Checklist (Achenbach, 2000; Achenbach & Rescorla, 2001).

$p < .001$; ages 6–7: $\beta = .79$, $p < .001$; ages 7–8: $\beta = .67$, $p < .001$; and ages 8–9: $\beta = .80$, $p < .001$) and child behavior problems (ages 3–4: $\beta = .60$, $p < .001$; ages 4–5: $\beta = .58$, $p < .001$; ages 5–6: $\beta = .53$, $p < .001$; ages 6–7: $\beta = .60$, $p < .001$; ages 7–8: $\beta = .62$, $p < .001$; and ages 8–9: $\beta = .71$, $p < .001$). As shown in Table 6, four out of the six cross-lagged effects from early child behavior problems

Table 6
Cross-Effects From Child Behavior Problems to Later Parental Stress

Cross-effect ages (years)	β for mother report of parental stress	β for father report of parental stress
Behavior problems (mother report)		
3–4	**.06**	.10†
4–5	**.00**	.12*
5–6	**.24*****	.10†
6–7	**.06**	.00
7–8	**.14****	.14*
8–9	**.15***	.02
Behavior problems (father report)		
3–4	.02	**.12***
4–5	.13*	**.19****
5–6	.19**	**.09**
6–7	.26***	**.13***
7–8	−.02	**.27*****
8–9	.14*	**.05**

Note. Boldfaced numerals represent cross-lagged effects with the same reporter.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 7
Cross Effects From Parental Stress to Later Child Behavior Problems

Cross-effect ages (years)	β for mother report of behavior problems	β for father report of behavior problems
Parental stress (mother report)		
3–4	**.21*****	.26***
4–5	**.24*****	.08
5–6	**.09**	.14*
6–7	**.22****	.22**
7–8	**.20****	.25***
8–9	**.10**	.07
Parental stress (father report)		
3–4	.09†	**.26*****
4–5	.16**	**.19****
5–6	.13*	**.27****
6–7	.14*	**.26*****
7–8	.10†	**.29*****
8–9	.01	**.17***

Note. Boldfaced numerals represent cross-lagged effects with the same reporter.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

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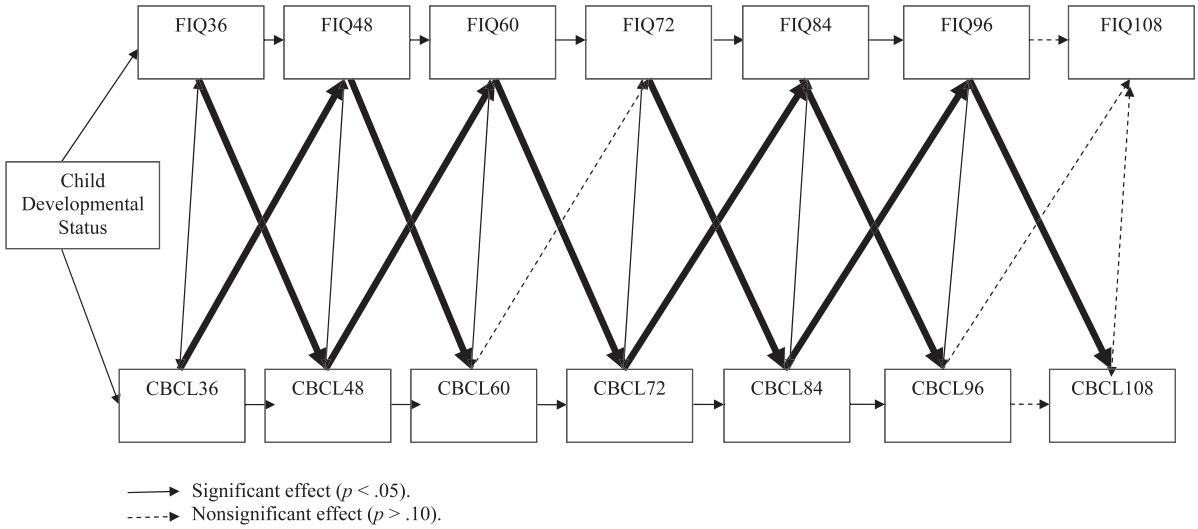

Figure 3. Cross-lagged panel analysis model predicting child behavior problems and father stress from child ages 3–9 years. FIQ = Family Impact Questionnaire (Donenberg & Baker 1993); CBCL = Child Behavior Checklist (Achenbach, 2000; Achenbach & Rescorla, 2001).

to later paternal parenting stress were significant. All six cross-lagged effects were significant from early parenting stress to later behavior problems (see Table 7).

For both mother- and father-report models, Wald tests were conducted to test for differences in the cross-lagged effect parameters at each time point. This statistical technique tested whether the path from early behavior problems to later parenting stress was significantly different from the path from early parenting stress to later behavior problems at each cross-lagged time point. None of the cross-lagged effects were significantly different from each other in the mother- or father-report models.

To address the limitation of shared method variance, two additional cross-lagged panel analyses were conducted using mismatched reporters. These results are also reported in Tables 6 and 7. In the model using mother reports of parenting stress and father reports of child behavior problems, four of the six cross-effects from early behavior problems to later parenting stress were significant, and four of the six cross-effects from early parenting stress to later parenting behavior problems were significant. In the model using father reports of parenting stress and mother reports of child behavior problems, two of the six cross-effects from early behavior problems to later parenting stress were significant and two were marginally significant, and three of the six cross-effects from early parenting stress to later behavior problems were significant and two were marginally significant. In summary, results provided some support for a bidirectional relationship between parenting stress and child behavior problems across time for both mothers and fathers.

Discussion

In keeping with the transactional model of development, we focused on the reciprocal relationship between child behavior problems and parenting stress across time. Overall, our findings provided converging evidence of a transactional relationship between these two variables across early and middle childhood. Results suggested that parenting stress is both an antecedent and consequence of child behavior problems. Simultaneously, child behavior problems are an antecedent and consequence of parenting stress. These variables appear to have a mutually escalating, or deescalating, effect on each other over time. We compared children without and with developmental delays to examine whether the relationship between behavior problems and parenting stress over time differed between families of children with typical development and those at developmental risk, and we found that the transactional relationship observed appears to be similar for children with and without developmental delays.

The study approach contributes to the field of developmental psychopathology by testing the

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transactional model using substantial longitudinal data, using a large sample of children at two levels of developmental risk, and examining processes within fathers as well as mothers. Our first set of analyses examined the trajectories of child behavior problems and parenting stress from ages 3–9 as well as the relationship between the trajectories (i.e., the covariance) using time-varying predictor analyses conducted with HLM. Behavior problems decreased across childhood for both groups (typically developing and developmental delays), consistent with other research showing a decrease in the level of problem behaviors across time (de Ruiter et al., 2007; McCarthy & Boyd, 2001; Wallander, Dekker, & Koot, 2003). This may be accounted for by individual developmental variables as well as environmental variables. As children develop, they acquire cognitive- and emotion-regulation skills that enable them to inhibit inappropriate behaviors, leading to a decrease in behavior problems (Baker et al., 2002, 2003; Eisenberg et al., 2001; Hill, Degnan, Calkins, & Keane, 2006; Olson, Sameroff, Lunkenheimer, & Kerr, 2009). In addition, the decline in behavior problems may be attributable to changes in the environment. Based on the graphical representation of the data, the largest decrease in behavior problems was from ages 5 to 6, when children typically entered full days of school, which is consistent with other studies showing a significant decrease in the level of behavior problems from preschool to elementary school entry (Combs-Ronto, Olson, Lunkenheimer, & Sameroff, 2009; Kerr, Lunkenheimer, & Olson, 2007). The new behavioral demands of a more structured school environment may help to reduce child behavior problems. Furthermore, behavior problems decreased more rapidly for the developmental delays group than for the typically developing group; this was likely due to the group with developmental delays starting out higher but might be related to the higher number of services this group is likely to receive.

We also examined changes in parenting stress from ages 3–9 years, controlling for time-varying behavior problems, and found that stress appeared to decrease over time only for parents of typically developing children as a group. Our findings suggest that the effect of time on stress in the typically developing group was fully accounted for by changes in behavior problems. After behavior problems were accounted for, there was a positive slope in parenting stress across time for the developmental delays group. Although it is possible this was a statistical artifact due to the high correlations between time and behavior problems, it is also possible that variability in parenting stress slope not explained by behavior problems was increasing over time among parents of children with developmental delays. One possible explanation for these findings is that parents of children with delays may be more likely to have recurrent and new stressors that maintain and even increase stress levels across time. For example, school entry may be a particularly difficult time for parents of children with developmental delays. This is often when parents make peer comparisons and realize how far behind their child is, resulting in greater parenting stress. A previous study with the current sample found that the number of children in the developmental delays group who were mainstreamed decreased significantly from school entry at age 6 (40.5%) to second grade at age 8 (25.7%), suggesting that, on average, parents became increasingly aware of their child's need for special services during this time (Blacher, Baker, & Eisenhower, 2009). Furthermore, parents of children with delays are faced with many challenges across their child's lifespan, including overcoming the disappointments related to the original diagnosis, securing school placements, and learning to navigate the health and educational systems (Chen & Tang, 1997; Floyd et al., 1996; Glidden, 1989). Often, the sources of stress move beyond the child to include the service delivery system.

We also investigated whether behavior problems and parenting stress changed in similar ways across time. We found that parenting stress and child behavior problems covaried significantly across development. Child developmental status did not moderate the relationship between behavior problems and stress over time, which was congruent with past studies showing that cognitive functioning has an indirect effect on parenting stress that is accounted for by child behavior problems (e.g., Baker et al., 2003). These results provided support for a strong relationship between child behavior problems and parenting stress over time; however, the direction of effect between these two was unclear.

We also investigated the direction of the relationship between child behavior problems and parenting stress across early and middle childhood (ages 3–9), using cross-lagged panel

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analyses. Multiple studies examining the relationship between child behavior problems and parenting stress among children with and without developmental delays have claimed that the effect between these two variables is bidirectional. However, to our knowledge, no study has tested these two directions of effect simultaneously, which is critical in determining whether this relationship is truly transactional. The present, more conservative analyses provided support for a bidirectional relationship. We observed significant cross-lagged effects, from initial parenting stress to later child behavior problems and from initial child behavior problems to later parenting stress. These findings were particularly interesting, given the high stability of child behavior problems and parenting stress over time, which affords little change to predict.

An earlier and related study by Keogh, Garnier, Bernheimer, and Gallimore (2000) also used a cross-lagged model that generally supported a child-driven model, specifically with regard to children's cognitive ability and personal–social competence (i.e., daily living skills) predicting parental accommodations to the demands of daily life with a child who has delays. However, when examining behavior problems and intensity, Keogh et al. found support for a bidirectional relationship. They proposed that children with more severe behavior problems require more accommodations; however, in light of the current study, it may also be that such accommodations lead to increased parental stress, which, in turn, may exacerbate the child's behavior problems over time. Furthermore, in a previous study (Neece & Baker, 2008), we used a cross-lagged model and found that parental stress was associated with child social skills difficulties 2 years later; however, the opposite direction of effect (early child social skills predicting later parental stress) was not significant. Together, these findings highlight the importance of empirically testing directions of effect when investigating parent–child relationships.

An inherent difficulty in studies of parenting stress is that stress is a subjective construct, leading investigators to use self-report assessments that are subject to response bias. In contrast, many child behavior problems can be determined using observational measures, which may be more objective than parent reports. Given that parenting stress and child behavior problems both were assessed with parent-report questionnaires in the present study, shared method variance is a concern. One strength of the study design, however, is that measures of parenting stress and child behavior problems were administered days or weeks apart (see the Method section), which may have decreased respondent bias. In addition, the convergent findings supporting a reciprocal relationship using mother and father reports increase our confidence in these results. Furthermore, we continued to find some evidence of a transactional relationship even when the models were run using different reporters for parenting stress and child behavior problems.

Although this investigation provides a more complete analysis of the relationship between child behavior problems and parenting stress across childhood than previous studies, additional research may lead to a fuller understanding of the transactional relationship between these variables over time. Mediators of the relationship between parenting stress and child behavior problems could be examined to elucidate the pathways through which stress leads to changes in child behavior problems and vice versa. Parenting behavior may be one mediator of stress as a predictor of child behavior problems. Some research conducted with typically developing children has suggested that stress in the family context may lead to less competent and less responsive parenting (Belsky, Woodworth, & Crnic, 1996; Crnic & Low, 2002; Patterson, 1983), which has been associated with subsequent changes in child behavior and, in extreme cases, the development of psychopathology (Cummings et al., 2000; Koblinsky, Kuvalanka, & Randolph, 2006; Osborne, McHugh, Saunders, & Reed, 2008). In addition, these highly stressed parents may not model good self-regulation for their children, which may lead to more behavior problems. With regard to the opposite direction of effect (child behavior to parenting stress), child behavior problems may create more stress in the broader ecological environment (e.g., school, neighborhood), leading to augmented parental stress (Bronfenbrenner, 1979).

Last, moderators of the relationship between behavior problems and parenting stress could be explored. The trajectories reported in this article represent mean changes in behavior problems and stress across development; however, it is likely that there are families for which these patterns diverge, and future research should identify moderators of changes in these variables over time. Studies should ascertain the primary risk

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and protective factors that change the strength of this relationship over time.

These findings have clear implications for intervention programs. The bidirectional relationship between children's behavior problems and parenting stress highlights both variables as targets for intervention. Fortunately, there is considerable evidence that behavior problems in youth with intellectual disability can be significantly reduced through effective interventions (Baker, 1996; Heyvaert, Maes, & Onghena, 2010; Horner et al., 2002; McIntyre, 2008). Parent-training interventions targeting child behavior problems have been found to reduce parental stress posttreatment, although these studies have been almost exclusively with cognitively typical children (Eyberg et al., 2001; Feinfield & Baker, 2004). The long-term effects of the intervention on parenting stress may not be as strong as the long-term effects on child behavior problems (Eyberg et al., 2001).

Our findings also suggest that stress management interventions may be effective in reducing parenting stress and, consequently, lead to reductions in behavior problems. Methods commonly used include progressive muscle relaxation, biofeedback, meditation, and cognitive restructuring (Lehrer, Carr, Sargunaraj, & Woolfolk, 1994). Stress management techniques have been associated with decreases in symptoms of anxiety and depression (Barlow, Rapee, Brown, 1992; Cruess et al., 2002) and better physical health outcomes (Garcia-Vera, Sanz, & Labrador, 1998; Holroyd et al., 2001). Although the effect of these interventions on parenting practices or child behavior problems is unknown, results of this study suggest that reducing parenting stress has the potential to reduce behavior problems.

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