

# Behavior Problem Trajectories and First-Grade Cognitive Ability and Achievement Skills: A Latent Growth Curve Analysis

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Using data from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development, the authors investigated whether there was evidence of intraindividual stability in behavior problems over time as well as whether children with higher levels of behavior problems at 24 months and more rapid increases in behavior problems prior to school entry performed more poorly on 1st-grade tests of cognitive ability and achievement than their peers. Three findings were noteworthy. First, there was evidence of both intraindividual and interindividual variability in behavior problems between 24 months and 1st grade. Second, children with higher initial levels of internalizing and externalizing behaviors at 24 months had lower cognitive ability and achievement scores in 1st grade. Finally, children with more rapid increases in internalizing behaviors over time had lower cognitive ability scores in 1st grade; this association did not exist for externalizing behaviors. Implications for future research are discussed.

*Keywords:* behavior problems, school performance, longitudinal analyses

New evidence from a report released by the Kauffman Early Education Exchange (2002) suggests that as many as half of the children entering kindergarten classrooms are not ready to learn, in part because they do not have well-developed cognitive and/or social skills. Children with behavior problems, marked by aggression, disruptiveness, anxiety, and social withdrawal, face particular adversity. In fact, children with higher levels of behavior problems tend to do less well in school (Arnold, 1997; McClelland, Morrison, & Holmes, 2000), have lower verbal and reading skills (Bowman, Donovan, & Burns, 2001; Snow, Burns, & Griffin, 1998), and receive more negative feedback from their teachers (Arnold et al., 1999) than their more behaviorally competent peers. The majority of research on behavior problems has focused on children in elementary school or beyond; there is only a small body of literature on the development of behavior problems prior to elementary school. It is important to note that little is known about the links between early changes in behavior problems and subsequent elementary school outcomes, or whether the effects differ across a variety of outcomes.

In the present study we addressed these gaps by investigating whether there is within- and between-individual stability in behav-

ior problems over time and whether growth trajectories in behavior problems from 2 years of age through first grade are related to early school performance. Of particular interest was whether children with higher initial levels of behavior problems at 24 months and more rapid increases in behavior problems prior to school entry perform more poorly on tests of cognitive ability and achievement skills in first grade than their peers with average or below average behavior problems at 24 months and minimal or decreasing behavior problems over time. We also tested whether the pattern of findings differed across our two outcomes: children's cognitive ability and achievement skills.

## Behavior Problems in Early Childhood: Prevalence and Stability

Research on children's behavior problems has commonly focused on two specific classes of behaviors: those characterized by overcontrol, referred to as *internalizing* behaviors, and those characterized by undercontrol, referred to as *externalizing* behaviors (Hinshaw, 1992). Internalizing behaviors are typified by self-focused expressions of distress and are marked by social withdrawal, anxiety, and fearfulness (Achenbach & Edelbrock, 1978; Campbell, 2002). In contrast, externalizing behaviors are expressed against others and are marked by aggression, impulsivity, disruptiveness, and defiance (Achenbach & Edelbrock, 1978). Although the vast majority of behaviors exhibited by young children are thought to represent normal developmental stages or transgressions, and most children are expected to outgrow them (Campbell, 2002; Mathiesen & Sanson, 2000), some patterns of behavior are cause for concern. In general, within-individual behaviors are considered serious if they are somewhat stable over time and if they disrupt the child's ability to negotiate developmental events (Campbell, 1995, 2002).

It is difficult to determine with absolute certainty the prevalence of behavior problems among young children, in part because

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estimates depend on who is rating the behaviors and on the population being examined. Estimates across studies suggest that approximately 10% of preschoolers exhibit noticeable behavior problems, with between 4% and 6% of these children exhibiting serious behavior problems (Briggs-Gowan, Carter, Skuban, & Horwitz, 2001; Raver & Knitze, 2002). Boys appear to be at greater risk than girls. That is, psychopathology and chronic behavior problems, especially externalizing behaviors, are more prevalent among boys than girls during early and middle childhood (Bates, Bayles, Bennett, Ridge, & Brown, 1991; Keenan & Shaw, 1994).

Evidence for the persistence of behavior problems within children over time is mixed. For example, several large-scale studies have indicated that both the frequency and severity of specific behaviors, including worries, fears, overactivity, and aggression, decrease over the preschool years (Crowther, Bond, & Rolf, 1981). In general, behavior problems that develop in children with few other developmental and familial risks (including health problems and family stress) are typically unstable individual traits (Lavigne et al., 1996). In fact, only a small proportion of children who exhibit behavior problems during early childhood have serious adjustment problems later in life (Campbell, 2002).

In contrast, a larger body of work has demonstrated that within-individual episodes of behavior problems are moderately stable over time, especially in the more extreme ranges, and tend to last for a year or longer (e.g., Campbell, March, Pierce, Ewing, & Szumowski, 1991; Fox, Henderson, Rubin, Calkins, & Schmidt, 2001). Evidence also suggests that intraindividual differences in internalizing behaviors are generally less stable than externalizing behaviors (Campbell, 1995). Behavior problems identified as early as preschool often persist into elementary school and beyond. For example, among children who exhibited more externalizing behaviors during preschool, 33% were rated by first-grade teachers and 47% were rated by second-grade teachers as having problems above the clinical cutoff (i.e.,  $> 67$ ) on the Child Behavior Checklist (CBCL; Egeland, Kalkoske, Gottesman, & Erickson, 1990). Adolescents with serious behavior problems are typically first identified with problems during the preschool years (Campbell & Ewing, 1990; Moffitt, 1990), suggesting that these traits are relatively stable over time, at least within individuals.

### Behavior Problems and Cognitive and Achievement Outcomes

Early school success is critical for later academic achievement. Low levels of cognitive ability at school entry are associated with lower achievement throughout school, greater retention and special education referral, and eventually increased dropout rates (Carnegie Council on Adolescent Development, 1995). Behavioral competence has been identified as one of the key components of early school success. In fact, the National Education Goals Panel (1997) highlighted social and emotional development, including behavioral competence, as fundamental for building a relational foundation that enables children to successfully function in a group setting. Similarly, the National Research Council and Institute of Medicine (2000) suggested that children must be able to cooperate with adults and peers in order to succeed in school. Children who are not behaviorally competent on entry into kindergarten and first grade are at greater risk not only for later behavior problems, but

also for academic failure, relative to their peers (Peth-Pierce, 2001; Raver, 2002; Raver & Knitze, 2002).

Elevated levels of behavior problems interfere with a child's normative development and consequently with the acquisition of age-appropriate behavioral and academic skills (Campbell, 2002). Children learn most effectively through interactions with others, including teachers and peers (Landry, Smith, Swank, & Loncar, 2000). Moreover, children gain skills and competencies far more quickly when they are exposed to a rich set of experiences as well as to structured (and supported) tasks involving complex thinking (Bowman, Donovan, & Burns, 2001). Yet children with behavior problems are provided with far fewer of these supports and experiences than are their more competent peers. For example, research suggests that teachers often underestimate the intelligence of socially withdrawn children and fail to recognize cognitive competencies of aggressive or disruptive children (Espinosa & Laffey, 2003; Rimm-Kaufman et al., 2002). Teachers also tend to provide aggressive and disruptive children with less instruction and less positive feedback (Arnold, 1997). One study found that, when spending time with children who have behavior problems, teachers spent more than 20% of the time engaged in negative interactions (e.g., discipline) and only 5% of the time engaged in positive interactions (e.g., praise; Jack et al., 1996).

Children with behavior problems are also considerably more difficult to teach than their peers because they are not interested in learning, have trouble following directions, and often lack the self-control to cooperate (Arnold et al., 1999; Rimm-Kaufman, Pianta, & Cox, 2000). These children also tend to participate less in classroom activities and act out more frequently during difficult tasks (Carr, Taylor, & Robinson, 1991). As such, children with behavior problems may have fewer opportunities to strengthen a broad range of cognitive abilities (e.g., processing speed, comprehension knowledge) and achievement skills (e.g., reading, mathematics, or general knowledge skills). Classrooms with a large proportion of children who exhibit these behaviors place a greater burden on the teacher to provide children with the skills they need for their next year of school.

### Internalizing Behavior and School Performance

Internalizing behaviors, marked by social withdrawal and anxiety, have been shown to affect adversely children's early school performance. In fact, there is some evidence suggesting that early internalizing behaviors are as predictive of later achievement as early assessments of intelligence (Horn & Packard, 1985). Egeland and colleagues (1990) found that children who exhibited higher levels of internalizing behaviors as early as preschool had lower achievement scores in first grade than did their more competent peers. Socially withdrawn children tend to take fewer risks in the classroom. In fact, these children rarely voluntarily respond to a difficult question (Martin, 1994). Socially withdrawn children also speak less frequently in large groups than their more outgoing peers.

There is a small body of literature suggesting that socially withdrawn children experience relatively high levels of peer rejection and social isolation and subsequently lower academic success (e.g., Rubin & Mills, 1988). One of the most common consequences of peer rejection is that children have fewer opportunities to learn from their peers in collaborative projects or

settings (Ladd, Birch, & Buhs, 1999). Yet these peer scaffolding experiences consistently enhance children's learning opportunities by providing support to the low achievers. Early learning environments are frequently designed to promote group work, for example via the arrangement of desks into clusters or through the use of small reading groups. As such, children with internalizing behaviors, who are typically less comfortable in peer groups, may not fully engage in activities designed to promote and enhance skills in areas such as reading, mathematics, and writing, thereby compromising their educational progress.

### Externalizing Behavior and Academic Outcomes

Externalizing behaviors in general, and aggression and disruptiveness in particular, have also been shown to adversely affect school success (e.g., Arnold et al., 1999). Prior to school entry, the occurrence of externalizing behaviors is strongly and negatively associated with children's preliteracy skills as well as their engagement in classroom activities (Arnold et al., 1999). This negative association continues into elementary school, with children who exhibit elevated levels of externalizing problems during preschool demonstrating lower verbal and reading skills in elementary school. Inattentiveness and hyperactivity, which are typical externalizing behaviors, are the most common correlates of academic failure among children in kindergarten and the early elementary school years (Hinshaw, 1992). On average, children with higher levels of externalizing behavior problems are more disengaged and noncompliant, which in turn negatively affects their academic trajectories (Arnold et al., 1999). Children who demonstrate marked levels of externalizing behaviors in elementary school fall further and further behind their peers academically and are at greater risk for grade retention and special education referral (Jimerson, Carlson, Rotert, Egeland, & Sroufe, 1997; Jimerson, Egeland, & Teo, 1999).

Children's relations with their peers typically provide an important support for their academic success and help promote more positive attitudes toward school. In fact, by middle to late elementary school, the effect of peers on students' achievement is often more powerful than the effect of families (Steinberg, 1996). In addition, aggressive children are more frequently rejected by their peers. Children who experience instability in their peer relationships, or who are rejected by their peers, tend to develop a negative attitude toward school and subsequently are at greater risk for lower academic success, retention, and eventually for delinquency and dropping out (Hymel, Rubin, Rowden, & Le Mare, 1990; Vitaro, Larocque, Janosz, & Tremblay, 2001). Like that of children with internalizing behaviors, the educational progress of children with externalizing behaviors may be compromised due to activities or classroom organization and the decreased opportunity for positive adult and peer interactions. Moreover, because the intelligence and cognitive competencies of children with externalizing behaviors are often underestimated, these children may be at an even greater disadvantage than are children with internalizing behaviors.

### Methodological Limitations of Previous Research on Behavior Problems

Methodological limitations, including difficulties with both the assessment of behavior problems and the analysis of change in

behavior problems over time, have typically led to inconsistent findings concerning the development of behavior problems. These problems often result in biased estimates of the association between behavior problems and other outcomes, leading to inaccurate conclusions and potentially inappropriate treatment. Another important methodological limitation is that the majority of prior research on the persistence of behavior problems over time has investigated the stability of interindividual differences among children over time rather than the stability of behavior within individuals over time (Spieker, Larson, Lewis, Keller, & Gilchrist, 1999). Because the years between toddlerhood and early elementary school span a period during which numerous individual developmental changes occur (e.g., from dependency to social and cognitive competence), understanding both normative within-individual development and interindividual differences in children's development of behavior problems is essential (Campbell, 1995).

### Assessment

Assessing behavior problems precisely is difficult because observers (i.e., mothers, caregivers or teachers, clinicians) typically interpret the same behaviors differently (Campbell, 2002). For example, agreement was quite low between mothers' and caregivers' ratings of behavior problems at 24 months and 36 months in the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD; NICHD Early Child Care Research Network [ECCRN], 1998). Behaviors are also highly contextual with respect to both setting and age. That is, what it means to be competent in one context or setting (e.g., home) may not match what it means to be competent in another (e.g., child care or preschool setting), even when behaviors are rated by the same individual in the two settings. Similarly, competence and appropriate behavior at one age may differ greatly from competence and appropriate behavior at another. As such, the precision with which behavior problems have been measured has often been poor, and this unreliability has typically led to bias in estimates of the relation between behavior problems and subsequent outcomes (e.g., school performance).

### Analysis of Change

The analysis of change in behavior problems over time is also challenging, in part because researchers often do not adequately capitalize on the longitudinal nature of their data (Raudenbush & Bryk, 2002; Singer & Willett, 2003). Researchers have only recently begun to explore the effects of change in behavior problems over time in an attempt to understand the developmental consequences of specific patterns of change, particularly as they relate to subsequent school performance (e.g., Campbell, 2002; Spieker et al., 1999). Although most of these studies have examined children in elementary school or later, a small number of studies have explored the relationship between change in behavior problems identified during the preschool years and the transition to formal schooling, including social adjustment and academic outcomes (Hamre & Pianta, 2001; Pianta, La Paro, Payne, Cox, & Bradley, 2002). These latter studies have typically estimated an initial status (intercept) and a rate of change (slope) in behavior problems for each child and then employed these estimates as predictors of school performance in a subsequent ordinary least squares regres-

sion analysis. However, estimates of individual intercept and slope are themselves fallible measures of true intercept and slope and, therefore, if used as predictors of later behavior, will produce biased and inefficient estimates of the hypothesized relationships under investigation (Willett & Keiley, 2000).

### The Current Study

In the present study, we addressed these methodological limitations by investigating intraindividual and interindividual variability in behavior problems as well as whether trajectories of change in behavior problems from toddlerhood through first grade are related to early school performance, including children's cognitive ability and achievement skills. Specifically, we were interested in whether children with higher initial levels of behavior problems at 24 months and more positive rates of change in behavior problems between 24 months and first grade had lower first-grade cognitive ability and/or achievement scores than children with lower positive rates of change or negative rates of change. We predicted that children with higher initial levels of behavior problems at 24 months would have lower cognitive ability and achievement scores in first grade. In addition, we predicted that children whose rate of change in behavior problems between 24 months and first grade was both positive and large would have lower cognitive ability and achievement scores in first grade than children whose rate of change during this period was positive and small, or children whose rate of change was negative. Finally, we predicted that the effects of development in internalizing and externalizing behaviors on our two outcomes would differ by outcome, with change in internalizing behaviors having a greater negative effect on achievement skills and change in externalizing behaviors having a greater negative effect on cognitive ability.

Support for these hypotheses would be consistent with the small body of existing literature in this area (e.g., Pianta et al., 2002). However, our study makes additional contributions to the literature. First, we treated children's cognitive ability and achievement skills as separate indices of school performance, rather than compositing the outcomes into a single measure of academic success. Second, we examined the impact on subsequent school performance of change in both internalizing and externalizing behaviors over time. Because internalizing behaviors are more difficult to measure than externalizing behaviors, the majority of existing studies on behavior problems among preschoolers have focused only on externalizing behaviors, leaving scant empirical research on internalizing behaviors in preschoolers. Third, we used an innovative statistical method called *latent growth curve analysis* to address our research questions. In particular, our application of latent growth curve analysis capitalized on the richness of our longitudinal data to model children's individual change in behavior problems over time and simultaneously treated these change trajectories as predictors of children's subsequent cognitive ability and achievement skills, as measured in first grade. It is important to note that our analysis incorporated a "measurement model" that teased out the measurement error from the observation of behavior problems over time. This disattenuated our findings of the influence of measurement error. As a result, we modeled how true initial status and true rate of change in behavior problems impact

later academic outcomes in first grade (Duncan, Duncan, Strycker, Li, & Alpert, 1999).

### Method

#### Data Set

We used data from Phases I and II of the NICHD SECCYD in the present investigation. The NICHD SECCYD is the most comprehensive longitudinal study of children's child care experiences to date and was designed with the goal of overcoming the many limitations of past research in this area (e.g., short-term studies, multiwave cohort studies, undercontrolled studies). Using multiple approaches, the investigators have collected extensive data on the family environment, characteristics of the child, and children's child care and school experiences. These data have been used to address questions about how children's experiences are related to their social, emotional and cognitive development throughout childhood. For additional information on the purposes and design of the study, please visit the SECCYD Web site at <http://secc.rti.org/public>.

#### Sample

Families were recruited to participate through hospital visits to mothers shortly after the birth of a child in 1991. Hospitals were located in or near Little Rock, Arkansas; Irvine, California; Lawrence, Kansas; Boston, Massachusetts; Philadelphia, Pennsylvania; Pittsburgh, Pennsylvania; Charlottesville, Virginia; Morganton, North Carolina; Seattle, Washington; and Madison, Wisconsin. Of the 8,986 women who gave birth during the sampling period, 5,151 met eligibility requirements (i.e., mother healthy, older than 18 years of age, and conversant in English; infant a singleton and healthy; family not planning to move within the next year and living in a neighborhood considered safe for visits) and agreed to be contacted in 2 weeks. Using a conditional random sampling method, investigators called 2,352 families, of which 1,364 participated in the 1-month home visit (NICHD ECCRN, 2001). The conditional random sampling plan employed by the NICHD SECCYD was such that for the first 3 to 4 months of the 11-month enrollment period, the list of eligible families was arranged in random order and all families were contacted; for the remainder of the enrollment period, specific family characteristics, including ethnicity, income, and plans to return to work, were examined and the list of families at each site was arranged to increase representation of various subgroups.

Note that the families in this study do not comprise a nationally representative sample. However, participating families were similar to other families in the catchment areas on demographic variables with two exceptions: mothers in the sample were slightly more educated and the families had slightly higher income levels. Mothers had an average of 14.4 years of education, and the average family income-to-needs ratio was 3.6 times the poverty threshold, somewhat higher than middle class (indexed by an income-to-needs ratio of 3.0). However, the resulting sample was diverse, including 24% ethnic minority children (13% African American; 6% Hispanic; and 5% Asian, Native American, or other ethnicity), 11% mothers not completing high school, and 14% single mothers.

### Attrition and Missing Data

Of the 1,364 children and their families originally enrolled in the study, 1,023 were still enrolled at first grade and 882 had complete data on the variables of interest. Contingency table analyses and mean equivalence tests were performed to investigate differences between participants ( $n = 882$ ) and nonparticipants ( $n = 482$ ) on key demographic characteristics, including level of maternal education, average family income-to-needs ratio, partner status across the study, child ethnicity, and child gender. Participating families differed from the 482 families who had been recruited but lost to follow-up or who had missing data. Mothers of participants had more education ( $M = 14.62$  vs.  $13.52$  years),  $t(1361) = 7.83$ ,  $p < .001$ , and were more likely to be partnered at all major assessments ( $72.5\%$  vs.  $15.7\%$ ),  $\chi^2(1, N = 1,363) = 394.76$ ,  $p < .001$ . Participating families also had higher average family income-to-needs ratios than nonparticipating families ( $M = 3.65$  vs.  $2.72$ ),  $t(1353) = -6.02$ ,  $p < .001$ . In addition, a smaller proportion of participating children than nonparticipating children were African American ( $9.4\%$  vs.  $19.2\%$ ),  $\chi^2(1, N = 1,364) = 27.60$ ,  $p < .001$ , and were less likely to be male ( $49.7\%$  vs.  $55.4\%$ ).

### Procedures

Demographic information on the child, including child gender and race/ethnicity, was collected via maternal report during home visits when the children were 1 month old. Maternal reports of children's behavior problems were obtained during home visits at 24, 36, and 54 months, and during kindergarten and first grade. For a detailed description of the NICHD SECCYD, see NICHD ECCRN (2001) or visit the study Web site at <http://secc.rti.org/public>.

### Outcome Variables: Cognitive Ability and Achievement Scores

At first grade, children were administered seven subscales of the Woodcock–Johnson Psycho-Educational Battery–Revised (Woodcock & Johnson, 1989). This battery is a comprehensive set of individually administered tests designed to measure a broad range of cognitive abilities and a set of achievement skills. The Tests of Cognitive Ability are typically used to determine children's intellectual level at a given age and measure factors such as long-term retrieval, short-term memory, processing speed, auditory and visual processing, comprehension knowledge, and reasoning (Woodcock & Mather, 1989/1990). The Tests of Achievement are typically used to determine a child's educational progress and measure broad curricular areas such as reading, mathematics, written language, general knowledge, and overall skills (Woodcock & Mather, 1989/1990). The Woodcock–Johnson Psycho-Educational Battery–Revised treats cognitive ability and achievement as separate constructs that measure different developmental processes. As such, we retained these separate constructs in our work in order to examine whether change in behavior problems affected children's subsequent cognitive ability more (or less) than their achievement.

When children were in first grade, they were administered four subscales from the standard battery of the Tests of Cognitive Ability: Memory for Names, Memory for Sentences, Incomplete Words, and Picture Vocabulary. In the examiner's manuals,

Woodcock and Mather (1989/1990) described a set of subscales that should be administered in order to obtain a cluster score representing broad cognitive ability. Using these recommendations, the NICHD ECCRN selected four of the five subscales (they excluded Visual Closure) as indices of the broad abilities that might be exhibited during early development. We averaged scores on these subscales to create a composite measure of cognitive ability at first grade ( $\alpha = .66$ ).

Children were also administered three subscales from the standard battery of the Tests of Achievement: Letter-Word Identification, Word Attack, and Applied Problems. As with the Tests of Cognitive Ability, Woodcock and Mather identified a set of tests they suggested should be administered in order to obtain a cluster score representing broad achievement skills. Again, the NICHD ECCRN selected these three subscales (two from the reading cluster and one from the math cluster) as indices of the broad achievement skills a first grader might exhibit. We averaged scores on the three subscales to create a composite measure of achievement ( $\alpha = .84$ ).

All of the subscales have moderate to high split-half reliability estimates ranging from .70 to .98, and moderate test–retest reliability estimates ranging from .63 to .87 (Woodcock & Johnson, 1989). The Woodcock–Johnson Psycho-Educational Battery–Revised also has excellent concurrent validity; McGrew, Werder, and Woodcock (1991) reported that the measure is highly correlated with similar measures including the Stanford-Binet and the McCarthy Scales of Children's Abilities.

### Primary Question Predictors: Behavior Problems

At 24 and 36 months, the preschool version of the CBCL/2–3 (Achenbach, 1992) was used to assess children's behavior problems; at 54 months, kindergarten, and first grade, the school-age version of the CBCL/4–18 was used (Achenbach, 1991). Mothers were asked to rate how characteristic of their child each behavior had been over the past 2 months ( $0 = \text{not true}$ ,  $1 = \text{sometimes true}$ , and  $2 = \text{very true}$ ). The obtained raw scores were converted to normalized  $T$  scores (based on a procedure provided by Abramowitz & Stegun, 1968) to provide a metric that was similar across ages and to facilitate a comparison of a child's deviation from the norming sample (Achenbach, 1991). Note, however, that we chose to use the raw scores to model change trajectories over time rather than the standardized scores to avoid problems associated with modeling change over time using a standardized measure.

Based on the original norming sample of 1,300 children who were heterogeneous with respect to race and socioeconomic status, two broadband factors were then created (as outlined by Achenbach, 1992). Scores on the Internalizing scale were created by summing mothers' responses to items on the Withdrawn, Somatic, and Anxious/Depressed scales and measured the child's social inhibition and anxiety. Scores on the Externalizing scale were formed by summing mothers' responses to items on the Aggressive and Destructive/Delinquent Behaviors scales and measured the child's antisocial and disruptive behavior. These subscale scores are typically used to distinguish between children who exhibit primarily internalizing behaviors versus externalizing behaviors. Nevertheless, internalizing and externalizing behaviors are not mutually exclusive; that is, a child can score high on both scales. In fact, the average correlation of scores on the Internaliz-

ing and Externalizing scales in the norming sample was .52. However, Achenbach (1991) suggested that internalizing and externalizing behaviors should be considered distinct measures of behavior, just as verbal and performance IQ scores are considered distinct measures of intelligence even though they are also positively correlated.

The CBCL has excellent concurrent and predictive validity and is the most widely used screening instrument for tracking the emergence of behavior problems in children. Specifically, the measure discriminates well between clinically referred and nonreferred toddlers (Achenbach, 1991). Standardized *t* scores between 60 and 63 on the CBCL are considered to indicate borderline clinical behavior, as reported by Achenbach (1992) in the norming sample. The CBCL has also been shown to predict subsequent problem behavior over a 6-year period.

### *Control Variables: Child Characteristics*

Maternal reports of child gender and ethnicity were collected when children were 1 month of age. Child gender was represented by a dichotomous predictor to distinguish boys (coded 1) and girls (coded 0). Child ethnicity was represented by a vector of dichotomous predictors that distinguished among non-Hispanic African American, non-Hispanic European American, and Hispanic American children. In our analyses, we omitted the dichotomous predictor representing Hispanic American children as the reference category.

### *Data Analysis*

We used latent growth curve analysis to model intraindividual change in behavior problems between 24 months and first grade and the relationship between change in behavior problems during this time period and subsequent first-grade cognitive ability and achievement skills simultaneously, across children. Latent growth curve analysis is a very flexible technique for modeling systematic intra- and interindividual differences in change over time (Willett & Bub, 2005), offering several advantages over other methods in this application. First, unlike typical growth modeling approaches, such as hierarchical linear modeling (Raudenbush & Bryk, 2002), latent growth curve models can be specified so that a child's trajectory of change over time in behavior problems becomes a predictor of subsequent outcomes, rather than being treated as an outcome itself. That is, using latent growth curve analysis, we could specify a linear growth trajectory for change over time in behavior problems and the simultaneous relationship between the parameters of that individual trajectory (i.e., a child's intercept and slope) and later cognitive ability and achievement outcomes. Second, by explicitly modeling the role of measurement error in the specification of the individual change trajectory, we were able to estimate the relations between the individual growth parameters—in this case, true initial status and true rate of change—and the child's subsequent academic success. This disattenuated the growth analyses from the errors of measurement involved in the observation of behavior problems, and it avoided the bias and inefficiency in the estimation of the relationship between change and subsequent school performance (Duncan et al., 1999; Willett & Sayer, 1994). This disattenuation process was particularly important here as there is evidence to suggest that assessments of

behavioral problems are subject to considerable measurement error (e.g., Bennett, Lipman, Racine, & Offord, 1998; Campbell, 2002). In addition to these two direct advantages for the latent growth curve analysis methodology in the analysis of longitudinal data, the approach also offers many additional and more general advantages that are documented elsewhere (Willett & Bub, 2005).

In our analyses, we first fitted a pair of unconditional growth models, in which we sought simply to reveal inter- and intraindividual differences in change over time that were present in the data: one for changes in internalizing behaviors and the other for changes in externalizing behaviors. We then specified and fitted four distinct hypothesized latent growth curve models: one for each of our two outcomes (children's first-grade cognitive ability and achievement) and for individual change in both internalizing and externalizing behavior. In Figure 1, we display a path diagram of our general latent growth curve model in which individual change in behavior problems was hypothesized to predict a subsequent first-grade outcome. This same hypothesized model was fitted for change in each predictor and for each of our first-grade outcomes, four models in total.

Notice that, on the left side of the figure, a two-factor measurement model is specified with factor loadings that are fixed and equal to either a constant value of 1 or to the values of the times at which the behavior problems were measured, in months (see Figure 1). These time measurements are "centered" on a child age of 24 months, implying that the first wave of measurement occurred at a centered time of 0 (for a child of age 24 months), the second wave of measurement occurred at a centered time of 12 months (for a child age of 36 months), and so on. This model parameterization forced the two latent factors,  $\eta_2$  and  $\eta_3$ , which underpin the behavioral measurement, to represent the true initial status and true rate of change of the individual growth in behavioral problems, respectively, assuming that it was linear over time.<sup>1</sup>

Immediately to the right of this hypothesized measurement model is a pair of structural paths, by which the individual growth parameters—now, the latent constructs representing true initial status and true rate of change—were hypothesized to predict the first-grade outcome construct (cognitive ability or achievement). Structural parameters  $\beta_{11}$  and  $\beta_{12}$  represent the prediction of the first-grade outcome construct by the hypothesized individual growth parameters, adjusted for the covariates, and directly addressed our research question. All of our hypothesized models also included covariates representing child gender and race/ethnicity.

<sup>1</sup> A preliminary investigation suggested that individual growth in behavior problems might be better described by a quadratic function. However, because the curvature induced by the inclusion of the quadratic individual growth parameter was imperceptible in subsequent fitted plots and because the added parameters led to considerable difficulties in the model-fitting process, we chose to retain the more parsimonious linear specification in subsequent analyses. Even though the omitted curvature did not affect our findings and was undetectable in plots, our results are perhaps more accurately interpreted in terms of the relationships of initial status and average rate of change (over the age range in question) with the subsequent outcomes.

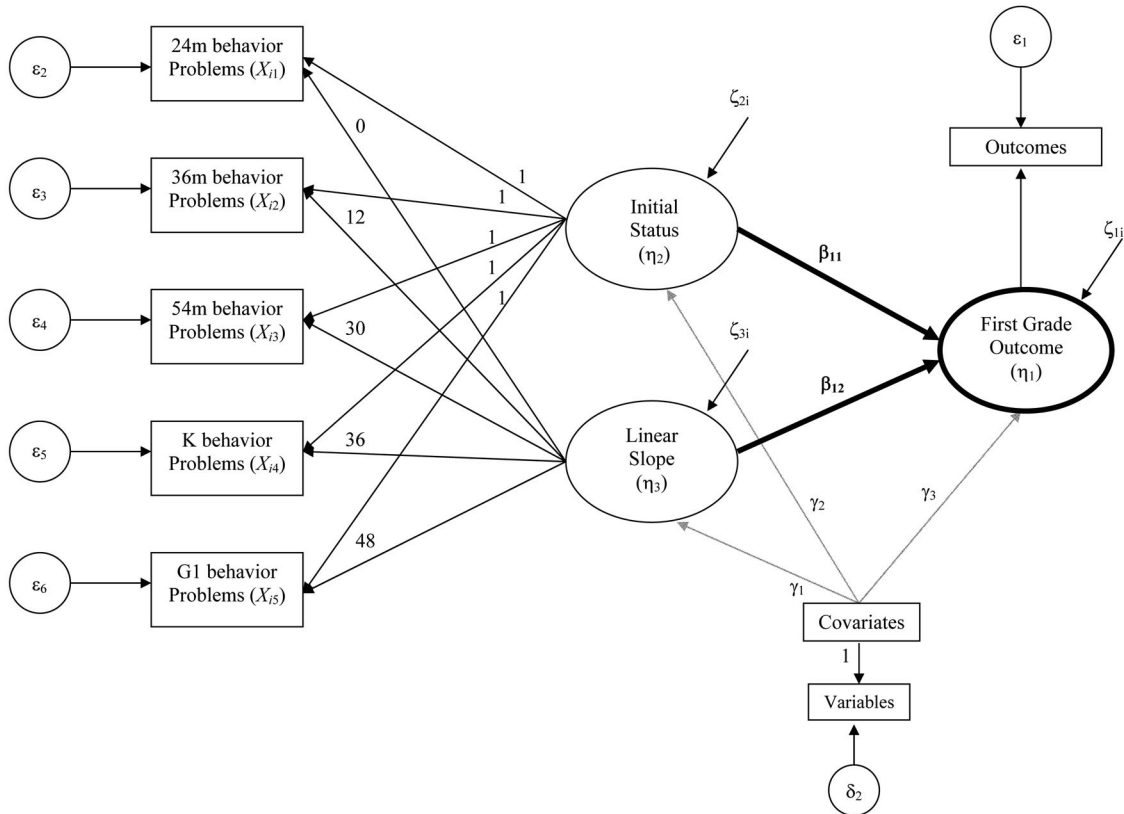


Figure 1. Hypothesized latent growth curve model depicting associations between children’s true initial status and true rate of change in behavior problems from 24 months through first grade and a first-grade outcome, controlling for selected child demographics. 24m = 24 months; 36m = 36 months; 54m = 54 months; K = kindergarten; G1 = first grade.

We fitted all latent growth models using the LISREL computer program, Version 8.52 (Bollen, 1990).

Results

We present sample means and standard deviations for outcomes, predictors, and covariates in Table 1.<sup>2</sup> Cognitive ability and achievement scores for children included in these analyses closely resembled the normed mean reported by Woodcock and Johnson (1989). However, there was substantial variability around the mean, as indexed by a standard deviation of just under 10 for cognitive ability and just under 14 for achievement skills. Raw scores on the internalizing and externalizing subscales for the analytic sample were comparable at all five ages to those for the normed sample (Achenbach, 1991). Nevertheless, 11% of children were rated by mothers as having internalizing behaviors above the borderline clinical cutoff (i.e., standardized *t* scores greater than 60 as reported by Achenbach, 1991) at 24 months, 15% at 36 months, 7% at 54 months, 8% at kindergarten, and 9% at first grade. Similarly, 16% of children were rated by mothers as exhibiting externalizing behaviors above the borderline clinical cutoff (> 60; Achenbach, 1991) at 24 months, 12% at 36 months, 17% at 54 months, 14% at kindergarten, and 12% at first grade.

*Are There Interindividual and Intraindividual Differences in Children’s Internalizing and Externalizing Behaviors Between 24 Months and First Grade?*

We present estimated intercorrelations among children’s internalizing and externalizing scores over time in Table 2. There was some evidence of interindividual stability in both internalizing and externalizing scores, as demonstrated by the moderate positive correlations among assessments between 24 months and first grade. More specifically, children may have retained their rank order of internalizing and externalizing behaviors between 24 months and first grade relative to their peers. It is important to note that interindividual differences among children’s externalizing behaviors appeared to be slightly more stable over time than the interindividual differences in internalizing behaviors (*r*s = .47 to .77 for externalizing behaviors, and .35 to .66 for internalizing behaviors).

Parameter estimates and goodness-of-fit statistics from the fitted unconditional latent growth curve models for internalizing and externalizing behaviors are presented in Table 3. As expected, on

<sup>2</sup> Tables of sample mean vectors and covariance matrices are available upon request from Kristen L. Bub.

Table 1  
*Univariate Descriptive Statistics on Outcome, Predictor, and Control Variables (n = 882)*

Variable	<i>M</i> or %	<i>SD</i>	Range
First-grade child outcomes			
Cognitive ability composite	101.12	9.88	63.50–131.50
Achievement composite	111.35	13.73	66.33–149.67
Internalizing behaviors			
24 months	7.92	4.85	0–32
36 months	8.43	5.13	0–39
54 months	4.36	4.16	0–23
Kindergarten	4.32	4.29	0–28
First grade	4.83	4.37	0–30
Externalizing behaviors			
24 months	14.21	7.03	0–37
36 months	13.13	7.00	0–39
54 months	9.90	6.66	0–42
Kindergarten	8.96	6.79	0–41
First grade	8.08	6.67	0–45
Control variables (%)			
Female	50		
European American	81		
African American	9		
Hispanic American	6		

average, children's internalizing behaviors declined between 24 months and first grade. In addition, there was statistically significant between-individual variation in change in internalizing behaviors, as evidenced in the estimated variance components in the table. Not only did children demonstrate considerable within-person change in internalizing behaviors between 24 months and first grade, but they also appeared to shift in the rank order relative to their peers. The pattern of findings for externalizing behaviors was similar. On average, children's externalizing behaviors declined over time, although at a slower rate than that of their internalizing behaviors. There was also evidence of between-individual variability in change, but this variability was more modest than the corresponding variability for internalizing behaviors. Thus, there was evidence that externalizing behaviors were more stable—both within and between individuals—over time.

To illustrate the extent of the intraindividual and interindividual change that was present in children's internalizing and externalizing behaviors over time, we plot fitted growth trajectories, recovered from the unconditional growth models for internalizing (Panel A) and externalizing (Panel B) behaviors, for a subgroup of 50 children selected randomly from our analytic sample as shown in Figure 2. Panel A clearly illustrates that there were both within-individual changes and between-individual differences in children's internalizing behaviors between 24 months and first grade. More specifically, there was considerable variability among children's initial level of internalizing behaviors as illustrated by the vertical spread of scores at 24 months (or Time 0). Furthermore, notice that, on average, children's internalizing behaviors declined over time, although some children exhibited relatively large increases whereas others showed very little change at all. Finally, Panel A illustrates the interindividual variability in change in internalizing behaviors that was present. That is, children did not tend to retain their rank order across assessments. In other words, a child with average internalizing behaviors at 24 months may have dropped to the lowest quartile by first grade, thereby shifting his or her rank order.

Corresponding estimated growth trajectories for children's externalizing behaviors are presented in Panel B of Figure 2. Again, there were intraindividual and interindividual differences in change in children's externalizing behaviors between 24 months and first grade. However, these differences were more modest than those evident for internalizing behaviors. In particular, there was less variability among children's externalizing scores at 24 months (as seen in the vertical spread of the scores at Time 0) than among children's internalizing scores even though the range was greater. Furthermore, on average, children exhibited fairly small declines in externalizing behaviors over time, with more children showing little or no change and only a handful of children displaying increased externalizing behaviors. Finally, Panel B suggests that children appeared to maintain their rank order more easily in externalizing behavior than in internalizing behavior. In other words, interindividual differences in externalizing behavior ap-

Table 2  
*Intraindividual Stability of Children's Internalizing and Externalizing Scores Between 24 Months and First Grade*

Score	Intercorrelation				
	24 months	36 months	54 months	Kindergarten	First grade
Internalizing scores					
24 months	—				
36 months	.667***	—			
54 months	.457***	.562***	—		
Kindergarten	.334***	.449***	.615***	—	
First grade	.357***	.459***	.594***	.649***	—
Externalizing scores					
24 months	—				
36 months	.692***	—			
54 months	.546***	.670***	—		
Kindergarten	.476***	.593***	.712***	—	
First grade	.475***	.560***	.696***	.766***	—

\*\*\*  $p < .001$ .

Table 3  
*Parameter Estimates and Approximate p Values From Fitted Unconditional Latent Growth Curve Models for Linear Individual Change in Internalizing and Externalizing Behaviors Between 24 Months and First Grade (n = 882)*

Variable	Parameter	Outcome	
		Internalizing behavior	Externalizing behavior
Fixed effects			
Initial status	$\beta_{11}$	8.0008***	14.2926***
Rate of change	$\beta_{12}$	-0.0833***	-0.1351***
Variance components			
Level 1			
24 months	$\sigma_{\epsilon 1}^2$	6.4587***	15.3726***
36 months	$\sigma_{\epsilon 2}^2$	12.9689***	15.1144***
54 months	$\sigma_{\epsilon 3}^2$	8.6748***	14.0145***
Kindergarten	$\sigma_{\epsilon 4}^2$	8.1938***	13.3679***
First grade	$\sigma_{\epsilon 5}^2$	7.1120***	8.2049***
Level 2			
Initial status	$\sigma_{\zeta 0}^2$	17.1426***	36.3981***
Rate of change	$\sigma_{\zeta 1}^2$	0.0074***	0.0128***
Initial Status $\times$ Rate of Change	$\sigma_{\zeta 01}^2$	-0.2190***	-0.2957***
Goodness-of-fit statistics <sup>a</sup>			
$\chi^2$ (df = 10)		551.27***	96.4828***
Goodness-of-fit index		0.9247	0.9758

<sup>a</sup> We examined multiple indices of goodness of fit because the chi-square statistic is sensitive to sample size and model misspecification (Bollen, 1990).

\*\*\*  $p < .001$ .

peared to be more stable than interindividual differences in internalizing behavior.

#### *Does Growth in Internalizing Behaviors Predict First-Grade Cognitive Ability and Achievement Skills?*

Parameter estimates and goodness-of-fit statistics from the fitted latent growth curve models predicting first-grade cognitive ability and achievement skills from change in internalizing behaviors are presented in Table 4. As hypothesized, estimated true initial status in internalizing behaviors predicted children's cognitive ability in first grade, even after controlling for gender and race/ethnicity (see Model 1, Table 4). On average, children rated as having higher levels of internalizing behaviors at 24 months had lower cognitive ability scores in first grade. Estimated true rate of change in internalizing behaviors also predicted children's first-grade cognitive ability, controlling for child gender and race/ethnicity. On average, children with large positive rates of change in internalizing behaviors between 24 months and first grade had lower cognitive ability scores in first grade than did children with moderate positive rates of change or negative rates of change.

Of interest is the fact that the effect of children's internalizing behaviors at 24 months on first-grade achievement scores was quite similar to the effect of these behaviors on children's first-grade cognitive ability scores. Parameter estimates and goodness-of-fit statistics for the latent growth curve models predicting first-grade achievement scores from growth in internalizing behaviors are also presented in Table 4 (see Model 3). Controlling for child gender and race/ethnicity, estimated true initial status in internalizing behaviors significantly predicted children's first-grade achievement scores. On average, children rated as having higher levels of internalizing behaviors at 24 months had lower achieve-

ment skills in first grade. However, unlike in the model predicting first-grade cognitive ability, true rate of change in internalizing behaviors was not a statistically significant predictor of first-grade achievement scores once child gender and race/ethnicity were controlled. Thus, as hypothesized, internalizing behaviors may have a different effect on children's cognitive ability and achievement skills.

In order to display the magnitude and direction of the detected effects, we present in Figure 3 the fitted cognitive ability (Panel A) and achievement (Panel B) scores for a prototypical child (i.e., a White girl) with three internalizing growth trajectories: those with behavior problems two standard deviations above the mean at 24 months (i.e., in the borderline clinical range), those with behavior problems at the mean at 24 months, and those with behavior problems two standard deviations below the mean at 24 months. Controlling for child characteristics, children with high levels of internalizing behaviors at 24 months exhibited fewer such behaviors over time, and children whose internalizing trajectory was classified as below average exhibited an increase in behaviors over time; there was relatively little change in the fitted growth trajectory for a child whose internalizing behaviors were classified as average at 24 months. The predicted first-grade cognitive ability scores for a prototypical child whose internalizing trajectory was classified as borderline clinical was 98.61, a value slightly below the sample mean of 101.12. In contrast, children whose internalizing trajectory was classified as below average outperformed their peers on tests of cognitive ability; specifically, their predicted score was 106.66.

The fitted internalizing growth trajectories for the model predicting first-grade achievement scores were nearly identical to those for the cognitive ability model (see Panel B of Figure 3).

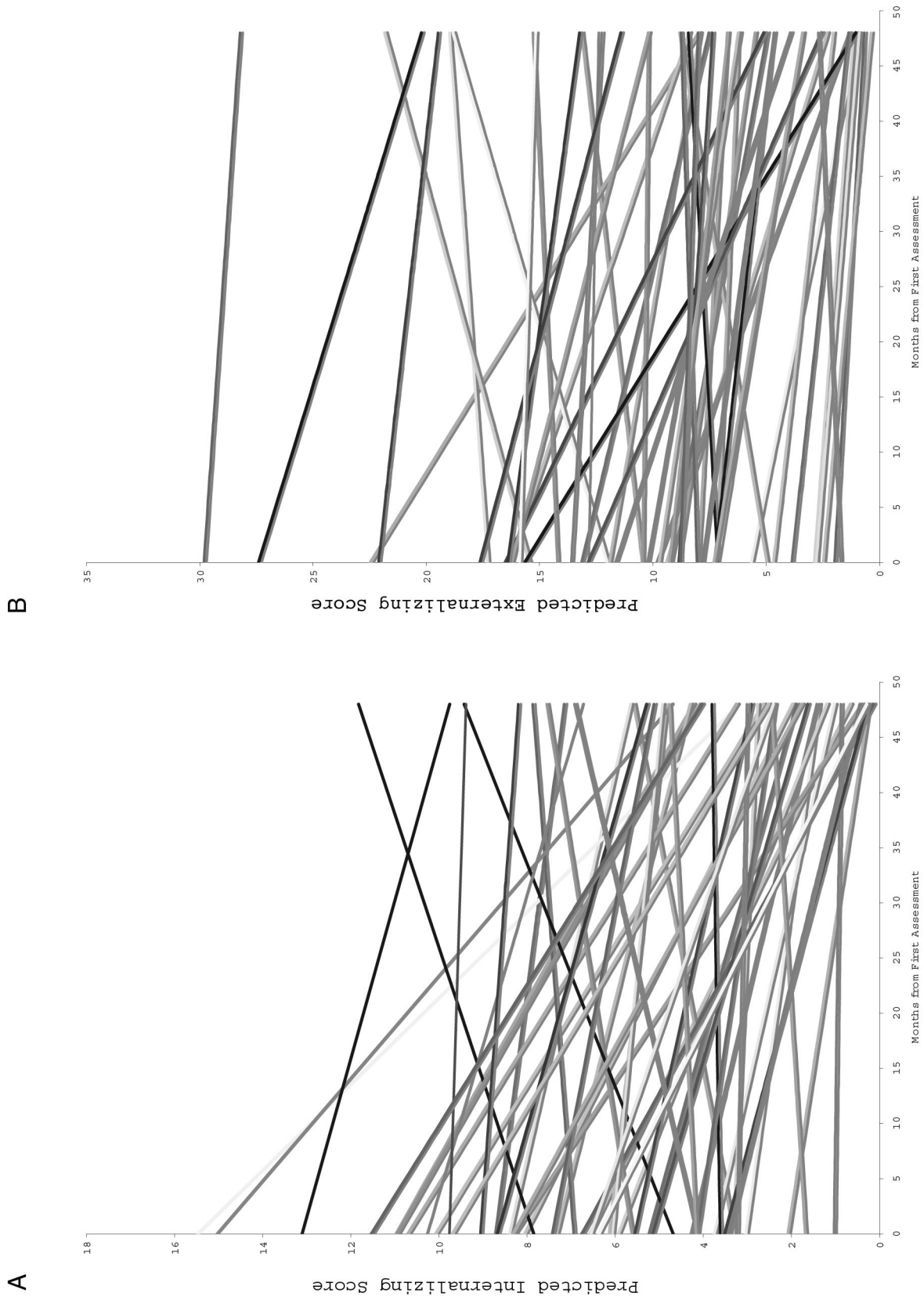


Figure 2. Fitted internalizing (A) and externalizing (B) trajectories for 50 children randomly selected from the analytic sample, with their individual growth parameters estimated and recovered from the unconditional growth models for internalizing and externalizing behaviors.

Table 4

*Selected Parameter Estimates From a Taxonomy of Fitted Latent Growth Curve Models That Predict First-Grade Cognitive Ability and Achievement by True Initial Status and True Rate of Change in Internalizing and Externalizing Behaviors Between 24 Months and First Grade, Controlling for Child Gender and Ethnicity (n = 882)*

Variable	Parameter	Predicting cognitive ability from change in:		Predicting achievement scores from change in:	
		Model 1	Model 2	Model 3	Model 4
		Internalizing behaviors	Externalizing behaviors	Internalizing behaviors	Externalizing behaviors
<b>Fixed effects</b>					
Intercept	$\alpha$	109.72***	123.26***	109.51***	109.98***
Initial status	$\beta_{11}$	-0.1845***	-0.1969***	-0.2267***	-0.2284**
Rate of change	$\beta_{12}$	7.6241*	-0.1941	5.8136	-1.6529
<b>Variance component</b>					
Cognitive ability/achievement	$\sigma_{\xi_{11}}^2$	50.8485***	54.1730***	136.8028***	139.8101***
<b>Goodness-of-fit statistics<sup>a</sup></b>					
$\chi^2$ ( <i>df</i> = 22)		219.59***	160.54***	223.96***	155.41***
Goodness-of-fit index		0.9791	0.9790	0.9780	0.9803
$\Delta \chi^2$ from null model <sup>b</sup>		30.99***	13.72***	80.80***	9.93**

<sup>a</sup> We examined multiple indices of goodness of fit because the chi-square statistic is sensitive to sample size and model misspecification (Bollen, 1990). <sup>b</sup> The delta chi-square is from the comparison of a model in which true initial status and true rate of change were free to be estimated, with a model in which these parameters were constrained to be 0.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

Specifically, there was a decline in internalizing behaviors over time for children with borderline clinical behaviors at 24 months, and an increase in internalizing behaviors for children with below average behaviors at 24 months. Not surprisingly, the predicted first-grade achievement score for a prototypical child whose trajectory was classified as borderline clinical was 108.86, slightly below the sample mean of 111.29. The predicted achievement score for a prototypical child whose internalizing trajectory was classified as below average was 117.61, more than a third of a standard deviation above the sample mean and almost two thirds of a standard deviation above the predicted achievement score for a child whose internalizing trajectory was classified as borderline clinical.

#### *Does Growth in Externalizing Behaviors Predict First-Grade Cognitive Ability and Achievement Skills?*

Parameter estimates and goodness-of-fit statistics for the latent growth curve models predicting first-grade cognitive ability and achievement scores from growth in externalizing behaviors are presented in Table 4. Controlling for child gender and race/ethnicity, only estimated true initial status in externalizing behaviors predicted children's first-grade cognitive ability scores (see Model 2 in Table 4). Children rated as having higher levels of externalizing behaviors at 24 months had lower cognitive ability scores in first grade, on average. Contrary to our hypothesis, true rate of change in externalizing behaviors between 24 months and first grade was not a statistically significant predictor of first-grade cognitive ability scores. Thus, there was some evidence that externalizing behaviors have a different effect on cognitive ability than internalizing behaviors, perhaps because there is greater in-traindividual stability in externalizing behaviors over time.

Estimated true initial status in externalizing behaviors also predicted children's first-grade achievement scores, controlling for

child gender and race/ethnicity (see Model 4 in Table 4). On average, children with higher levels of externalizing behaviors at 24 months had statistically significantly lower achievement scores in first grade than did their more socially competent peers. Once again, true rate of change in externalizing behaviors was not a statistically significant predictor of first-grade achievement scores once child gender and race/ethnicity were controlled.

The fitted cognitive ability (Panel A) and achievement (Panel B) scores for a prototypical child (i.e., a White girl) with the three externalizing trajectories (borderline clinical, average, and below average) are presented in Figure 4. The pattern of findings for externalizing behaviors was somewhat different from the pattern of findings for internalizing behaviors. There was a very moderate decline in externalizing behaviors for a prototypical child whose growth trajectories were classified as borderline clinical at 24 months. Contrary to expectation, there was very little change (about one point) in the growth trajectories of a prototypical child whose externalizing behaviors were classified as below average. Despite the limited change in externalizing behaviors over time, the predicted cognitive ability for a child whose trajectory was classified as borderline clinical was below the sample mean ( $M = 98.70$ ). Of interest is the fact that the predicted cognitive ability score for a child whose trajectory was classified as below average was nearly identical to the sample mean ( $M = 101.44$ ). Note that the difference in cognitive ability scores between a child whose externalizing growth trajectory was classified as borderline clinical and one whose growth trajectory was classified as below average was less than a third of a standard deviation, compared with more than half a standard deviation for the internalizing models.

The model predicting children's first-grade achievement scores from externalizing growth trajectories (see Panel B of Figure 4) again demonstrated that there was little change in externalizing behaviors over time, regardless of the level of behaviors children

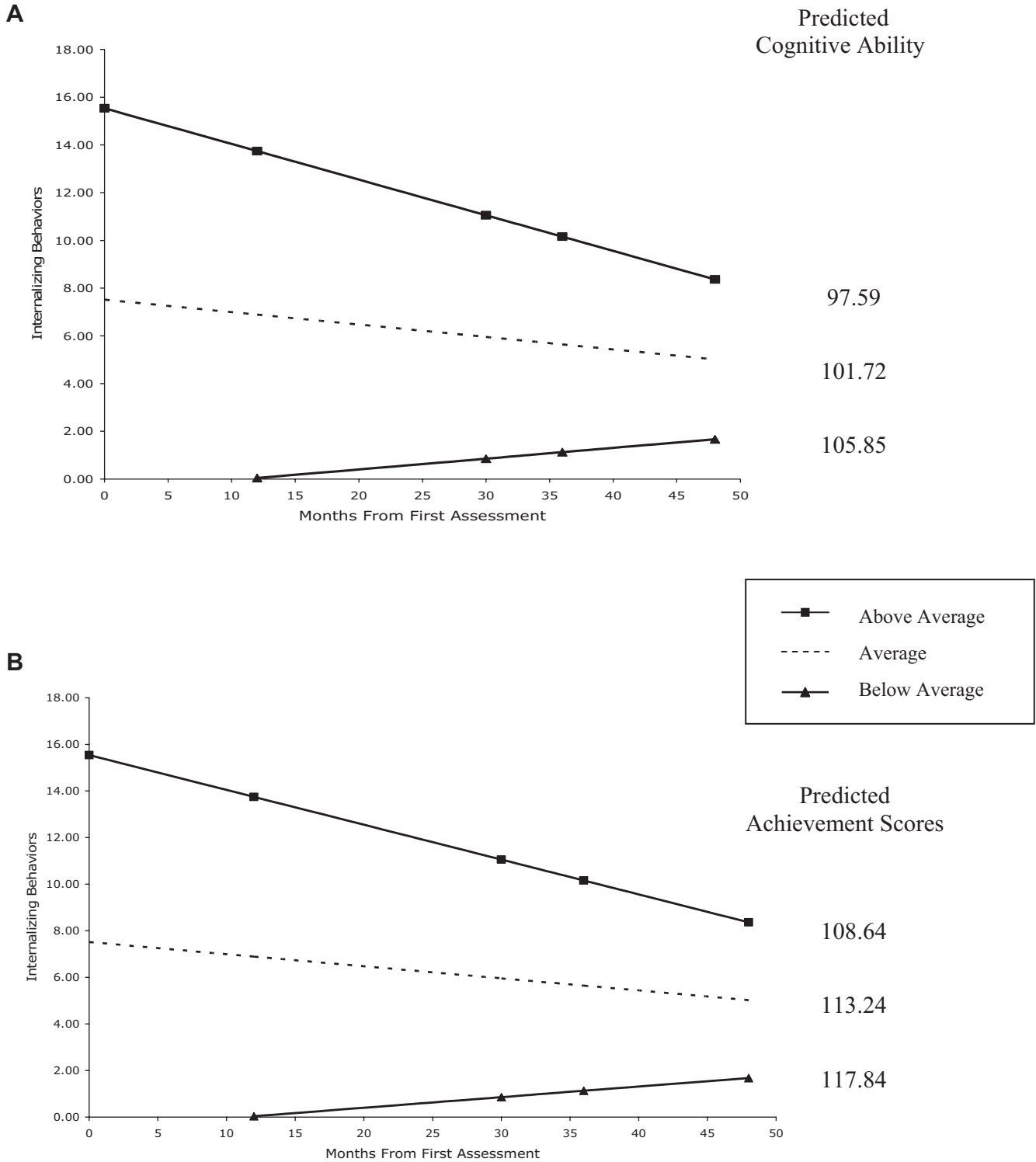


Figure 3. Predicted first-grade cognitive ability (A) and achievement (B) scores and associated average fitted internalizing growth trajectories for a child with (a) borderline clinical behavior at 24 months (2 SD above the mean) and a small negative rate of change, (b) average behavior at 24 months (mean) and a minimal rate of change, and (c) below average behavior at 24 months (2 SD below the mean) and a small positive rate of change. Trajectories were estimated from a model predicting first-grade cognitive ability or achievement and controlling for selected child demographics.

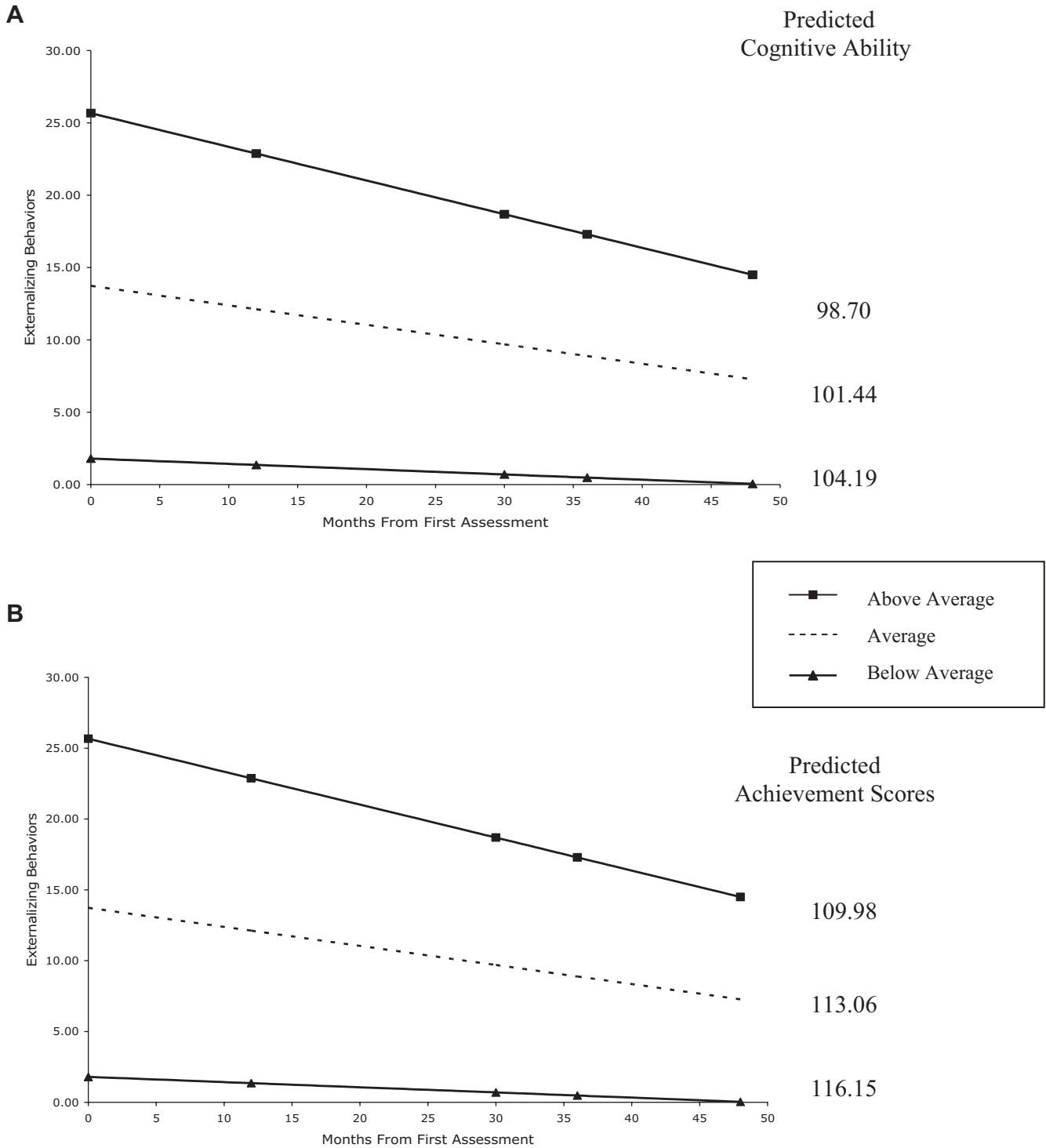


Figure 4. Estimated first-grade cognitive ability (A) and achievement (B) scores and associated average fitted externalizing growth trajectories for a child with (a) borderline clinical behaviors at 24 months (2 SD above the mean) and a small negative rate of change, (b) average behavior at 24 months (mean) and a minimal rate of change, and (c) below average behavior at 24 months (2 SD below the mean) and a small positive rate of change. Trajectories were estimated from a model predicting first-grade cognitive ability or achievement and controlling for selected child demographics.

exhibited at 24 months (i.e., borderline clinical, at or below the mean). A child whose growth trajectory was classified as borderline clinical performed slightly below the mean on first-grade tests of achievement ( $M = 109.98$ ), and a child whose growth trajectory was classified as below average performed just above the mean on first-grade tests of achievement ( $M = 116.15$ ). Only about a third of a standard deviation separated the predicted scores for a prototypical child whose externalizing trajectory was classified as borderline clinical and one whose externalizing trajectory was classified as below average.

### Discussion

The overall purpose of the present study was to investigate intraindividual and interindividual variability in behavior problems over time and to examine the relation between children's behavioral trajectories from 24 months through first grade and their cognitive ability and achievement skills in first grade. There has been relatively little work on how specific aspects of early social development, including internalizing and externalizing behaviors, are related to early school performance. The few studies that have examined these associations have focused on overall academic success rather than on specific cognitive abilities and achievement skills, as we have done here. To date, no other study has examined whether growth in behavior problems from 2 years of age through first grade differentially predicts cognitive ability and achievement skills in first grade, in part because relevant data have not been available for study. The NICHD SECCYD data set provides an excellent means by which to address this gap in the literature.

There were three main findings from this study. First, changes in individual children's internalizing and externalizing behaviors do not appear to be stable over time, as evidenced by the statistically significant within- and between-individual variance. That is, children who develop behavior problems at a young age do not necessarily continue to exhibit those problems as they grow older. Furthermore, children do not appear to retain their rank order over time. These findings are consistent with other cross-sectional and longitudinal studies of intraindividual stability of behavior problems that show that behavior problems typically decrease over time (Campbell, 2002; Crowther et al., 1981), especially when they occur in the absence of other developmental and familial risks (Lavigne et al., 1996). These data also provide support for the hypothesis that internalizing behaviors across children are less stable than externalizing behaviors (Campbell, 1995). Specifically, the between-individual variability in internalizing behaviors was larger than the between-individual variability in externalizing behaviors. Furthermore, the correlation between 24-month internalizing behaviors and first-grade internalizing behaviors is only moderate; in contrast, the correlation between 24-month externalizing behaviors and first-grade externalizing behaviors is quite strong (Cohen, 1977, suggested that a correlation of .5 is strong).

Second, results from this study provide clear evidence that both internalizing and externalizing behaviors at 24 months are related to children's early school performance. Children with higher levels of internalizing or externalizing behaviors at 24 months performed lower on first-grade tests of cognitive ability and achievement than did their more competent peers, even after controlling for child gender and race/ethnicity. Consistent with the scant literature linking preschool behavior problems to school performance (e.g.,

Arnold, 1997; Hamre & Pianta, 2001), these findings provide clear evidence that children who exhibit extreme levels of these behaviors, even as early as 24 months, are at risk for later academic difficulties. The magnitude of the effects provides some evidence that internalizing behaviors are more important than externalizing behaviors for later success. It is important to keep in mind that the naturalistic design of the data collection makes it difficult to determine the direction of effects. We hypothesized that elevated levels of behavior problems would result in lower cognitive ability and achievement scores in first grade because children with behavior problems tend to be less attentive in the classroom and less cooperative (Arnold et al., 1999). However, it is equally plausible that children with lower intelligence scores become frustrated with learning and thus act out. As such, our ability to make causal inferences about the impact of children's internalizing and externalizing growth trajectories on their first-grade cognitive ability and achievement scores is limited.

Finally, there was little support for the hypothesis that rate of change in children's behavior problems was related to first-grade school performance. In fact, only first-grade cognitive ability was predicted by rate of change in internalizing behaviors, such that children with large, positive rates of change had lower cognitive ability scores. Of interest is the fact that children's cognitive ability and achievement scores did not vary as a function of their rate of change in externalizing behaviors. This provides some support for our hypothesis that internalizing and externalizing behaviors might affect cognitive ability and achievement skills differently. Because children's externalizing behaviors were more stable than their internalizing behaviors, it is not particularly surprising that rate of change does not add to the predictive power of the model above and beyond initial status. Also noteworthy is the fact that the children in the NICHD SECCYD appear to exhibit fewer behavior problems, on average, than children in other smaller samples. In particular, the rates of borderline clinical internalizing and externalizing behaviors were lower than those that have been seen in other large-scale studies (Briggs-Gowan et al., 2001). Although this makes the effects that were obtained even more compelling, it may have also limited our power to detect effects of change over time.

### *Mechanisms for Development*

Children's early relationships with their classroom teachers and their peers provide two potential mechanisms that may link behavior problems with cognitive ability and achievement skills. With respect to classroom teachers, positive teacher-child relationships, marked by closeness and responsiveness, increase the likelihood that children will enjoy school and cooperate in the classroom, which will help motivate them to succeed (Birch & Ladd, 1998; Hamre & Pianta, 2001). Children whose teacher-child relationships are positive have fewer behavior problems than their peers with poor relationships (Birch & Ladd, 1998). Early teacher-child relationships also appear to have long-term effects. Teacher sensitivity and positive teacher-child relationships may be particularly meaningful for children with higher levels of behavior problems. Indeed, children who exhibit more externalizing behaviors but who have strong positive relationships with their teachers exhibit fewer negative behaviors in the classroom and spend less time off-task than children with poor teacher-child

relationships (Pianta et al., 2002). There was no evidence of this association for socially withdrawn children. It would not be surprising to find that children who have more behavior problems but who also have a positive teacher–child relationship do better academically than children who have a poor teacher–child relationship.

Behavior problems and early school performance may also be linked through peer relationships, with same-sex peer groups providing a particularly important context for development. Children begin to develop a preference for same-sex peer groups around age 3, and these groups have a stronger influence on their adjustment and school competencies than do mixed-sex peer groups (Fabes, Martin, Hanish, Anders, & Madden-Derdich, 2003; Fabes, Shepard, Guthrie, & Martin, 1997). There is some evidence suggesting that interactions in girls' peer groups are more cooperative compared with interactions in boys' peer groups, which tend to be more arousing (e.g., Fabes, Hanish, & Martin, 2003). As such, girls may be exposed to cooperative and regulated play earlier and more frequently than boys. Because the experiences in same-sex peer groups differ substantially for girls and boys, it would not be surprising to find that peer groups are differentially related to social and academic development for girls and boys. Furthermore, because children's relations with their peers provide an important support for academic success and help promote positive attitudes toward school, children who are rejected by their peers are at greater risk of academic failure (Jimerson, Egeland, Sroufe, & Carlson, 2000; Vitaro et al., 2001). Thus, it is likely that children with behavior problems who have positive peer relations will perform better in school than children with behavior problems and negative peer relations.

### *Limitations of the Present Study*

There are several limitations to the current study. First, as described earlier, the children participating in the NICHD SECYD appear to exhibit fewer behavior problems, on average, than children in other samples. In particular, the rates of borderline clinical or clinical internalizing and externalizing problems were lower than those that have been seen in other large-scale studies (e.g., Briggs-Gowan et al., 2001). Although this makes the effects that were obtained even more compelling, it may have also limited our power to detect effects of change over time.

Second, we relied on maternal reports of children's behavior problems for this investigation. As described earlier, assessment of behavior problems is difficult because raters typically interpret the same behaviors differently (Campbell, 2002), and, as a result, agreement among raters tends to be quite low (e.g., NICHD ECCRN, 1998). Furthermore, behaviors are highly contextual with respect to both setting and age. Although we chose not to analyze caregivers' and teachers' reports on the CBCL, in part because considerably fewer children would have had complete caregiver and teacher data, we recognize that there are benefits to having multiple measures of behavior problems.

Third, our ability to make causal inferences about the impact of children's internalizing and externalizing growth trajectories on their first-grade cognitive ability and achievement scores is limited. That is, because of the correlational nature of the data (as opposed to data gathered in an experimental study), we are not able to determine the direction of effects between behavior problems

and school performance. We hypothesized that elevated behavior problems would result in lower cognitive ability and achievement scores in first grade. However, it is equally plausible that children with lower intelligence scores become frustrated with learning and thus act out. In fact, recent work by Bellanti and Bierman (2000) suggested that low cognitive ability strongly predicts social behavior problems among young children. By choosing to focus on the role of the child in his or her development (and including only a small number of control variables in these models) rather than on a broader ecological context, we further limited our ability to determine the direction of effects. Family control variables should be included in analyses to provide a better estimate of the effects of internalizing and externalizing trajectories on first-grade outcomes, net of these control variables.

Finally, the validity of the inferences drawn from this study is also threatened by the potential omission of unobserved variables. It is very likely that characteristics that influence the development of internalizing and externalizing behaviors also influence children's cognitive ability and achievement scores (e.g., temperament). As such, it is not possible to determine whether the estimates on internalizing or externalizing behaviors are true estimates or whether they are biased by unobserved characteristics of child or family. This bias is something nonexperimental studies of behavioral effects cannot take into account.

### *Conclusion*

For most children, behavioral transgressions are a normal part of development. In fact, these behaviors typically reflect children's attempts to establish autonomy and master age-appropriate social skills (Campbell, 1990). An increase in negativity and oppositionality during the preschool years generally represents the onset of independence and the frustration children experience in the face of limits (Keenan & Wakschlag, 2000). In fact, parents report non-compliance and poor regulation of impulses as the most common childrearing problems during this period (Campbell, 1997). However, for a small number of children, serious and sustained behavior problems can disrupt their development and interfere with the acquisition of social and academic skills (Campbell, 2002). Indeed, a limited body of work suggests that children's academic trajectories throughout elementary school rest, to some extent, on their social and emotional foundation, although the effect sizes are relatively small (Alexander, Entwistle, & Dauber, 1993). Early identification of children with extreme levels of behavior problems is clearly imperative for deflecting negative academic trajectories.

This study adds to the existing literature on behavioral change over time and predictors of early school performance in several ways. First, our use of latent growth curve modeling allowed us to capitalize on the longitudinal nature of the data to model children's individual growth trajectories in behavior problems over time and to simultaneously treat behavioral trajectories as predictors of children's subsequent cognitive ability and achievement scores as measured in first grade. Until relatively recently, the majority of studies that examined behavior problems assessed them on only one measurement occasion. The few studies that did explore change in behavior problems typically examined predictors of individual differences in change rather than how different patterns of change in behavior problems might affect other outcomes (Huttenlocher, Haight, Bryk, & Seltzer, 1991; Mathiesen & San-

son, 2000; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Second, our latent growth curve analysis explicitly incorporated a measurement model in order to account for the errors associated with the measurement of behavior problems over time. As a result, unlike previous work that used fallible measures of initial status and rate of change to predict later outcomes, we modeled how true initial status and true rate of change in behavior problems subsequently impact later outcomes (Duncan et al., 1999). Third, we chose to explore within-individual differences in behavioral change over time, rather than focusing only on the rank order of children in this study (i.e., between-individual differences). By examining within-individual differences in initial status and rate of change, we were better able to understand the persistence of behavior problems both within and between children. We were also able to shed light on the similarities and differences in the persistence of internalizing and externalizing behaviors over time. Fourth, no other study has investigated the relation between growth in behavior problems assessed from toddlerhood (24 months), the earliest age at which behavior problems can be measured reliably, through first grade and early school performance. As such, this study provides important information on the prevalence of behavior problems at a very early age and suggests that for some children, interventions beginning prior to preschool may be important.

Future work should include a more careful examination of different profiles of behavior problems. Of particular interest are the patterns for children who exhibit behavior problems at or above the borderline clinical cutoff at 24 months. Children in this category who experience increases in behavior problems over time would likely have lower cognitive ability and achievement scores in first grade than children who do not experience a change or children who experience decreases in behavior problems over time. In addition, research should focus on determining whether early growth patterns in behavior problems continue to predict later academic trajectories. Finally, research is needed to identify the mechanisms by which behavior problems affect academic outcomes. Children's early relationships with their classroom teachers and their peers provide two potential mechanisms that may link behavior problems with early school performance and should be investigated further.

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