Effects of Aggression on Achievement: Does Conflict With the Teacher Make It Worse?
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This longitudinal study examined different explanations for negative associations between aggression and academic achievement using data collected from 403 children from low-income families followed from kindergarten or first grade (ages 6 and 7 years) through fifth grade (ages 10–11 years). Most results of growth curve analyses examining change over time and path analyses examining associations among the variables within grades were consistent with the hypothesis that the effect of aggression on achievement was partially mediated by the conflictual relationships relatively more aggressive children tended to develop with their teachers and concomitant reductions in engagement in academic tasks. The evidence suggested, however, that the relationship between aggression and achievement is complex and reciprocal. Gender differences were also observed.

Countless studies have found associations between children’s social behavior and their academic performance (for an illustration of a study that did not find these associations, see Duncan et al., 2007). Less well understood is how social behavior affects students’ learning. This study was designed to examine evidence for different explanations for the association, including the role that children’s relationships with their teachers plays in mediating the effects of social behavior on students’ academic engagement and achievement.

We focused on aggressive behavior, a form of externalizing against peers. Recent studies on children’s aggression have distinguished between overt physical aggression, found more commonly among boys than girls, and “relational aggression” (social or indirect aggression, such as excluding a child from play), found more commonly among girls (e.g., Crick, Grotpeter, & Bigbee, 2002; see Crick et al., 1999, for a review). The current study focuses on what is usually referred to as physical aggression. Because we relied on teacher ratings, we did not differentiate aggression based on different reasons—instrumental versus reactive—as a few researchers have done in past studies (e.g., Little, Brauner, Jones, Nock, & Hawley, 2003).

In a review focusing on externalizing behavior, Hinshaw (1992) summarizes evidence on four possible explanations for associations with achievement: (a) achievement affects externalizing behavior, (b) externalizing behavior affects achievement, (c) there is a reciprocal relationship between externalizing behavior and achievement, and (d) some third variable affects both externalizing behavior and achievement similarly. Analyses for the current study are based on this framework, extended to assess mediators of the association between aggression and achievement.

Evidence

Looking across extant studies, there is evidence for all of Hinshaw’s (1992) explanations. First, results of some studies suggest that achievement affects students’ social behavior. Miles and Stipek (2006), for example, found that poor literacy achievement in first and third grades predicted relatively high aggressive behavior in third and fifth grades, respectively. In a study on Australian children, Jorm, Share, Matthews, and Maclean (1986) found no differences in children’s antisocial behavior in kindergarten as a function of reading skills, but the children who had reading difficulties were significantly more antisocial than the normal readers by the end of first and second grades. Williams and McGee (1994) similarly found that boys with reading disabilities at age 9 were more likely to develop a conduct disorder at age 15.
Finally, McGee, Williams, Share, Anderson, and Silva (1986) reported that children who were having considerable difficulty learning to read at the beginning of school already showed behavior problems. Behavior problems also increased from ages 5 to 9 at a much faster pace for children who had serious reading difficulties than for other children.

The present study investigates further evidence related to possible effects of achievement on aggression, employing growth curve analysis to assess the degree to which change in achievement from kindergarten or first grade to fifth grade on an experimentally implemented test predicted change in the amount of aggression rated by teachers over those grades.

There is also evidence for Hinshaw’s (1992) second explanation that conduct problems affect academic achievement. Aggression and other externalizing behaviors may directly affect engagement and learning. For example, children who are aggressive may spend relatively more time misbehaving or being disciplined, reducing the amount of time they have to spend engaged in academic work. Consistent with this proposal, Coie and Dodge (1988) found that first- and third-grade students who were aggressive were more likely to be reprimanded by the teacher and spent less time “on task” than other children. Arnold (1997) similarly observed that misbehavior (aggression, hostility, and noncompliance) predicted low on-task behavior in their study of 4- to 6-year-old boys. The misbehavior prompted teachers to remove boys from the activity, and presumably as a consequence, they spent less time learning the material presented during that lesson. Accordingly, the present study assessed the degree to which changes in aggression predicted changes in achievement.

Aggressive behavior may also undermine engagement and learning indirectly. In this study, we test the hypothesis that the effect of aggression on students’ engagement and learning is mediated by the relationships students develop with their teachers. Specifically, we propose that aggressive children form conflictual relationships with teachers, which presumably diminish their desire to engage in the work the teacher gives them and thus undermines their academic engagement and achievement. Our hypothesis is based on a set of empirical findings, summarized in the following, which support each of the links in the model we propose. Taken together, the evidence suggests the model, but it has not been previously tested directly.

Our prediction that children who are relatively more aggressive would develop more negative relationships with their teachers is consistent with previous research showing that teachers claim to have more conflictual relationships with children who exhibit antisocial behaviors (e.g., Birch & Ladd, 1998; Hamre & Pianta, 2001; Howes, Phillipson, & Peisner-Feinberg, 2000; Ladd, Birch, & Buhs, 1999; Ladd & Burgess, 2001; Pianta & Steinberg, 1992; Silver, Measelle, Armstrong, & Essex, 2005), and one study in which low-income kindergarten children’s own ratings of the amount of conflict they had with their teachers were associated with teachers’ ratings of their conduct problems (Mantzicopoulos, 2005).

The causal relationship between children’s social behavior and their relationships with teachers is most likely reciprocal. For example, Hamre and Pianta (2001) found that among children who were identified as having behavior problems in kindergarten, those who developed relationships with teachers characterized by low levels of conflict and dependency had fewer discipline problems and more positive motivation than their counterparts through eighth grade. Silver et al. (2005) reported that conflict in the teacher–child relationship in kindergarten predicted faster rates of increase in aggressive behavior from kindergarten through third grade. To examine the possibility of a reciprocal relationship, we assess how well changes in teacher–child conflict predicted changes in aggressive behavior, as well as how well changes in aggressive behavior predicted teacher–child conflict.

Several studies have demonstrated associations between teacher–child relationships and academic performance for elementary-aged children (Birch & Ladd, 1997; Furrer & Skinner, 2003; Ladd & Burgess, 2001; Mantzicopoulos, 2005; Pianta & Stuhlman, 2004) and adolescents (e.g., Crosnoe, Johnson, & Elder, 2004; Gregory & Weinstein, 2004). Connell and his colleagues (Connell, 1990; Connell & Wellborn, 1991; Skinner & Belmont, 1993; see also Ryan & Deci, 2000) developed a self-system model to explain the effect of teacher–child relationships on children’s learning behavior and achievement. According to Connell, children’s motivation to engage in particular activities is determined in part by whether these activities take place in a context that satisfies their need for belonging or being socially connected. Children who feel a sense of belonging and social support adopt or internalize the goals and values of their teachers, such as active engagement and participation in school work (Deci & Ryan, 1985; Wentzel, 1997; see also National Research Council Committee on Increasing High School Students’ Engagement and Motivation to Learn, 2004). In contrast, children who have conflict with their teachers are likely to feel alienated and consequently disengage from sanctioned classroom behavior (Connell, 1990; Lynch & Cicchetti, 1997).
There is some empirical evidence to support the proposed effects of negative relationships with teachers on adaptive participation (e.g., Birch & Ladd, 1998; Ladd et al., 1999). For example, in a study following children from kindergarten through eighth grade, Hamre and Pianta (2001) found a negative association between teacher–child conflict in kindergarten and children’s positive work habits in first through fourth grades and with disciplinary problems in fifth and sixth grades. Ladd and Burgess (2001) found that children who had “chronic” levels of teacher–child conflict in kindergarten and first grade demonstrated relatively less cooperative participation (accepted the teacher’s authority, complied with classroom rules). Children with whom teachers claimed to have relatively more conflictual relationships were thus at greater risk for poor academic achievement.

We did not expect teacher–child relationships to account for the entire association between aggression and achievement, given substantial evidence supporting Hinshaw’s (1992) “third-variable” explanation. Many studies have shown that aggression and conduct disorders are strongly associated with hyperactivity and attention/distraction problems (Connor et al., 2003; Fergusson & Horwood, 1995; Frick et al., 1991; Johnson, McGue, & Iacono, 2005; Spira & Fischel, 2005), which are also associated with poor academic achievement or underachievement (Frick et al., 1991; Hinshaw, 1992; Horn & Packard, 1985; Rabiner, Coie, & the Conduct Problems Prevention Research Group, 2000; Spira & Fischel, 2005; Velting & Whitehurst, 1997). Attention problems are not viewed as a mediator of the effects of aggressive behavior on achievement, but researchers who have attempted to separate their effects conclude that what appears to be an effect of conduct behaviors on achievement in elementary school can be explained substantially by the comorbidity of conduct disorders and hyperactivity/attention/distraction problems (Fergusson & Horwood, 1995; Frick et al., 1991; Hinshaw, 1992; Johnson et al., 2005). The independent effect of conduct on achievement appears to increase, however, in adolescence (Hinshaw, 1992). Most of these studies are based on clinical populations—children who have been diagnosed with attention-deficit hyperactive disorder, conduct disorders, and underachievement (a significant difference between actual achievement and achievement that would be predicted by IQ)—in contrast to the current study, which included mostly children who had no such diagnosis. This body of evidence is mentioned, however, because it reminds us that there are most likely a variety of valid explanations for associations between conduct and achievement and evidence for one explanation does not preclude the validity of another.

Children in this study were followed from kindergarten or first through fifth grades. Although we expected conflictual student–teacher relationships to mediate the effects of aggression on engagement and academic achievement for all these elementary grades, we took advantage of the longitudinal data to assess possible changes in the nature of the relationships over time. We also assessed gender differences, to determine whether boys were more prone to developing negative relationships that could undermine their engagement and learning, as is suggested by some previous studies discussed in the following, and to assess possible differences between boys and girls in the pattern of associations over time among the variables studied.

**Gender Differences**

Many previous studies have found girls to exhibit more prosocial and less antisocial behavior, and to have closer and less conflictual relationships with their teachers (e.g., Birch & Ladd, 1997; Bracken & Crain, 1994; Furrer & Skinner, 2003; Hamre & Pianta, 2001; Howes et al., 2000; Hughes, Cavell, & Willson, 2001; Kesner, 2000; Ryan, Stiller, & Lynch, 1994; Saft & Crain, 1994; Furrer & Skinner, 2003; Hamre & Pianta, 2001; Silver et al., 2005). As noted by Hamre and Pianta (2005), because of the high percentage of female teachers, it is difficult to determine whether girls’ advantage is related to the greater likelihood that their teacher is the same gender. The present study, like most, included too few male teachers to assess the effects of the teacher gender, but the design did allow us to assess gender differences in children from kindergarten or first grade through the fifth grade on these dimensions. Moderator effects of gender were also assessed in the longitudinal analyses, although we had no basis for making specific hypotheses.

The children in the study were ethnically diverse and came from very low-income families. This population was studied because although low-income children and children of color have, on average, the poorest achievement outcomes, most of the research on social skills and relationships in school involve middle-class samples. An understanding of the way social variables affect achievement in the children who are most at risk of school failure could help guide interventions designed to close the achievement gap. Previous studies have not focused on low-income children who are most at risk of poor performance, few have followed children for as long as 6 years through elementary school, and none have examined
simultaneously direct effects of children’s aggression on academic engagement and the effects of aggression on achievement mediated by relationships with teachers.

Method

Participants

Children. Participants of the original sample included 403 children (51.7% girls) who were participating in a longitudinal study on transition to school, although for most analyses, given missing data and attrition, there were approximately 300 children. Children were followed from kindergarten (N = 283) or first grade (N = 120) through the fifth grade. Some of the children had already completed kindergarten when the study began and thus could not begin their participation until the first grade. Kindergartners and first graders were combined for analyses. The children who entered the study at either kindergarten or first grade were reassessed in second, third, and fifth grades. Analyses at each grade level included all the children in the longitudinal sample for whom relevant data were available at that grade level.

The families of all participating children had incomes below the federal poverty guidelines when they entered the study. At the start of the present study, most (76%) household incomes were below $15,000, 21% were below $6,000, most (62%) mothers were not married, and 49% were not working. With regard to education, 13% of the primary caretakers interviewed had less than the equivalent of a ninth-grade education and 28% went past the ninth grade but did not complete high school.

Of the participating children, 35% are African American, 34% are White, 28% are Latino, 2% are Asian, and 1% is Native American. Approximately 38% of the Latino children were not proficient in English at the beginning of the study. Children lived in three geographical areas of the United States: a rural and an urban area in the Northeast and a West Coast urban area.

Overall, attrition in the study was modest (less than 19% over a period of 6 years). Analyses comparing children who were lost to those who were still in the sample at fifth grade revealed no significant differences in family income, gender, or cognitive skills (measured at 60 months, before the present study began). A chi-square analysis of ethnic differences in attrition rates was, however, significant, $\chi^2(4) = 18.62, p \leq .001$. A higher proportion of Latino children were lost than either African American or Caucasian children.

Teachers. All teachers who had a study child enrolled in their classroom were invited to participate in the study. By the fifth grade, children were enrolled in 233 classrooms in 138 schools. The modal number of study children per classroom was 1. Teacher experience varied from 1 to 38 years of teaching, with a mean of 16 years. Almost all teachers (99%) had at least a bachelor’s degree; 45% had a master’s degree.

Procedures and Measures

Teacher questionnaires. In the spring of each year, questionnaires were mailed or delivered to teachers of participating children. Teachers responded to questions regarding an individual child’s aggressive behavior, academic engagement, and teacher–child conflict. The average return rate for questionnaires was 75%.

Aggressive behavior. Teachers rated children’s aggression using a subscale of the Child Behavior Scale, developed by Ladd and Profet (1996). Four items (e.g., “fights with other children,” “aggressive child,” “taunts/teases other children,” “bullies other children”) were used, with a 3-point response format (does not apply, applies sometimes, certainly applies). Alpha coefficients were .91, .92, and .91 for kindergarten/first, third, and fifth, grades, respectively.

Teacher–child conflict. Teachers rated the degree to which they had a relationship that involved conflict for the individual child at each grade level using items from the conflict subscale of Pianta’s Student–Teacher Relationship Scale (Pianta, 1994; Pianta & Steinberg, 1992; Pianta, Steinberg, & Rollins, 1995). Each item has a 5-point response scale (definitely does not apply, not really, neutral/not sure, applies somewhat, definitely applies). In consultation with the scale’s author, 5 of the original 12 items from the conflict subscale were selected to diminish the burden on teachers (e.g., “this child and I always seem to be struggling with each other,” “this child easily becomes angry with me”). The alphas for this scale were .89, .89, .92, and .88 for kindergarten/first, second, third, and fifth, grades, respectively.

Academic engagement. Teachers rated children’s academic engagement—the degree to which an individual student is responsibly engaged with academic work—using items from the Teacher Rating Scale of School Adjustment (TRSSA) developed by Birch and Ladd (1997). Three of the items were taken from the self-directedness subscale of the TRSSA (e.g., “seeks challenges,” “works independently”), and one of the items was from the cooperative participation subscale (“accepts responsibility for a given task”) of the TRSSA. The items all have a 3-point response format.
Reliabilities for these four items were acceptable for each grade level (alphas = .87, .84, .83, and .85 for kindergarten/first, second, third, and fifth grades, respectively).

Academic achievement. Children’s math and literacy skills were assessed individually in the spring of kindergarten or first grade, and again in third and fifth grades, by a trained experimenter. The literacy and most of the math assessments were available in Spanish. The sections of the math assessment that were not available in Spanish were translated. Children who preferred the Spanish version were assessed by a native Spanish speaker. The number of children who were assessed in Spanish ranged from 38 (kindergarten/first) to 0 (fifth grade).

To ensure a range of scores and a broad array of math skills, kindergarteners and first graders were given a math test that included items from the Woodcock–Johnson Psychoeducational Battery–Revised (WJ–R) calculations subtest (Woodcock & Johnson, 1989), identification of written numbers and shapes from the Peabody Individual Achievement Test–Revised (Dunn & Dunn, 1981), word problems involving addition and subtraction developed by cognitively guided instruction (CGI) researchers (Carpenter, Ansell, Franke, & Fennema, 1993; Carpenter, Fennema, & Franke, 1996), questions about relative size (e.g., “which is more, 5 or 6?”) from the Test of Early Mathematics Ability (Ginsburg & Baroody, 1990), and set of counting items (e.g., counting 50 blocks, counting from 90 to 120, and counting up or down from a specified number; Secada, 1991). Scores for each of these sets of items reflected the proportion of items answered correctly. The third- and fifth-grade math assessments included two subtests from the WJ–R: calculation and applied problem solving. Scores were calculated according to the manual instructions—the item number of the most difficult item answered correctly before missing five problems in a row minus the number of items missed since the basal item (based on the lowest of five items the student answered correctly). In addition to these two WJ–R subtests, children were given additional word problems taken from CGI research projects (Carpenter et al., 1993; Carpenter et al., 1996). Third graders received one additional set of CGI problems that involved counting using individual and sticks of 10 unifix cubes. The total math achievement score was calculated by standardizing the score for each subtest within grade and averaging them. Alpha reliability coefficients ranged from .55 (third grade) to .80, with an average of .71. We suspect that the relatively low alpha in math for third graders is a consequence of items (e.g., using unifix cubes) that were unfamiliar to some children.

For literacy achievement, two subtests of the WJ–R were used for the third and fifth graders: the letter–word reading and the passage comprehension. The first test asks children to decode single words. In the second, children read a passage and fill in a missing word. The WJ–R letter–word identification subscale was adapted for the kindergarten and first graders to ensure enough items at their level to show some variability in scores. (Pilot testing revealed a floor effect.) Thus, instead of asking children to identify only the 9 letters in the WJ–R, they were shown all 26 letters of the alphabet. Kindergarten and first-grade children were also given a larger number of simple (2 to 4 letters) words to identify than are provided in the WJ–R. The WJ–R was supplemented at all grades with the Saunders (1999) performance-based test, which assesses writing, comprehension, and reading and verbal fluency. Children were dictated letters (kindergarten only), words, and sentences to write. Scores reflected the proportion of letters or words written correctly. Comprehension was assessed by reading a passage to the child (kindergarten) or having a child read a passage (first, third, and fifth grades) and asking a series of questions about the story. Answers were rated on a 1–3 scale for their correctness, and these scores were averaged to create a comprehension score. Overall verbal fluency was rated on a 0 (practically nonverbal) to 2 (verbal, fluent, talkative; gave detailed answers) scale. Reading fluency was assessed on a 0 (nonreader) to 6 (reads words fluently) scale. All subscale scores were converted to standardized scores and then combined within each grade to create an overall mean literacy achievement score. Alphas for the literacy scores at each grade ranged from .74 to .82, with an average of .79.

Assessments of children’s math and literacy skills were highly correlated at every grade (.58, .55, and .55 for kindergarten/first, third, and fifth grades, respectively, all ps ≤ .001). Because we had no reason to expect aggression to affect or be affected differently by math and literacy skills, standardized scores for the two subject areas were combined to form one measure of academic achievement. The alphas for this combined achievement measure were .73, .72, and .71 for kindergarten/first, third, and fifth grades, respectively.

Results

The percentage of children missing data on the variables included in this study ranged from 8% to
24% of the sample. Children with missing data did not differ significantly from children without missing data on ethnicity or gender, with one exception. Latino children were more likely to have missing teacher-reported data in Grades 1, 3, and 5 than White and African American children. Because hierarchical linear modeling (HLM) allows for ignorably missing data through its use of weighting and smoothing techniques, no imputations were made and all data were used in the growth curve analysis. For the path analysis, only the participants who had complete data at each grade level were included.

Table 1 presents the means and standard deviations, by gender, for all variables used in analyses. The distributions for aggression were positively skewed, with Pearson skewness coefficients ranging from 1.17 to 1.34. The distribution of teacher–child conflict ratings were also positively skewed, with Pearson skewness coefficients ranging from .98 to 1.41. Log transformation of these variables did not affect the findings.

Interconstruct and Intrigrade Correlations

As a first step in testing the hypotheses, correlations among all the variables of interest were computed (see Table 2). As expected, and consistent with previous research (e.g., Birch & Ladd, 1998), children’s aggression ratings were generally positively associated with teacher–child conflict and negatively associated with academic engagement and achievement. Teacher–child conflict, in turn, was generally negatively associated with academic engagement and achievement, and academic engagement was significantly correlated with academic achievement. The one notable anomaly was that academic achievement was not associated with either aggression or teacher–child conflict at third grade. Intergrade correlations shown in Table 3 indicate a fair amount of stability in all the variables studied.

Explanations for Associations Between Aggression and Achievement

Growth curve analyses. Growth curve analysis using HLM 6.21 (Raudenbush & Bryk, 2002) was used to test three sets of hypotheses bearing on different explanations for the association between aggression and achievement: (a) that changes in achievement predict changes in aggression, (b) that changes in aggression predict changes in achievement, and (c) that the effect of aggression on achievement is mediated by teacher–student relationships. To assess the mediation hypothesis we first tested each of the proposed links in the model: (a) changes in aggression predict changes in teacher–child conflict, (b) changes in teacher–child conflict predict changes in engagement, which (c) in turn predict changes in academic achievement. We then tested the mediation hypothesis more directly by assessing the hypothesis that (d) increases in aggression no longer predict changes in achievement with mean teacher–child conflict (and in a subsequent analysis, mean engagement) held constant.

HLM was used because it estimates individual and group growth curves simultaneously to describe patterns of change over time. The individual growth curves can be predicted from time-varying variables as well as testing mediation and moderation effects of between-subjects and time-invariant factors, such as gender and mean teacher–child conflict, and HLM can accommodate missing values.

Table 1
Means and Standard Deviations for Aggression, Teacher–Child Conflict, Engagement, and Achievement, by Gender

<table>
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<tr>
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<th>Aggression</th>
<th>Conflict</th>
<th>Engagement</th>
<th>Achievement</th>
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<tbody>
<tr>
<td>Kindergarten/first grade</td>
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<tr>
<td>Boys (n = 151)</td>
<td>1.55 (.55)</td>
<td>1.89 (0.98)</td>
<td>2.28 (.51)</td>
<td>−0.02 (0.66)</td>
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<tr>
<td>Girls (n = 150)</td>
<td>1.37 (.42)</td>
<td>1.70 (0.91)</td>
<td>2.40 (.56)</td>
<td>0.03 (0.73)</td>
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<tr>
<td>Second grade</td>
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<tr>
<td>Boys (n = 162)</td>
<td>1.57 (.64)</td>
<td>2.04 (1.00)</td>
<td>2.07 (.53)</td>
<td>—</td>
</tr>
<tr>
<td>Girls (n = 168)</td>
<td>1.36 (.42)</td>
<td>1.74 (0.78)</td>
<td>2.26 (.40)</td>
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<tr>
<td>Third grade</td>
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</tr>
<tr>
<td>Boys (n = 162)</td>
<td>1.54 (.53)</td>
<td>2.00 (1.00)</td>
<td>2.11 (.46)</td>
<td>−0.03 (0.65)</td>
</tr>
<tr>
<td>Girls (n = 166)</td>
<td>1.39 (.49)</td>
<td>1.71 (0.91)</td>
<td>2.20 (.52)</td>
<td>0.01 (0.60)</td>
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<tr>
<td>Fifth grade</td>
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<tr>
<td>Boys (n = 137)</td>
<td>1.58 (.60)</td>
<td>2.16 (0.96)</td>
<td>2.04 (.51)</td>
<td>−0.09 (1.34)</td>
</tr>
<tr>
<td>Girls (n = 143)</td>
<td>1.27 (.47)</td>
<td>1.67 (0.89)</td>
<td>2.24 (.52)</td>
<td>0.14 (1.29)</td>
</tr>
</tbody>
</table>
For each model tested, the Level 1 model looked as such,

\[ y_{it} = \pi_{0i} + \pi_{1i} \times (\text{Grade}_t) + \pi_{2i} \times (\text{Grade} \times \text{Predictor}_t) + e_{it}. \]

The term \( y_{it} \) is the outcome variable for child \( i \) at time \( t \) and is a linear function of the child’s grade in school on that occasion plus random error \( (e_{it}) \). The equation stipulates that the trajectory is linear across time and has the growth parameters: \( \pi_{0i}, \pi_{1i}, \) and \( \pi_{2i} \). A linear model was used because we had just three time points.

The intercept \( \pi_{0i} \) should be interpreted as each child’s mean score of the outcome variable at the initial time, which is in either kindergarten or first grade. The second parameter, \( \pi_{1i} \), represents the slope of the outcome variable or the rate the individual child changes across the grades (coded as kindergarten or first grade = 1, third grade = 3, and fifth grade = 5). Second grade was not included in this analysis because an independent achievement assessment was not given in second grade. The third parameter, \( \pi_{2i} \), represents the rate of change on the outcome variable over time, taking into account change in the predictor. This parameter tests whether changes in the predictor across grades is associated with changes in the outcome variable. The random error for child \( i \) at time \( t \) is represented in the equation as \( e_{it} \). This may be interpreted as the measurement errors associated with the differences between the true and observed growth trajectories.

The first model (Model 1) tested whether changes in achievement predicted changes in aggression. As seen in Table 4, the estimation of fixed effects indicates that change over time in children’s achievement was a marginally significant predictor of change over time in children’s aggression \( (\beta = -0.01, p \leq .10) \); on average, an increase in achievement was associated with a decrease in aggression.

The second model (Model 2) tested whether changes in aggression across the grades predicted changes in achievement. The results (Table 4) indicate that on average an increase in aggression was significantly associated with a decrease in achievement \( (\beta = -0.09, p \leq .05) \).

The third set of models (Models 3a, 3b, 3c) tested whether (a) changes in aggression predicted changes in teacher–child conflict, (b) changes in teacher–child conflict predicted changes in engagement, and (c) changes in engagement predicted changes in children’s achievement (see Table 4). The results indicate that changes in aggression significantly predicted changes in teacher–child conflict; an increase in aggression was associated with an increase in conflict \( (\beta = .31, p \leq .001) \). In addition, an increase in conflict significantly predicted a decrease in engagement \( (\beta = -0.07, p \leq .001) \). Last, an increase in engagement was significantly associated with an increase in achievement \( (\beta = .19 p \leq .001) \).
To assess the goodness of fit of the models tested, a comparison of the deviance and the chi-square statistics among models was conducted. The deviance statistic of a full maximum likelihood model reflects the fit of the entire model and signifies how much worse the current model is when compared to the best possible model. Thus, the smaller the absolute value is, the closer the fit to the best possible model (Singer & Willett, 2003). For Models 1 – 3, the deviance statistics were as follows: Model 1 $52,502.23$, Model 2 $1,577.92$, Model 3a $2,683.24$, Model 3b $1,822.39$, and Model 3c $4,171.74$. The chi-square statistics also indicate the relative fit of a model to the data. In the present study, none of the models’ chi-square statistics were significant ($p \leq .50$). Thus, we are able to reject the null hypotheses for all models, which is desired when testing the fit of a model.

Gender differences. To assess the role of gender (coded as 1 = boys, 0 = girls) in the growth curve analyses, gender was included in the earlier models at the second level, such that:

$$
\pi_{0i} = \beta_{00} + \beta_{01} \times \text{(gender)} + r_0
$$

$$
\pi_{1i} = \beta_{10} + \beta_{11} \times \text{(gender)}
$$

$$
\pi_{2i} = \beta_{20} + \beta_{21} \times \text{(gender)}
$$

Results (see Table 4) indicate that gender significantly predicted initial differences in aggression, teacher–child conflict, and student engagement; on average, boys had significantly higher ratings of aggression ($\beta = .13, p \leq .05$) and teacher–child conflict ($\beta = .22, p \leq .05$), and, initially, girls had significantly higher engagement ($\beta = -.16, p \leq .01$). The test of gender differences in initial achievement was not significant. Gender did not show any significant effects on changes in these four variables across grades and gender did not moderate the effect of the predictor on the outcome in any analysis (see Table 4).

Mediational models. Finally, we tested directly whether mean teacher–child conflict or student engagement mediated the relationship between aggression and achievement. Mean teacher–child conflict and student engagement were added into the Level 2 model separately such that:

$$
\pi_{0i} = \beta_{00} + \beta_{01} \times \text{(mean teacher–child conflict or engagement)} + r_0
$$

$$
\pi_{1i} = \beta_{10} + \beta_{11} \times \text{(mean teacher–child conflict or engagement)}
$$

$$
\pi_{2i} = \beta_{20} + \beta_{21} \times \text{(mean teacher–child conflict or engagement)}
$$

As shown in Table 5, the results indicate that neither mean teacher–child conflict ($\beta = .05, p = .31$) nor mean student engagement ($\beta = .04, p = .50$) significantly mediated the effect of changes in aggression on changes in achievement.

<table>
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<th></th>
<th>Second grade</th>
<th>Third grade</th>
<th>Fifth grade</th>
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<tbody>
<tr>
<td>Aggression</td>
<td></td>
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<tr>
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<td>Kindergarten/first grade</td>
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<td>Achievement</td>
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<tr>
<td>Kindergarten/first grade</td>
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<td>.65***</td>
<td>.58***</td>
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<tr>
<td>Third grade</td>
<td></td>
<td></td>
<td>.71***</td>
</tr>
</tbody>
</table>

Note. The sample sizes are 301 for kindergarten/first grade, 330 for second grade, 228 for third grade, 280 for fifth grade; no achievement test was given in second grade.

*p $\leq .05$, **p $\leq .01$, ***p $\leq .001$. 

Table 3

Intergrade Correlations

<table>
<thead>
<tr>
<th></th>
<th>Second grade</th>
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<th>Fifth grade</th>
</tr>
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<tbody>
<tr>
<td>Aggression</td>
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<td></td>
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</tr>
<tr>
<td>Kindergarten/first grade</td>
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<td>.32**</td>
<td>.48***</td>
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<td>Teacher–child conflict</td>
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<tr>
<td>Engagement</td>
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<tr>
<td>Achievement</td>
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<tr>
<td>Kindergarten/first grade</td>
<td>—</td>
<td>.65***</td>
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<td>Third grade</td>
<td></td>
<td></td>
<td>.71***</td>
</tr>
</tbody>
</table>

To assess the goodness of fit of the models tested, a comparison of the deviance and the chi-square statistics among models was conducted. The deviance statistic of a full maximum likelihood model reflects the fit of the entire model and signifies how much worse the current model is when compared to the best possible model. Thus, the smaller the absolute value is, the closer the fit to the best possible model (Singer & Willett, 2003). For Models 1 – 3, the deviance statistics were as follows: Model 1 = 2,502.23, Model 2 = 1,577.92, Model 3a = 2,683.24, Model 3b = 1,822.39, and Model 3c = 4,171.74. The chi-square statistics also indicate the relative fit of a model to the data. In the present study, none of the models’ chi-square statistics were significant (all $p \leq .50$). Thus, we are able to reject the null hypotheses for all models, which is desired when testing the fit of a model.

Gender differences. To assess the role of gender (coded as 1 = boys, 0 = girls) in the growth curve analyses, gender was included in the earlier models at the second level, such that:

$$
\pi_{0i} = \beta_{00} + \beta_{01} \times \text{(gender)} + r_0
$$

$$
\pi_{1i} = \beta_{10} + \beta_{11} \times \text{(gender)}
$$

$$
\pi_{2i} = \beta_{20} + \beta_{21} \times \text{(gender)}
$$

Results (see Table 4) indicate that gender significantly predicted initial differences in aggression, teacher–child conflict, and student engagement; on average, boys had significantly higher ratings of aggression ($\beta = .13, p \leq .05$) and teacher–child conflict ($\beta = .22, p \leq .05$), and, initially, girls had significantly higher engagement ($\beta = -.16, p \leq .01$). The test of gender differences in initial achievement was not significant. Gender did not show any significant effects on changes in these four variables across grades and gender did not moderate the effect of the predictor on the outcome in any analysis (see Table 4).

Mediational models. Finally, we tested directly whether mean teacher–child conflict or student engagement mediated the relationship between aggression and achievement. Mean teacher–child conflict and student engagement were added into the Level 2 model separately such that:

$$
\pi_{0i} = \beta_{00} + \beta_{01} \times \text{(mean teacher–child conflict or engagement)} + r_0
$$

$$
\pi_{1i} = \beta_{10} + \beta_{11} \times \text{(mean teacher–child conflict or engagement)}
$$

$$
\pi_{2i} = \beta_{20} + \beta_{21} \times \text{(mean teacher–child conflict or engagement)}
$$

As shown in Table 5, the results indicate that neither mean teacher–child conflict ($\beta = .05, p = .31$) nor mean student engagement ($\beta = .04, p = .50$) significantly mediated the effect of changes in aggression on changes in achievement.
Within-grade path analyses. The growth curve analyses have several limitations. They do not allow a test of the full hypothesized causal model (aggression → teacher–child conflict → low engagement → low achievement). Second, because there are only three time points, it cannot be determined whether the significant effect is primarily based on predictions from kindergarten/first to third grade or third grade to fifth grade. A related limitation is that they take good advantage of the longitudinal data, but they do not tell us whether the hypothesis is supported within each grade.

Path analyses were therefore conducted to test the mediation hypothesis at individual grade levels. In the model was a path that included the mediators (teacher–child conflict and engagement) as well as a direct path from aggression to academic achievement. To assess the overall fit of each model at
each grade level, LISREL 8 (Jöreskog & Sörbom, 1993) was used. In addition, all path coefficients in Figures 1a–1c are standardized beta coefficients. Figure 1a shows the results of the path analysis for kindergarten/first grade. The results from the various tests of model fit allow us to conclude that the specified kindergarten/first-grade model fit the data well. The chi-square test ($\chi^2 = 2.68, p = 0.26$) was not statistically significant; that is, we failed to reject the null hypothesis, which is desired in testing a model. The root mean square error of approximation (RMSEA) was 0.03. Byren (1998) notes that a model with RMSEA values less than 0.05 indicates a good fit, whereas values ranging from 0.08 to 0.10 indicate a mediocre fit. The goodness of fit index (GFI), in which 0.9 indicates a relatively good fit, was 0.98. The results from the individual paths show that the paths from aggression to teacher–child conflict, conflict to engagement, and engagement to achievement are significant but the direct path from aggression to achievement is not significant.

Figure 1b shows the results of the path analysis for third grade. The results from the various tests of model fit allow us to conclude that the specified third-grade model fit the data well. The chi-square test ($\chi^2 = 3.54, p = 0.17$) was not statistically significant and the RMSEA was 0.05. The GFI was 0.97. Similar to the results in kindergarten/first grade, the paths from aggression to conflict, conflict to engagement, and engagement to achievement were significant, whereas the direct path from aggression to achievement was not.

Figure 1c shows the results of the path analysis for fifth grade. The results from the various tests of model fit allow us to conclude that the specified fifth-grade model fit the data fairly well. The chi-square test ($\chi^2 = 1.41, p = 0.52$) was not statistically significant. The RMSEA of 0.09 indicated a mediocre fit and the GFI was 0.95. All the paths representing the mediation hypothesis had significant standardized beta coefficients. Unlike the findings for the younger grades, in which the direct path from aggression to achievement was not significant, for fifth grade it was marginally significant.

In summary, the path analyses are consistent with the hypothesis that the effect of aggression on academic achievement is at least partially mediated by its effects on conflict with teachers and the resultant lowered engagement in academic work. The direct path between aggression and achievement was not significant, although by fifth grade, it was almost significant.

### Predicting Aggression From Teacher–Child Conflict

As discussed earlier, there is evidence suggesting that teacher–child relationships are both affected by and affect children’s social behavior. In the aforementioned analyses, teacher–child conflict was predicted by children’s aggression. In the next analysis we assess evidence for a relationship in the opposite direction. Results of a growth curve analysis (see Table 4, Model 4) indicate that changes in teacher–child conflict significantly predicted changes in achievement.

<table>
<thead>
<tr>
<th>Fixed effects (with robust SEs)</th>
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Table 5
Mediation Models for Aggression Predicting Achievement

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</table>

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. $\chi^2 = 2.68, df = 2, p = 0.26$. RMSEA = 0.03, GFI = 0.98. $\chi^2 = 3.54, df = 2, p = 0.17$. RMSEA = 0.05, GFI = 0.97. $\chi^2 = 1.41, df = 2, p = 0.52$. RMSEA = 0.09, GFI = 0.95.

Figure 1. Path analysis results, predicting achievement within grade: (a) kindergarten/first grade, (b) third grade, and (c) fifth grade.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. $\chi^2 = 2.68, df = 2, p = 0.26$. RMSEA = 0.03, GFI = 0.98. $\chi^2 = 3.54, df = 2, p = 0.17$. RMSEA = 0.05, GFI = 0.97. $\chi^2 = 1.41, df = 2, p = 0.52$. RMSEA = 0.09, GFI = 0.95.
aggression; an increase in conflict across the grades was associated with an increase in aggression ($\beta = .08$, $p \leq .001$). The deviance statistic to test the goodness of fit for Model 4 was 1,250.31 and the chi-square statistic measuring the homogeneity of the Level 1 variance was nonsignificant, suggesting a good fit.

To assess whether the effect of teacher–child conflict on the change in aggression was different for boys than girls, gender (coded as 1 = boys, 0 = girls) was included in Model 4 at the second level. The results (see Model 4, Table 4) of the main effect of gender on the change in aggression indicate that gender significantly predicted initial differences in aggression, with boys, on average, having significantly higher ratings in aggression ($\beta = .17$, $p \leq .01$). However, the test of gender differences in change in aggression was not significant ($\beta = -.04$, $p = .12$).

Discussion

This study examined several alternative, although not mutually exclusive, explanations for the association often found between aggression and achievement (see Duncan et al., 2007, for an exception in that it found few significant associations between social behavior and school performance). The study also assessed gender differences on these dimensions and in the pattern of relationships among them. These topics are discussed in the following.

Explanation of Aggression–Achievement Association

The significant cross-grade correlations are consistent with previous studies suggesting that children’s social behavior remains relatively stable over the first few grades of school (e.g., Birch & Ladd, 1998; Ladd & Burgess, 2001; Ladd & Proffit, 1996; Silver et al., 2005). Nevertheless, changes that were seen in children’s aggression predicted changes in achievement, suggesting that aggression may undermine achievement. There was also some, albeit weaker, evidence for the view that poor academic achievement promotes aggression.

Why might academic skills affect children’s behavior? We have previously proposed that children who find schoolwork difficult may become frustrated or unhappy in school and express their frustration and unhappiness by acting aggressively (Miles & Stipek, 2006). Our proposal is based on an early theory that frustration (defined as the state that emerges when circumstances interfere with a goal response) leads to aggression (Dollard, Doob, Miller, Mowrer, & Sears, 1939). Berkowitz (1968) suggested that any unpleasant emotion and feeling, such as anxiety, anger, and annoyance, can trigger either “fight or flight.” There is some empirical evidence for the theory (see Berkowitz, 1978; Buss, 1963). Rutter and Guller (1983) proposed a somewhat different but related explanation for the effect of poor achievement on aggression. They suggested that academic failure leads to low self-esteem and general antagonism toward school, which in turn prompts negative behaviors.

By fifth grade, there was some weak evidence for a direct effect of aggression on achievement. But most of the findings were consistent with our hypothesis that the effect of aggression on achievement is partially mediated by its effects on teacher–child relationships. The growth curve analyses supported each link in the model, showing that changes in aggression significantly predicted changes in the amount of teacher–child conflict, which in turn predicted changes in students’ engagement, which predicted changes in students’ achievement. Although gender was associated with mean initial scores on all but the achievement measure, gender did not moderate the associations found among the variables. The mediation hypothesis was also supported by path analyses within each grade evaluating the entire model, although not in the growth curve analysis. The failure of the test of the mediators in the growth curve analyses may have occurred because only the average of the mediator over the three grades could be tested, not change over time in the mediators, and teacher–child conflict and engagement had to be tested in separate analyses. Although the growth curve analysis took advantage of the longitudinal data, it was not the most effective way to assess the full mediation model.

There are many reasons why developing a conflictual relationship with the teacher might undermine academic engagement and learning. For example, children who have relatively high amounts of conflict with the teacher may develop generally negative feelings about the teacher and school, and as a result lack motivation to engage in the academic work the teacher assigns. Teachers may also report a conflictual relationship with the children they discipline relatively often; the frequent experience of being disciplined may contribute to the children’s negative feelings as well as take time away from academic work.

The results of this study highlight the importance of helping children develop self-regulation, anger management, and social problem-solving skills. Even if academic performance is the primary concern, there may be value in investing time and effort in children’s social experiences and skills. Positive social skills and relationships might serve as important protective
mechanisms against academic failure, which might be particularly important for low-income children, who are often found to be at risk for poor academic performance.

Relationships with teachers and engagement, as measured in this study, did not completely explain the effects of aggression on achievement. In the longitudinal analyses changes in aggression continued to predict changes in achievement, with mean teacher–child conflict and with mean engagement held constant. And for fifth graders, the direct path from aggression to achievement was marginally significant. Also, despite the consistently strong associations found between aggression and achievement, the results of this study do not rule out the possibility that aggression is not really the culprit but rather other problems that co-occur with aggression undermine academic achievement. Previous research, mentioned earlier, suggests that hyperactivity and accompanying attention problems are really at fault, not aggression. Most previous studies on hyperactivity and attention problems included children who were diagnosed with significant problems on these dimensions. It would be useful in future studies to assess the independent effects of attention/hyperactivity and aggression on children’s learning, both directly and indirectly, for children who cover a broader range on these dimensions.

Effect of Teacher–Child Conflict on Aggression

The study also examined whether teacher–child conflict predicted aggression, consistent with previous research, summarized earlier (e.g., Hamre & Pianta, 2001; Silver et al., 2005), suggesting that teacher–child relationships may promote or undermine positive behavior. As predicted, not only did changes in aggression predict changes in teacher–child conflict but the reverse was also true. Changes in teacher–child conflict also predicted changes in children’s aggression. The findings are consistent, therefore, with a reciprocal relationship, with aggressive behavior generating conflict with teachers and conflict with teachers exacerbating children’s aggressive behavior.

The findings that teacher–child conflict predicted both increased aggression and lower engagement suggest the importance of helping teachers avoid developing conflictual relationships with aggressive children. We recognize that this may be difficult, given that teacher behavior is in part a reaction to child behavior. But a preponderance of negative interactions with the teacher is not likely to support children’s desire to engage in teacher-sanctioned activities. Efforts to ensure at least some positive interactions, for example, by engaging the more aggressive children in conversation about their interests, taking care to notice good behavior, and conveying high expectations, may compensate for the negative disciplinary interactions.

Gender Differences

As hypothesized, already by kindergarten or first grade, teachers rated boys as more aggressive and less engaged, and their relationships with girls as less conflictual. These findings are consistent with previous research (e.g., Birch & Ladd, 1997; Bracken & Crain, 1994; Furrer & Skinner, 2003; Hamre & Pianta, 2001; Howes et al., 2000; Hughes et al., 2001; Kesner, 2000; Ryan et al., 1994; Saft & Pianta, 2001; Silver et al., 2005) and have important practical implications. In light of evidence that social competence, teacher–child relationships, and academic engagement affect children’s academic learning, the present study provides further evidence that boys are at greater risk of underachievement than girls. Given the possibility of a key role played by relationships with teachers in children’s engagement and achievement, teachers might need to make extra efforts to develop positive relationships with boys, especially boys who are aggressive. Such efforts might serve as a protective factor and improve boys’ academic success.

Limitations and Conclusions

This study relied substantially on teacher ratings. It would be useful in future studies to obtain independent assessments of children’s aggression, relationships with teachers, and engagement in academic activities. Children’s own perceptions related to all of these constructs would also be useful. Furthermore, data were gathered at one time point at each grade level. Future work could examine children’s social competencies, relationships with teachers, and achievement at both the beginning and the end of each school year.

Despite some limitations, the study reminds us of the complexity of relationships among variables that affect student achievement. Many factors affect children’s learning. This study, combined with previous research, suggests that even one factor, aggressive behavior, probably affects achievement in more than one way and that the relationship between aggression and achievement is very likely reciprocal. Developing analytic methods to assess these complex relationships is a challenge but an important goal of developmental research.
References


