Published in final edited form as:
J Educ Psychol. 2008 February 1; 100(1): 67–77. doi:10.1037/0022-0663.100.1.67.

Prediction of Children's Academic Competence From Their Effortful Control, Relationships, and Classroom Participation

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Abstract

The authors examined the relations among children's effortful control, school relationships, classroom participation, and academic competence with a sample of 7- to 12-year-old children (*N* = 264). Parents and children reported on children's effortful control, and teachers and children reported on children's school relationships and classroom participation. Children's grade point averages (GPAs) and absences were obtained from school-issued report cards. Significant positive correlations existed between effortful control, school relationships, classroom participation, and academic competence. Consistent with expectations, the teacher–child relationship, social competence, and classroom participation partially mediated the relation between effortful control and change in GPA from the beginning to the end of the school year. The teacher–child relationship and classroom participation also partially mediated the relation between effortful control and change in school absences across the year.

Keywords

effortful control; peer and teacher relationships; classroom participation; academic competence

Children's academic competence is central to their future success. The importance of successfully navigating the challenges of the school environment is highlighted by findings that academic competence is a significant correlate of positive mental health and high school graduation (Caspi, Elder, & Bem, 1987; Ensminger & Slusarcick, 1992). Despite the importance of school success, 15% of adults report that they have not completed high school (Stoops, 2004). Although the majority of research on school success has focused on curricula, structure, teacher–child ratios, and intelligence, there is an increased awareness of the important roles children's regulatory abilities, school-related relationships, and classroom participation play in contributing to their academic competence. Indeed, Blair (2002) noted that some longitudinal evidence indicates that social and emotional factors

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relate to aspects of school success or failure even when controlling for general intelligence at school entry.

The literature considering indices of children's regulatory abilities and measures of academic competence is growing, as is the literature on relational and motivational correlates of school success. However, studies that bridge these literatures are rare. The current study begins to fill this gap and was designed (a) to test if effortful control (an index of regulatory abilities) predicts changes in academic competence (i.e., grades and absences) across a school year; (b) to test if students' relationships with teachers and peers, as well as their classroom participation, predict changes in academic competence; and (c) to test if relationships and classroom participation partially mediate the relation between effortful control and academic competence. Simultaneously considering constructs from traditionally different areas of research may clarify if and how children's regulatory abilities predict their academic competence.

We used effortful control (EC) as an index of children's regulatory abilities. EC is defined as "the efficiency of executive attention—including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors" (Rothbart & Bates, 2006, p. 129). Children high in EC are believed to be able to voluntarily control their attention and behavior as needed. EC is measured in a variety of ways, often with measures of attentional regulation, persistence, and the ability to delay gratification, as well as with indices of the ability to voluntarily inhibit or activate behavior (Kochanska, Murray, & Harlan, 2000; Rothbart & Bates, 2006). EC processes are linked to children's emotion-related regulation, and they modulate emotional reactivity and behaviors (Rothbart & Bates, 2006).

Relations Between Children's Effortful Control and Academic Competence

Several investigators have argued that emotional competence and processes involving executive attention are important for academic success (Blair, 2002; Raver, 2002). Huffman, Mehlinger, and Kerivan (2000) hypothesized that children's regulatory abilities contribute to competence beyond measures of IQ. In one study, 60% of teachers reported that being sensitive and not disruptive represented important aspects of academic readiness (Lewit & Baker, 1995). Children high in EC likely have many of these skills, do not easily divert from tasks (Zimmerman, 1998), and process detailed situations more accurately than do their peers low in EC (Lemerise & Arsenio, 2000; NICHD Early Child Care Research Network, 2003).

Some evidence supports the hypothesis that components of EC (e.g., attentional regulation, persistence, or delay of gratification) are positively related to reading, math, and linguistic abilities as well as teachers' reports of competence (Fabes, Martin, Hanish, Anders, & Madden-Derdich, 2003; NICHD Early Child Care Research Network, 2003), although EC sometimes does not relate to grade retention (Willson & Hughes, 2006). Findings that preschoolers' delay of gratification predicts future verbal intellectual ability and SAT scores provide some evidence that the relations between regulatory abilities and academic competence persist over time (Rodriguez, Mischel, & Shoda, 1989; Shoda, Mischel, & Peake, 1990). Moreover, some data indicate that the relations between EC and academic competence are similar cross-ethnically. For example, Valiente, Lemery-Chalfant, and Castro (2007) found that Mexican American children's EC was related to teacher-reported academic competence and absenteeism.

The preceding review indicates that children's EC is positively related to measures of academic competence; however, not all findings are consistent or significant effects are reduced in magnitude when control variables (e.g., sex or socioeconomic status; SES) or

correlates of academic competence are added to the models. In addition, the relations generally account for a modest amount of the variance, suggesting that other constructs are also important when considering academic competence. On the basis of the broader literature, it seems likely that students' relationships and classroom participation may mediate the relations between EC and academic competence.

Relations Between Children's Relationships and Academic Competence

As noted above, in addition to EC, the relationships children develop and maintain in school have been associated with their academic competence. A supportive teacher–child relationship may buffer children from some risk factors associated with poor performance, perhaps because teachers are more likely to provide extra assistance to children with whom they have a positive relationship (Resnick et al., 1997). Consistent with this hypothesis, Hamre and Pianta (2001) predicted that a high-quality teacher–child relationship motivates teachers to invest extra resources that can promote children's school success. In contrast, a conflictual teacher–child relationship may increase stress for the child that may interfere with learning and motivation. Longitudinal data suggest that declines in the nurturant teacher–child relationship precede declines in achievement, and there is evidence that teacher-reported negativity in the teacher–child relationship is related to achievement test scores even when controlling for verbal IQ (Hamre & Pianta, 2001; Midgley, Feldlaufer, & Eccles, 1989).

Positive relationships with peers also contribute to children's academic achievement (Raver, 2002). Indeed, components of social competence such as peer acceptance and friendships are hypothesized to promote social inclusion in the classroom, which may yield resources that foster interpersonal and academic success (Ladd, 2003). Welsh, Parke, Widaman, and O'Neil (2001) found that positive social skills were associated with academic compe tence, and evidence supports the premise that peer acceptance and general levels of social competence are linked to performance in math, reading, and language (see Ladd, 2003, for a review).

The preceding review suggests that both children's EC and relationships are related to academic competence. In addition, some data support the hypothesis that EC is related to children's relationships, and this is necessary for relationships to mediate the relation between EC and academic competence. When children are low in EC and disruptive, they are at increased risk of developing poor relationships with their teachers and receiving low levels of instruction (Berndt & Keefe, 1995; Birch & Ladd, 1997; Murray & Greenberg, 2000). This may contribute to negative perceptions of the classroom, which interfere with motivation for subsequent learning and performance (Wentzel, 1999). Consistent with this line of reasoning, children who lack social skills are viewed as difficult to teach and receive low levels of positive feedback (Arnold, Homrok, Ortiz, & Stowe, 1999; McEvoy & Welker, 2000; Shores & Wehby, 1999), but studies that directly measure EC and examine the hypothesized relations are needed.

There is support for the hypothesis that EC is positively related to indices of social competence. For example, children high in EC are often rated high in compliance (Kochanska, Coy, & Murray, 2001; Kochanska, Murray, & Coy, 1997), sympathy (Eisenberg & Fabes, 1998; Valiente et al., 2004), and social competence (Eisenberg, Gershoff, et al., 2001; see Rothbart & Bates, 2006, for a review). In contrast, children low in EC likely have difficulty modulating negative emotions, complying with others' requests, and avoiding conflictual peer interactions. In summary, there is evidence that academic competence is associated with both EC and children's relationships, but it is not clear if EC

provides unique prediction of academic competence or if relationships partially mediate the EC and academic competence associations.

Relations Between Children's Classroom Participation and Academic Competence

Some findings indicate that students' classroom participation is associated with their grades and absences and that classroom participation might partially mediate the relations between EC and academic competence. Theorists argue that participation may reflect an internal motivation and learning-goal orientation that directs one's behavior toward classroom tasks and demands (Dweck, 1989; Finn, 1993; Gottfried, Fleming, & Gottfried, 1994). In a national report on educational statistics, Finn (1993) noted that students who rarely participate in their classrooms are at risk to perform poorly beyond risks associated with race, ethnicity, language, or family income. Furthermore, scholars suggest that motivation contributes to academic outcomes because it directs students' actions and activities, perhaps because they are motivated to pursue goals valued in the school context (Wentzel, 1999; Wig-field, Eccles, Schiefele, Roeser, & Davis-Kean, 2006). Evidence indicates that measures of engagement such as classroom participation and school liking are related to academic progress, math skills, language skills, and attendance (Ladd, Birch, & Buhs, 1999; Valiente et al., 2007). Children low in engagement are likely to have difficulty following rules and capitalizing on learning opportunities that are often correlated with indices of cognitive functioning (Bronson, Tivnan, & Seppanen, 1995; Hughes & Kwok, 2006).

After reviewing the motivation-to-succeed literature, Eccles, Wigfield, and Schiefele (1998) noted that "the highest priority in this area is attention to the influence of emotions on motivation" (p. 1075). Although progress has been made (Wigfield et al., 2006), Eisenberg (2006) suggested in the introduction to the *Handbook of Child Psychology* that much more work is necessary. Relations between EC and classroom participation might be expected, because children must modulate emotions and demands that occur in school environments to remain engaged (Alexander & Entwisle, 1988). Consistent with this line of reasoning, Valiente et al. (2007) found that EC was positively related to school liking (an index of engagement), and school liking mediated the relation between EC and academic competence.

The Present Study

Findings from several often disparate literatures support the premise that children's EC, relationships with teachers and peers, and classroom participation represent important correlates of academic competence. However, it is unclear if these variables offer unique or overlapping prediction of academic competence. Our first aim in this study was to test if EC predicted measures of academic competence (i.e., grades and absences) at the conclusion of a school year (i.e., spring) while controlling for academic competence at the beginning of the school year (i.e., fall). Our second goal was to test if prediction from EC remained significant after adding measures of children's relationships and a measure of classroom participation to the model. We expected positive zero-order relations among children's EC, the teacher–child relationship, social competence, classroom participation, and GPA; the reverse pattern of relations was expected for school absences. In an effort to extend the literature and on the basis of some empirical evidence (Valiente et al., 2007) and theory (Eisenberg, Sadovsky, & Spinrad, 2005), we predicted that the teacher–child relationship, social competence, and classroom participation would mediate the relations between EC and academic competence.

The extant literature indicates that measures of children's SES often relate to children's performance in school and attendance. For example, income was positively related to both the classroom environment (NICHD Early Child Care Research Network, 2005) and students' achievement (Davis-Kean, 2005). In a review, Haveman and Wolfe (1995) concluded that poverty limits students' academic competence and academic years completed. Nevertheless, as noted above, low classroom participation places a child at risk for school failure regardless of family income (Finn, 1993). To examine the influence of SES, we added SES to all models and expected SES to be positively related to grades and negatively related to absences.

The literature also suggests that children's sex is associated with their academic competence; however, findings regarding sex are somewhat less consistent than findings for SES. Whereas sex differences in math and reading sometimes fail to reach significance (Davis-Kean, 2005; Simpkins, Davis-Kean, & Eccles, 2006), some research suggested that boys outperformed girls on math tasks (Frome & Eccles, 1998; Jordan, Kaplan, Oláh, & Locuniak, 2006), and other reports found that girls achieved better reading performance than boys (Frome & Eccles, 1998). Although sex differences such as these are generally small, because of these relations, we added children's sex to all equations when testing our hypotheses.

In addition, because 47% of the sample in this study was Mexican American and the next largest ethnic group represented was European American (30%), we tested if the strength of the relations differed for Mexican American and European American children. Findings from previous work indicate that Latino students perform more poorly in reading and math than do their European American peers (Children's Action Alliance, 1999; U.S. Department of Education, 2004).[1] Latino students also tend to be absent, to be tardy, and to drop out of school prior to graduation more often than students of other ethnicities (Finn, 1993; U.S. Bureau of the Census, 2004).

Despite some mean level differences, and although much of the data in this area stems from European American children, it seems likely that EC, school relationships, and classroom participation are also important correlates of Mexican American children's academic competence. There is some evidence that prediction of developmental outcomes from measures of EC in other cultures (e.g., Indonesia and China) is similar to prediction of outcomes found in U.S. samples (Eisenberg, Pidada, & Liew, 2001; Zhou, Eisenberg, Wang, & Reiser, 2004). Furthermore, the relations between U.S. minority children's regulatory abilities and their socioemotional and school functioning are similar to relations found in studies that include mostly European American children (Blair, 2002; Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Schultz, Izard, & Ackerman, 2000). Thus, we did not expect the relations among the study variables to be different for Mexican American versus European American children.

Method

Procedure and Participants

Participants were recruited from two schools in a southwestern U.S. city. Before the study began, parents (N = 561) received an introductory letter informing them of enrollment and participation procedures. In addition, research assistants were available in the schools during parent–teacher conferences to enroll parents and answer questions about the study. To

[1]We use *Latino* when describing the pan-ethnic population that comprises those of Spanish ethnicity and *Mexican American* when either describing our sample (composed only of Mexican American Latinos) or when referring only to the Mexican American subethnic Latino group.

increase the reliability of the construct scores and to reduce shared method variance, we used a multireporter (child, primary caregiver parent, and teacher) method to assess the key constructs. The questionnaires sent to parents assessed children's EC and social competence. Parent packets were available in either English or Spanish, because some parents (n = 40) preferred to complete their packets in Spanish. A translation and back-translation method was used, and the original English version was compared with the back-translated version to determine equivalence. The process of translation and back translation continued until all differences were resolved. Teachers (N= 22; teachers reported on an average of 12 children) reported on the teacher–child relationship, children's social competence, and classroom participation. Children reported on their EC, the teacher–child relationship, and their classroom participation. During the school day, a research assistant read all items to children in their classroom. All questionnaires were completed between March and April, and participants were compensated for their participation.

Parents of 122 boys and 142 girls (47% of those eligible) provided consent for themselves and for their children to participate. Children were between the ages of 7 and 12 years (M = 9.57 years, SD = 1.04), attended 1 of 22 regular education classrooms, and provided assent. Forty-seven percent of the parent and child participants were Mexican American, 30% were European American, 5% were African American, 8% were Native American, and 10% were of other ethnic origins. To reduce the heterogeneity of the sample, we did not include children who were solely enrolled in special education services and did not spend any time in regular education classrooms in this study.

The sample represents the sex and ethnic population composition of the classrooms (i.e., the population of the classrooms was 48% boys and 52% Mexican American, 34% European American, 8% African American, and 6% Native American children), demonstrating that our sample of children closely resembles all of those eligible. To further compare those children whose parents provided consent with those whose parents did not, we examined the absence rate, a percentage rate published by the Arizona Department of Education, of those who participated with those eligible. The absence rate in our sample (4%) closely represents the absence rate for those eligible (5%). Because public access of GPA data is unavailable, we were not able to conduct a similar comparison for GPA.

Children were predominantly from two-parent homes (80%) in which the primary caregiver was the child's biological mother (84%). Seventeen percent of primary caregivers (percentages for secondary caregivers [75% were fathers] are in parentheses; 17%) had less than a high school education, 26% (37%) had a high school education, 28% (19%) had some college education, 16% (11%) had a 2-year-college or trade degree, 7% (7%) had a 4-year-college degree, and 6% (9%) had attended graduate school. Family income ranged from below $15,000 to above $150,000 per year and had a mean range of $30,000 to $50,000 per year.

Measures

SES—Income, primary caregivers' education, and secondary caregivers' education were highly related (rs > .45, p < .01); therefore, after standardizing, the items were averaged to form a measure of SES (α = .76).

Effortful control—Children and parents reported on children's EC. Items from the Attention Shifting (e.g., "I am [Your child is] good at keeping track of several different things that are happening around me [him/her]"), Activation Control (e.g., "If I have [Your child has] a hard assignment to do, I get [he/she gets] started right away"), and Inhibitory Control (e.g., "When someone tells me [your child] to stop doing something, it is easy for me [him/her] to stop") subscales from the Early Adolescent Temperament Questionnaire

(Capaldi & Rothbart, 1992) assessed children's EC. Items were rated on a 5-point Likert-type scale (1 = *almost always untrue* to 5 = *almost always true*), and the average of the items (18 for parents and 16 for children) served as a composite of parent-reported and child-reported EC (αs = .89 and .73 for parents and children, respectively). Capaldi and Rothbart (1992) reported that scores from the scale have good discriminant validity, and there is evidence that parent-reported EC and observed indices of EC are significantly related (Eisenberg, Gershoff, et al., 2001; Valiente et al., 2003).

Teacher–child relationship—Teachers reliably (α = .90) rated 20 items on a 5-point scale (1 = *definitely not true* to 5 = *definitely true*) from the Student-Teacher Relationship Scale to report on the closeness and conflict of the teacher–child relationship (e.g., Hamre & Pianta, 2001; Pianta, 2001). This scale has been used often in studies with elementary school children, and scores have demonstrated internal consistency. Children rated their relationship with their teacher on a 3-point scale (α = .92; 1 = *not at all* to 3 = *a lot of the time*) using an age-appropriate version of the Student–Teacher Relationship Scale. Evidence that the measure correlates in the expected directions with later academic performance, attitudes, and involvement supports the convergent validity of the Student–Teacher Relationship Scale (Birch & Ladd, 1997; Hamre & Pianta, 2001).

Social competence—Two subscales of a slightly modified (Eisenberg, Fabes, Guthrie, & Reiser, 2000) version of Harter's (1982) Perceived Competence Scale for Children were used to assess children's social competence. Socially appropriate behavior was the average of four items (e.g., "This child is usually well behaved"; αs = .87 for parents and .85 for teachers). Popularity was the average of three items (e.g., "This child has a lot of friends"; αs = .88 for parents and .89 for teachers). Parents' reports of socially appropriate behavior and popularity were highly correlated, $r(217) = .73$, $p < .001$, as were teachers' reports, $r(236) = .53$, $p < .001$. Thus, the scales were averaged within reporter to form separate measures of parents' and teachers' reports of social competence.

Classroom participation—Teachers used 11 items from the Teacher Rating Scale of School Adjustment (Birch & Ladd, 1997; Ladd, Kochenderfer, & Coleman, 1996) to rate children's classroom participation. Items were rated on a 3-point scale (0 = *doesn't apply* to 2 = *certainly applies*). Teachers' reports of children's classroom participation (e.g., "This child follows instructions," "This child challenges him/herself to do well in school") were reliable (α = .94). Children reliably (α= .67) rated items on an age-appropriate version (e.g., "I follow my teacher's instructions") of this measure.

Academic competence—Official school records were used to obtain measures of children's academic competence. At the conclusion of the school year, we obtained records of full school days missed and tardies from the fall and spring quarters of the school year. Because the number of full school days missed and tardies were significantly related at the first and last quarters (*r*s = .24 and .27, *p*s < .001, respectively), we standardized the number of full school days missed and tardies and then averaged the standardized scores. In the remainder of the article, we refer to this composite as *absences.* Consistent with Pierce, Hamm, and Vandell (1999), we averaged scores in language, vocabulary, and math (all *r*s > .60) to form children's fall and spring GPAs (1 = *a grade of F* to 5 = *a grade of A*).

Results

Prior to hypothesis testing, we computed a series of preliminary analyses to test for potential age and sex differences. Next, we examined zero-order relations among the study variables. Finally, mixed model regressions were computed to test the hypotheses. We concluded by

testing if the strength of the findings was different for Mexican American versus European American participants.

Complete data were available for 77% of the participants. To avoid problems associated with listwise deletion (see Schafer & Graham, 2002), we imputed missing values using the expectation maximization algorithm after specifying a normal distribution with the missing value analysis program in SPSS Version 12.0. Little's missing completely at random test was not significant, $\chi^2(288) = 291.60$, *ns*, which supports this method of imputing missing data. Because the patterns of findings were similar for imputed and nonimputed data, we present the results obtained on the single imputed set.

Preliminary Analyses

Table 1 contains the means and standard deviations for the study variables. To examine sex differences, we computed separate multivariate analyses of variance (MANOVAs) by reporter. There were significant multivariate effects (Hotelling's *T*) for child-reported measures, $F(3, 260) = 5.86$, $p < .001$, and for teacher-reported measures, $F(2, 261) = 18.17$, $p < .001$. Univariate tests indicated that teachers reported closer teacher–child relationships with girls than with boys and rated girls higher than boys in classroom participation, *F*s(1, 262) = 25.02 and 34.22, *p*s < .001, respectively. Girls reported higher levels of EC, closer teacher–child relationships, and more classroom participation than boys reported, *F*s(1, 262) = 13.56, 9.36, and 5.05, *p*s < .001, .01, and .05, respectively. In addition, parents rated girls higher in EC than they did boys, $t(263) = 21.60$, $p < .001$. There was also a significant multivariate effect for grades and absences, $F(4, 259) = 7.26$, $p < .001$. Univariate tests indicated that girls performed significantly better academically than boys did in fall and in spring, *F*s(1, 262) = 21.82 and 24.94, *p*s < .001, respectively; however, there were no significant sex differences in fall or spring absence patterns.

Table 2 presents the correlations among all the variables and illustrates the similar pattern of findings for imputed versus non-imputed data. As shown in Table 2, when considering the imputed data, 63 of 78 correlations were significant. Irrespective of reporter, the measures of EC, the teacher–child relationship, social competence, and classroom participation were all significantly related to children's GPAs in fall and spring. EC, both child and parent reported, was positively related to children's social competence (parent and teacher reported), teacher–child relationship (child and teacher reported), and classroom participation (child and teacher reported). The indices of children's EC, teacher–child relationship, and social competence were significantly related to children's absences from school. The zero-order correlations provide initial support for the hypotheses.[2]

Table 2 also contains the within-construct relations. Consistent with previous research, child and parent reports of children's EC correlated .41, and teacher and parent reports of social competence correlated .29. In addition, teacher and child reports of the teacher–child relationship were correlated .31, and their reports of classroom participation were correlated .32. Therefore, because reports of the same construct across reporters were always significant (*p*s < .01) and because significant relations were found across reporters, to reduce the number of analyses, we created composite scores by averaging across reporters.[3] The remainder of the analyses use these composites.

[2]Neither parent nor child reports of their own social desirability significantly correlated with the other measures.

[3]Because teacher and child reports of the teacher–child relationship were on a different scale, we standardized the scores before averaging the two scores. All other measures were on the same scale, so we did not standardize scores prior to creating the composites.

Regression Analyses

The observations in the present study are clustered (i.e., children are nested within classrooms); thus, prior to testing our hypotheses, we examined the intraclass correlations associated with each model. Clustered data can result in a correlation among responses from the same classroom, and standard errors and consequent significance tests may be biased if the correlation is ignored. Hox (2002) considered intraclass correlations values of .05, .10, and .15 to be small, medium, and large, respectively, but also demonstrated that even intraclass correlations of .10 can bias results. The intraclass correlations in this study ranged from .02 to .14, and the average intraclass correlation was .08 (see Table 3 and Table 4 for the intraclass correlation associated with each mixed model regression). Although the intraclass correlations were generally small, because clustering can potentially bias significance tests and resulting conclusions, the remainder of the analyses were computed using mixed models in SPSS Version 12.0, with classroom as a random effect.

The variables did not exceed West, Finch, and Curran's (1995) cutoffs for skewness, kurtosis, and outliers. According to Cook's (1977) distance, there were no multivariate outliers. In each analysis, we controlled for children's sex and family SES. In addition, when predicting spring GPA (or spring absences), we controlled for fall GPA (or fall absences) to examine the relation of the predictors to change in academic competence across the school year.

To address the first goal of predicting indices of academic competence from EC, we computed two mixed model regressions (see Table 3). Consistent with expectations, EC was positively related to spring GPA and negatively related to spring absences. To test the prediction that the teacher–child relationship, social competence, and classroom participation partially mediated the relation between EC and GPA (or absences), we computed additional mixed model regressions on the basis of the guidelines outlined by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002). For mediation to be present, EC should predict the mediator (e.g., teacher–child relationship, social competence, or classroom participation) and the mediator should predict the outcome (e.g., GPA or absences) when EC is included in the model. Full mediation exists if the relation between EC and the outcome is zero when the mediator is included in the model, whereas partial mediation exists if EC continues to predict the outcome when the mediator is in the model.

The first column of betas in Table 4 illustrates that the relation between EC and the teacher–child relationship was significant and that the teacher–child relationship was positively related to GPA and absences beyond the effects of EC (and fall GPA or absences, sex, and SES). To test for mediation and to accommodate the nonnormal distribution of the indirect effects (e.g., the product of the coefficient from the independent variable to the mediator and the coefficient from the mediator to the dependent variable are generally nonnormally distributed), we used a confidence interval method (MacKinnon et al., 2002). The upper and lower confidence limits are based on the product of the two random variables from tables produced by Meeker, Cornwell, and Aroian (1981). When the confidence intervals do not include zero, mediation is significant. As shown in Table 5, the confidence limits for mediation by the teacher–child relationship of the EC to academic competence (GPA and absences) relation do not include zero. Table 5 also indicates that the teacher–child relationship mediated 14% of the effect of EC on GPA and 40% of the effect of EC on absences.

Findings in the second panel of Table 4 demonstrate that EC was positively related to social competence and that social competence partially mediated the relation between EC and GPA but not absences (see Table 5 for the confidence limits and the percentage of variance that was mediated). In contrast, consistent with the findings for the teacher–child relationship,

there was evidence that classroom participation partially mediated the relation between EC and GPA and mediated the relations between EC and absences (see the third column of betas in Table 4).

Although we did not expect findings to differ by ethnicity, we computed interactions to test if the strength of the relations differed for Mexican American versus European American students, because 47% of the sample was Mexican American and the next largest percentage of ethnic population represented was European American (30%). We added the main effect of ethnicity (i.e., Mexican American vs. European American) and the interaction of ethnicity and EC when predicting the teacher–child relationship, social competence, and classroom participation. When predicting GPA or absences, we also tested if the mediators interacted with ethnicity. None of the interaction terms or main effects of ethnicity were significant. The relatively small sample sizes for the other ethnic groups (e.g., African American students) precluded the testing of further ethnic group comparisons. Thus, consistent with expectations, there was no evidence that the strength of the findings differed across the ethnicities we tested.

Discussion

Our primary purpose in this study was to begin to fill a gap in the literature on the regulatory and social variables related to children's school success. Despite a recent research emphasis on the importance of academic functioning for positive developmental trajectories (Ladd, 2003; Welsh et al., 2001), 15% of U.S. students drop out of formal schooling prior to graduating from high school (Stoops, 2004). Students who perform poorly often develop negative attitudes and poor scholastic habits early in their school careers; thus, a better understanding of the regulatory and social factors that are related to academic achievement in early academic grades may inform intervention programs for these students. Therefore, our first goal was to test if EC was positively related to changes in children's grades and absences, and the second goal was to test if part of the relation between EC and academic competence was mediated by children's social relationships and classroom participation.

Results supported the hypothesis that EC was positively related to grades and negatively related to absences. This relation is consistent with limited theory and data (Eisenberg et al., 2005; Hill & Craft, 2003; Raver, 2002; Valiente et al., 2007). Blair (2002) has argued that EC, and particularly attentional regulation, is related to academic competence because students who have difficulty directing their attention and behavior likely experience significant challenges when trying to learn and focus on educational material. This explanation has roots in the cognitive literature (Ruff & Rothbart, 1996) and is supported by findings that children who have difficulty with attention often have poor reading and language skills (McGee, Partridge, Williams, & Silva, 1991; Tamis-LeMonda & Bornstein, 1989), perhaps because frequently shifting attention and moving between tasks interfere with both learning and completing tasks.

Consistent with our hypotheses, there was evidence that some of the relation between EC and grades (as well as absences) was mediated by the teacher–child relationship, social competence (for grades only), and classroom participation. To our knowledge, this is the first study to find that the teacher–child relationship and social competence mediate part of the relation between EC and grades. A number of investigators have found links between children's EC and their social competence, problem behaviors, and social skills (see Rothbart & Bates, 2006, for a review), and data from this study suggest that part of the reason children high in EC perform well in school is indirect and through their social relationships at school. These results support the hypothesis that students' relationships in the school context are important for school success (Baumeister & Leary, 1995; Furrer &

Skinner, 2003). It is also possible that when children are low in EC and disruptive in class, they receive less classroom support from teachers and peers, miss out on learning opportunities, and view the classroom environment negatively and as something to be avoided.

In addition to the teacher–child relationship and social competence, classroom participation partially mediated the relation between EC and GPA and mediated the relation between EC and absences. These results are consistent with findings that classroom participation is positively related to math and language skills (Buhs & Ladd, 2001) and improvements in academic achievement (Ladd, Buhs, & Seid, 2000) and with evidence that school liking mediates the relation between EC and academic competence (Valiente et al., 2007). The data presented here coincide with Wentzel's (1999) hypothesis that children who are comfortable and engaged at school may also perform well academically because they are motivated to pursue goals valued in the school context.

There is increasing evidence that indices of EC are related to students' academic competence. In this article, we have argued that part of the reason for this relation is that EC provides students with both relational and motivational advantages that help them perform well. Because we found evidence of partial mediation (especially for grades), there is some evidence that EC also has a direct effect on academic competence. Perhaps there are components of EC that are more closely tied to academic performance and that are independent of relational and motivational processes. In future work, it would be useful to measure various components of EC and related constructs to more closely assess why there are both direct and indirect effects. More cognitively oriented components of EC such as planning and attention allocation may be directly related to academic competence. Inhibitory components are necessary for desirable behavior, and these may be aspects of EC that are mediated by constructs such as social competence, the teacher–child relationship, and classroom participation. One could test the working hypothesis that social and motivational processes mediate the relational and inhibitory components of EC, but the attentional advantages directly relate to academic competence by obtaining purer measures of the components of EC. Advancing this approach is one way to more fully explain why preschoolers' ability to delay gratification is associated with later verbal and quantitative SAT scores (Shoda et al., 1990).

This study demonstrates several strengths. First, we incorporated data from multiple reporters for all variables (i.e., parents, teachers, and children reported on the same variables) to reduce common source variance. Second, although researchers have recently attended to the influence of EC on academic competence, few have examined processes or mechanisms underlying this relation. A more precise understanding of why relations emerge between EC and academic performance and school absence is useful for promoting children's positive development. Third, the inclusion of a large percentage of Mexican American participants strengthens this study: The U.S. Bureau of the Census (2004) reported that by 2050, 25% of students will be of Latino descent, yet research on the normative academic functioning of this population is rare. Understanding school success among ethnic minority students is particularly important because a robust association between ethnic minority status and the likelihood of failing to complete high school has been established, with Latino students ranked most likely to drop out (Kaufman, Alt, & Chapman, 2004; U.S. Bureau of the Census, 2004). In this study, results did not differ for the European American participants and the Mexican American participants.

Finally, although not all variables were assessed longitudinally, academic competence was examined at two time points. Prediction of children's academic competence in the spring was examined while controlling for their academic competence in the fall. By controlling for

fall grades or absences when examining regulatory and social contributors to children's spring grades or absences, one can assess how these factors related to academic competence beyond children's preexisting academic ability.

Despite strengths, this study had some limitations. First, we used concurrent assessments of children's EC, social competence, and classroom participation. Our data are thus correlational and do not allow for firm conclusions about directionality. Second, although the scores used in this study are valid and relate to observed indices of the relevant constructs (Birch & Ladd, 1997; Capaldi & Rothbart, 1992; Eisenberg et al., 2000), the data in the current study were assessed with questionnaires only, and future studies would benefit from using observational assessments. For example, Kochanska and colleagues have developed a battery of tasks to measure young children's EC, and methods are available to observationally code both student-teacher interactions and engagement (Kochanska et al., 2000, 2001; Ladd et al., 1999; Pianta, La Paro, Payne, Cox, & Bradley, 2002). These methods will be especially useful tools to elaborate on the beginning stages from this line of research. Finally, this line of research would be strengthened by adding a measure of IQ to the models. Evidence indicates that measures of children's regulatory abilities, relationships, and participation relate to academic competence beyond the effects of IQ (Blair, 2001; Gottfried, 1990; Masten et al., 2005), but it remains possible that the strength of the relations would be reduced after including IQ.

Despite these limitations, the findings from the current study advance the understanding of the relations between regulatory and social variables and academic competence and provide new information about mechanisms that may explain why children's regulatory abilities are associated with their learning and school success. The results presented here provide evidence that EC is related to academic competence, that the teacher–child relationship and classroom participation partially mediate the relation of EC to GPA and absences, and that social competence partially mediates the relation of EC to GPA. These models present some possible process mechanisms underlying factors that are associated with children's academic competence, and these findings emphasize the importance of considering regulatory and social influences on academic competence in future models.

Acknowledgments

This research was funded in part by a grant from the Faculty Grant in Aid program, Arizona State University, and from National Science Foundation CAREER Award BCS-0546096 to Carlos Valiente. We thank the principals, teachers, and students of the Casa Grande School District for their support of this research. We also thank Adriana Umaña-Taylor and Sandra Simpkins for their comments on a draft of this article.

References

Alexander KL, Entwisle DR. Achievement in the first 2 years of school: Patterns and processes. Monographs of the Society for Research in Child Development 1988;53:2.

Arnold DH, Homrok S, Ortiz C, Stowe RM. Direct observation of peer rejection acts and their temporal relation with aggressive acts. Early Childhood Research Quarterly 1999;14:183–196.

Baumeister RF, Leary MR. The need to belong: Desire for interpersonal attachments as a fundamental human motivation. Psychological Bulletin 1995;117:497–529. [PubMed: 7777651]

Berndt TJ, Keefe K. Friends' influence on adolescents' adjustment to school. Child Development 1995;66:1312–1329. [PubMed: 7555218]

Birch SH, Ladd GW. The teacher–child relationship and children's early school adjustment. Journal of School Psychology 1997;35:61–79.

Blair C. The early identification of risk for grade retention among African American children at risk for school difficulty. Applied Developmental Science 2001;5:37–50.

Blair C. School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. American Psychologist 2002;57:111–127. [PubMed: 11899554]

Bronson MB, Tivnan T, Seppanen PS. Relations between teacher and classroom activity variables and the classroom behaviors of prekindergarten children in Chapter 1 funded programs. Journal of Applied Developmental Psychology 1995;16:253–282.

Buhs ES, Ladd GW. Peer rejection as antecedent of young children's school adjustment: An examination of mediating processes. Developmental Psychology 2001;37:550–560. [PubMed: 11444490]

Capaldi DM, Rothbart MK. Development and validation of an early adolescent temperament measure. Journal of Early Adolescence 1992;12:153–173.

Caspi A, Elder GH, Bem DJ. Moving against the world: Life-course patterns of explosive children. Developmental Psychology 1987;23:308–313.

Children's Action Alliance. Phoenix, AZ: Author; 1999. One in three: Trends, challenges, and opportunities facing Hispanic families in Arizona.

Cook RD. Detection of influential observation in linear regression. Technometrics 1977;19:15–19.

Davis-Kean PE. The influence of parent education and family income on child achievement: The indirect role of parental expectations and the home environment. Journal of Family Psychology 2005;19:294–304. [PubMed: 15982107]

Dweck, CS. Motivation. In: Lesgold, A.; Glaser, R., editors. Foundations for a psychology of education. Hillsdale, NJ: Erlbaum; 1989. p. 87-136.

Eccles, JS.; Wigfield, A.; Schiefele, U. Motivation to succeed. In: Damon, W.; Eisenberg, N., editors. Handbook of child psychology: Vol. 3. Social, emotional, and personality development. New York: Wiley; 1998. p. 1017-1095.

Eisenberg, N. Introduction. In: Damon, W.; Eisenberg, N., editors. Handbook of child psychology: Vol. 3. Social, emotional, and personality development. 6th ed.. New York: Wiley; 2006. p. 1-23.

Eisenberg, N.; Fabes, RA. Prosocial development. In: Damon, W.; Eisenberg, N., editors. Handbook of child psychology: Vol. 3. Social, emotional, and personality development. New York: Wiley; 1998. p. 701-778.

Eisenberg N, Fabes RA, Guthrie IK, Reiser M. Dispositional emotionality and regulation: Their role in predicting quality of social functioning. Journal of Personality and Social Psychology 2000;78:136–157. [PubMed: 10653511]

Eisenberg N, Gershoff ET, Fabes RA, Shepard SA, Cumberland AJ, Losoya SH, et al. Mothers' emotional expressivity and children's behavior problems and social competence: Mediation through children's regulation. Developmental Psychology 2001;37:475–490. [PubMed: 11444484]

Eisenberg N, Pidada S, Liew J. The relations of regulation and negative emotionality to Indonesian children's social functioning. Child Development 2001;72:1747–1763. [PubMed: 11768143]

Eisenberg N, Sadovsky A, Spinrad T. Associations among emotion-related regulation, language skills, emotion knowledge, and academic outcomes. New Directions in Child and Adolescent Development 2005;109:109–118.

Ensminger ME, Slusarcick AL. Paths to high school graduation or dropout: A longitudinal study of a first-grade cohort. Sociology of Education 1992;65:95–113.

Fabes RA, Martin CL, Hanish LD, Anders MC, Madden-Derdich DA. Early school competence: The roles of sex-segregated play and effortful control. Developmental Psychology 2003;39:848–858. [PubMed: 12952398]

Finn, JD. Publication No. NCES 93470. Washington, DC: U.S Department of Education, National Center of Educational Statistics. (ERIC Document Reproduction Service No. ED 362 322); 1993. School engagement and students at risk.

Frome PM, Eccles JS. Parents' influence on children's achievement-related perceptions. Journal of Personality and Social Psychology 1998;74:435–452. [PubMed: 9491586]

Furrer C, Skinner E. Sense of relatedness as a factor in children's academic engagement and performance. Journal of Educational Psychology 2003;95:148–162.

Gilliom M, Shaw DS, Beck JE, Schonberg MA, Lukon JL. Anger regulation in disadvantaged preschool boys: Strategies, antecedents, and the development of self-control. Developmental Psychology 2002;38:222–235. [PubMed: 11881758]

Gottfried AE. Academic intrinsic motivation in young elementary school children. Journal of Educational Psychology 1990;82:525–538.

Gottfried AE, Fleming JS, Gottfried AW. Role of parental motivational practices in children's academic intrinsic motivation and achievement. Journal of Educational Psychology 1994;86:104–113.

Hamre BK, Pianta RC. Early teacher–child relationships and the trajectory of children's school outcomes through eighth grade. Child Development 2001;72:625–638. [PubMed: 11333089]

Harter S. The Perceived Competence Scale for Children. Child Development 1982;53:87–97.

Haveman R, Wolfe B. The determinants of children's attainments: A review of methods and findings. Journal of Economic Literature 1995;33:1829–1878.

Hill NE, Craft SA. Parent-school involvement and school performance: Mediated pathways among socioeconomically comparable African American and Euro-American families. Journal of Educational Psychology 2003;95:74–83.

Hox, J. Multilevel analysis: Techniques and applications. Mahwah, NJ: Erlbaum; 2002.

Huffman, LC.; Mehlinger, SL.; Kerivan, AS. Risk factors for academic and behavioral problems at the beginning of school. Bethesda, MD: National Institute of Mental Health; 2000.

Hughes JN, Kwok O-m. Classroom engagement mediates the effect of teacher-student support on elementary students' peer acceptance: A prospective analysis. Journal of School Psychology 2006;43:465–480. [PubMed: 20431706]

Jordan NC, Kaplan D, Oláh LN, Locuniak MN. Number sense growth in kindergarten: A longitudinal investigation of children at risk for mathematics difficulties. Child Development 2006;77:153–175. [PubMed: 16460531]

Kaufman, P.; Alt, MN.; Chapman, CD. Publication No. NCES 2005046. Washington, DC: U.S. Government Printing Office; 2004. Dropout rates in the United States: 2001.

Kochanska G, Coy KC, Murray KT. The development of self-regulation in the first four years of life. Child Development 2001;72:1091–1111. [PubMed: 11480936]

Kochanska G, Murray K, Coy KC. Inhibitory control as a contributor to conscience in childhood: From toddler to early school age. Child Development 1997;68:263–277. [PubMed: 9180001]

Kochanska G, Murray KT, Harlan ET. Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. Developmental Psychology 2000;36:220–232. [PubMed: 10749079]

Ladd, GW. Probing the adaptive significance of children's behavior and relationships in the school context: A child by environment perspective. In: Kail, RV., editor. Advances in child development and behavior. Vol. Vol. 31. San Diego, CA: Academic Press; 2003. p. 43-104.

Ladd GW, Birch SH, Buhs ES. Children's social and scholastic lives in kindergarten: Related spheres of influence? Child Development 1999;70:1373–1400. [PubMed: 10621962]

Ladd GW, Buhs ES, Seid M. Children's initial sentiments about kindergarten: Is school liking an antecedent of early classroom participation and achievement? Merrill Palmer Quarterly 2000;46:255–279.

Ladd GW, Kochenderfer BJ, Coleman CC. Friendship quality as a predictor of young children's early school adjustment. Child Development 1996;67:1103–1118. [PubMed: 8706512]

Lemerise EA, Arsenio WF. An integrated model of emotion processes and cognition in social information processing. Child Development 2000;71:107–118. [PubMed: 10836564]

Lewit EM, Baker LS. School readiness. Future of Children 1995;5:128–139. [PubMed: 8528685]

MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V. A comparison of methods to test mediation and other intervening variable effects. Psychological Methods 2002;7:83–104. [PubMed: 11928892]

Masten AS, Roisman GI, Long JD, Burt KB, Obradović J, Riley JR, et al. Developmental cascades: Linking academic achievement and externalizing and internalizing symptoms over 20 years. Developmental Psychology 2005;41:733–746. [PubMed: 16173871]

McEvoy A, Welker R. Antisocial behavior, academic failure, and school climate: A critical review. Journal of Emotional and Behavioral Disorders 2000;8:130–140.

McGee R, Partridge F, Williams S, Silva PA. A twelve-year follow-up of preschool hyperactive children. Journal of the American Academy of Child & Adolescent Psychiatry 1991;30:224–232. [PubMed: 2016226]

Meeker, WQ.; Cornwell, LW.; Aroian, LA. Selected tables in mathematical statistics: Vol. VII. The product of two normally distributed random variables. Providence, RI: American Mathematical Society; 1981.

Midgley C, Feldlaufer H, Eccles JS. Student/teacher relations and attitudes toward mathematics before and after the transition to junior high school. Child Development 1989;60:981–992. [PubMed: 2758891]

Murray C, Greenberg MT. Children's relationship with teachers and bonds with school: An investigation of patterns and correlates in middle childhood. Journal of School Psychology 2000;38:423–445.

NICHD Early Child Care Research Network. Do children's attention processes mediate the link between family predictors and school readiness? Developmental Psychology 2003;39:581–593. [PubMed: 12760525]

NICHD Early Child Care Research Network. Predicting individual differences in attention, memory, and planning in first graders from experiences at home, child care, and school. Developmental Psychology 2005;41:99–114. [PubMed: 15656741]

Pianta, RC. Student–Teacher Relationship Scale. Odessa, FL: Psychological Assessment Resources; 2001.

Pianta RC, La Paro KM, Payne C, Cox MJ, Bradley R. The relation of kindergarten classroom environment to teacher, family, and school characteristics and child outcomes. Elementary School Journal 2002;102:225–238.

Pierce KM, Hamm JV, Vandell DL. Experiences in after-school programs and children's adjustment in first-grade classrooms. Child Development 1999;70:756–767. [PubMed: 10368920]

Raver CC. Emotions matter: Making the case for the role of young children's emotional development for early school readiness. Social Policy Report 2002;16:3–18.

Resnick MD, Bearman PS, Blum RW, Bauman KE, Harris KM, Jones J, et al. Protecting adolescents from harm: Findings from the National Longitudinal Study on Adolescent Health. Journal of the American Medical Association 1997;278:823–832. [PubMed: 9293990]

Rodriguez ML, Mischel W, Shoda Y. Cognitive person variables in the delay of gratification of older children at risk. Journal of Personality and Social Psychology 1989;57:358–367. [PubMed: 2760808]

Rothbart, MK.; Bates, JE. Temperament. In: Damon, W.; Eisenberg, N., editors. Handbook of child psychology: Vol. 3. Social, emotional, and personality development. 6th ed.. New York: Wiley; 2006. p. 99-166.

Ruff, HA.; Rothbart, MK. Attention in early development: Themes and variations. London: Oxford University Press; 1996.

Schafer JL, Graham JW. Missing data: Our view of the state of the art. Psychological Methods 2002;7:147–177. [PubMed: 12090408]

Schultz D, Izard CE, Ackerman BP. Children's anger attribution bias: Relations to family environment and social adjustment. Social Development 2000;9:284–301.

Shoda Y, Mischel W, Peake PK. Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. Developmental Psychology 1990;26:978–986.

Shores RE, Wehby JH. Analyzing the classroom social behavior of students with EBD. Journal of Emotional and Behavioral Disorders 1999;7:194–199.

Simpkins SD, Davis-Kean PE, Eccles JS. Math and science motivation: A longitudinal examination of the links between choices and beliefs. Developmental Psychology 2006;42:70–83. [PubMed: 16420119]

Stoops, N. Educational attainment in the United States: 2003. Washington, DC: U.S. Census Bureau; 2004.

Tamis-LeMonda CS, Bornstein MH. Habituation and maternal encouragement of attention in infancy as predictors of toddler language, play, and representational competence. Child Development 1989;60:738–751. [PubMed: 2737021]

U.S. Bureau of the Census. U.S. interim projections by age, sex, race, and Hispanic origin. Washington, DC: U.S. Government Printing Office; 2004.

U.S. Department of Education. Stronger accountability: Reaching out, raising Hispanic achievement. Washington, DC: Author; 2004.

Valiente C, Eisenberg N, Fabes RA, Shepard SA, Cumberland AJ, Losoya SH. Prediction of children's empathy-related responding from their effortful control and parents' expressivity. Developmental Psychology 2004;40:911–926. [PubMed: 15535747]

Valiente C, Eisenberg N, Smith CL, Reiser M, Fabes RA, Losoya S, et al. The relations of effortful control and reactive control to children's externalizing problems: A longitudinal assessment. Journal of Personality 2003;71:1171–1196. [PubMed: 14633062]

Valiente C, Lemery-Chalfant KS, Castro KS. Children's effortful control and academic competence: Mediation through school liking. Merrill-Palmer Quarterly 2007;53:1–25.

Welsh M, Parke RD, Widaman K, O'Neil R. Linkages between children's social and academic competence: A longitudinal analysis. Journal of School Psychology 2001;39:463–482.

Wentzel KR. Social-motivational processes and interpersonal relationships: Implications for understanding motivation at school. Journal of Educational Psychology 1999;91:76–97.

West, SG.; Finch, JF.; Curran, PJ. Structural equation models with nonnormal variables: Problems and remedies. In: Hoyle, RH., editor. Structural equation modeling: Concepts, issues, and applications. Thousand Oaks, CA: Sage; 1995. p. 56-75.

Wigfield, A.; Eccles, JS.; Schiefele, U.; Roeser, R.; Davis-Kean, P. Development of achievement motivation. In: Damon, W.; Eisenberg, N., editors. Handbook of child psychology: Vol. 3. Social, emotional, and personality development. 6th ed.. New York: Wiley; 2006. p. 933-1002.

Willson VL, Hughes JN. Retention of Hispanic/Latino students in first grade: Child, parent, teacher, school, and peer predictors. Journal of School Psychology 2006;44:31–49. [PubMed: 20419036]

Zhou Q, Eisenberg N, Wang Y, Reiser M. Chinese children's effortful control and dispositional anger/frustration: Relations to parenting styles and children's social functioning. Developmental Psychology 2004;40:352–366. [PubMed: 15122962]

Zimmerman, BJ. Developing self-fulfilling cycles of academic regulation: An analysis of exemplary instructional models. In: Schunk, DH., editor. Self-regulated learning: From teaching to self-reflective practice. New York: Guilford Press; 1998. p. 1-19.

Table 1

Descriptive Statistics for Study Variables

Variable	*M*	*SD*	Range
Socioeconomic status	3.28	1.37	0–7
Effortful control: Child report	3.41	0.52	2.00–5.00
Effortful control: Parent report	3.27	0.60	1.11–4.72
Social competence: Teacher report	3.05	0.68	1.00–4.00
Social competence: Parent report	3.00	0.78	1.00–4.06
Teacher–child relationship: Child report	2.21	0.44	1.00–3.00
Teacher–child relationship: Teacher report	3.90	0.61	1.50–5.00
Classroom participation: Child report	2.34	0.31	1.20–3.00
Classroom participation: Teacher report	2.44	0.51	1.18–3.00
GPA (fall)	3.92	0.87	1.00–5.00
GPA (spring)	3.89	0.94	1.00–5.00
Absences (fall)	0.97	1.12	0.00–6.50
Absences (spring)	1.86	1.78	0.00–12.00

Note. Statistics for socioeconomic status and absences are presented prior to standardizing scores. The standardized scores are used in all other analyses.

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Table 2

Zero-Order Correlations for Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Socioeconomic status	—	.22**	.14*	.14*	.35**	−.02	.13	.11	.17*	.27**	.28**	−.07	.05
2. Effortful control: Child report	.26**	—	.39**	.33*	.26**	.32**	.34**	.32**	.42**	.36**	.41**	−.13*	−.17*
3. Effortful control: Parent report	.16*	.41**	—	.35**	.26**	.27**	.20**	.16*	.43**	.46**	.49**	−.08	−.09
4. Social competence: Teacher report	.18*	.35**	.37**	—	.28**	.19**	.65**	.15*	.77**	.38**	.46**	−.16*	−.24**
5. Social competence: Parent report	.36**	.27**	.27**	.29**	—	.05	.24**	.16*	.30**	.32**	.32**	.06	.13* -
6. Teacher–child relationship: Child report	−.03	.33**	.29**	.20**	.05	—	.30**	.51**	.27**	.22**	.30**	−.11	.17*
7. Teacher–child relationship: Teacher report	.14*	.35**	.19**	.65**	.25**	.31**	—	.26**	.70**	.29**	.33**	−.13*	−.21**
8. Classroom participation: Child report	.12*	.34**	.16*	.16*	.17**	.52**	.28**	—	.30**	.22**	.25**	−.07	−.15*
9. Classroom participation: Teacher report	.20*	.43**	.45**	.78**	.30**	.29**	.70**	.32**	—	.56**	.61**	−.16*	−.28*
10. GPA (fall)	.29*	.38**	.48**	.43**	.32**	.27**	.33**	.26**	.59**	—	.65**	−.12*	−.08
11. GPA (spring)	.27*	.42**	.52**	.48**	.31**	.30**	.35**	.27**	.63**	.67**	—	−.15*	−.23**
12. Absences (fall)	−.10	−.14*	−.08	−.15*	.09	−.10	−.13*	−.08	−.16*	−.12*	−.14*	—	.42**
13. Absences (spring)	.04	−.17**	−.11†	−.24**	.15*	−.17**	−.21**	−.16**	.28**	−.13*	−.23**	.42**	—

Note. Correlations with imputed data are below the main diagonal. Correlations based on pairwise deletion are above the main diagonal.

† $p < .10$.

* $p < .05$.

** $p < .01$.

Table 3

Prediction of GPA and Absences From EC

Predictor	β	*SE* β	R^2	ICC
Predicting spring GPA from EC				.07
Fall GPA	.54***	.06		
Sex	.14†	.08		
SES	.11*	.06	.47	
EC	.51**	.10	.51	
Predicting spring absences from EC				.02
Fall absences	.43***	.06		
Sex	.01	.09		
SES	.12*	.06	.19	
EC	−.23*	.09	.21	

Note. EC = children's effortful control; SES = family socioeconomic status; ICC = intraclass correlation. Betas are unstandardized.

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

Mixed Model Regressions

Predictor	β	*SE* β	R^2	ICC	Predictor	β	*SE* β	R^2	ICC	Predictor	β	*SE* β	R^2	ICC
Predicting the teacher-child relationship from EC				.11	Predicting social competence from EC				.09	Predicting classroom participation from EC				.04
Sex	.34***	.09			Sex	.13*	.06			Sex	.13***	.04		
SES	−.01	.06	.09		SES	.18***	.04	.16		SES	.05*	.02	.17	
EC	.61***	.10	.21		EC	.48***	.07	.28		EC	.32***	.04	.32	
Predicting spring GPA from EC and the teacher-child relationship				.14	Predicting spring GPA from EC and social competence				.14	Predicting spring GPA from EC and classroom participation				.14
Fall GPA	.52***	.06			Fall GPA	.51***	.06			Fall GPA	.45***	.06		
Sex	.10	.08			Sex	.12	.08			Sex	.08	.08		
SES	.11*	.06	.47		SES	.08	.06	.47		SES	.09	.05	.47	
EC	.45***	.10	.52		EC	.44***	.10	.52		EC	.38***	.10	.51	
Teacher-child relationship	.12*	.06	.53		Social competence	.20*	.08	.53		Classroom participation	.66***	.14	.56	
Predicting spring absence from EC and the teacher-child relationship				.03	Predicting spring absences from EC and social competence				.02	Predicting spring absences from EC and classroom participation				.02
Fall absence	.41***	.06			Fall absences	.42***	.06			Fall absences	.41***	.06		
Sex	.06	.09			Sex	.01	.09			Sex	.08	.09		
SES	.11†	.06	.19		SES	.12	.06	.19		SES	.14*	.06	.19	
EC	−.15	.10	.21		EC	−.23*	.11	.21		EC	−.06	.11	.21	
Teacher-child relationship	−.15**	.06	.23		Social competence	−.01	.08	.21		Classroom participation	−.55***	.15	.25	

Note. EC = children's effortful control; SES = family socioeconomic status; ICC = intraclass correlation. Betas are unstandardized. Sex was dummy coded such that boys = 1 and girls = 2.

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 5

Confidence Limits for Mediated Effects

Effect	Lower confidence limit	Upper confidence limit	Total effect that was mediated
EC > TCR > GPA	**.01**	**.15**	**14%**
EC > TCR > Absence	**−.18**	**−.02**	**40%**
EC > SC > GPA	**.02**	**.18**	**19%**
EC > SC > Absence	−.08	.07	1%
EC > PART > GPA	**.12**	**.32**	**36%**
EC > PART > Absence	**−.29**	**−.08**	**76%**

Note. EC = children's effortful control; TCR = teacher–child relationship; GPA = grade point average; SC = social competence; PART = classroom participation. Bolded effects are significant at the .05 level because the confidence limits do not contain zero.