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Are Approaches to Learning in Kindergarten Associated with Academic and Social Competence Similarly?

Rachel A. Razza, PhD^a, Anne Martin, DrPH^b, and Jeanne Brooks-Gunn, PhD^b

Rachel A. Razza: rrazza@syr.edu; Anne Martin: arm53@columbia.edu; Jeanne Brooks-Gunn: jb224@columbia.edu

^aDepartment of Child and Family Studies, Syracuse University, 426 Ostrom Avenue, Syracuse, NY 13244

^bNational Center for Children and Families, Teachers College, Columbia University, 525 West 120th Street, Box 39, New York, NY 10027

Approaches to learning (ATL) is an umbrella term encompassing a broad set of learning-related skills that reflect children's enthusiasm for and engagement in educational activities (Hyson, 2008). In general, ATL include attentiveness, persistence, flexibility, organization and compliance, although specific components may vary from study to study (Fantuzzo et al., 2007; McWayne, Fantuzzo, & McDermott, 2004; Stipek, Newton, & Chudgar, 2010). Collectively, these skills facilitate learning by allowing children to follow directions, persevere with difficult tasks, adapt problem-solving strategies, work independently, and cooperate with classmates (Blair, 2002; Foulks & Morrow, 1989).

Since ATL was named a key dimension of school readiness by the National Education Goals Panel (Kagan, Moore, & Bredekamp, 1995), a growing body of research has demonstrated the implications of these skills for children's early academic trajectories. Specifically, ATL at kindergarten entry significantly predict reading and math achievement across elementary school (Li-Grining, Votruba-Drzal, Maldonado-Carreno, & Haas, 2010; McClelland, Acock, & Morrison, 2006; Morgan, Farkas, & Wu, 2011). Interestingly, however, the benefits of ATL for social competence have been largely unaddressed. This oversight is puzzling because many of the same skills that promote engagement with learning also promote competent behavior with peers. For example, persistence enables children to wait their turn, and to sustain participation in a game despite boredom or frustration, both of which may make the child a more desirable playmate (Andrade, Brodeur, Waschbusch, Stewart, & McGee, 2009). Thus, it is likely that the benefits of ATL extend to the socioemotional domain. The current study addresses this possibility by examining the effects of kindergarten ATL on children's externalizing problems and social skills in middle childhood.

Also of interest is whether the benefits of early ATL are uniform across all children or whether ATL confer unique advantages based on risk status. Two studies using a nationally representative sample found that kindergarten ATL had the largest return on achievement in elementary school for students with the lowest levels of initial achievement (Bodovski &

Farkas, 2007; Li-Grining et al., 2010). This pattern is consistent with a *compensatory model* of development, in which children at greater developmental risk reap greater rewards from protective factors such as ATL compared to peers at lower risk (Leppanen, Niemi, Aunola, & Nurmi, 2004; Luthar, Cicchetti, & Becker, 2000). It is unknown whether ATL also have a compensatory effect within the socioemotional domain, such that children with the poorest skills (i.e., highest level of behavior problems) benefit the most socially from ATL. Alternatively, it is possible that ATL follow a *cumulative model* of growth with respect to social competence, such that children with more problem behaviors experience less growth in this domain as a function of ATL. This could be the case, for instance, if children with high levels of problem behavior at school entry earn lasting reputations among teachers, who fail to recognize the children's ATL and/or restrict their opportunities to practice adaptive social skills. Thus, the current study considers competing hypotheses regarding the interaction between ATL and early problem behavior in predicting children's social outcomes at age 9. We analyze a largely low-income urban sample, where moderation may be more pronounced than in a national sample given lower academic achievement and greater problem behaviors (Duncan, Brooks-Gunn, & Klebanov, 1994; Lavigne et al., 1996).

ATL and School Success

ATL, also referred to as learning-related skills or work-related skills (Fantuzzo, Perry, & McDermott, 2004; McClelland et al., 2006; McClelland, Morrison, & Holmes, 2000), are generally conceptualized as a broad set of skills that support engagement in learning activities within an educational environment. More specifically, ATL assesses several skills that rely on executive function (EF), a suite of higher-order cognitive skills (working memory, inhibitory control, and attention flexibility) that support children's ability to monitor and control thought and action (Blair & Ursache, 2011). ATL also taps effortful control (EC), the ability to inhibit prepotent responses and control reactivity or emotionality (Rothbart & Bates, 2006). However, unlike EF and EC, which have implications for children's behavior across a variety of contexts, ATL refers to skills within the classroom context. Thus, while EF and EC are typically directly assessed, ATL are often reported by teachers and reflect their daily observations of the child's behavior.

The multidimensional nature of ATL likely explains its identification as a key dimension of school readiness and indicator of future academic success. Indeed, teacher-reported ATL in kindergarten have been found to predict academic success in both reading and math years later (Bodovski & Farkas, 2007; DiPerna, Lei, & Reid, 2007; Li-Grining et al., 2010). While it is certainly related to other dimensions of school readiness, particularly social/emotional development, the ATL construct is also distinct both theoretically and empirically. Specifically, ATL focus on skills that promote engagement in learning, while social/emotional development focuses on abilities that establish positive relationships with peers and teachers (Kagan et al., 1995). Although both ATL and social competence include cooperative behavior, ATL considers compliance with teacher requests and participation in group educational activities, while social competence considers interactions that foster friendships with peers and amiable relations with teachers. Past research demonstrates that ATL are central to academic success in elementary school, whereas interpersonal skills are not (McClelland et al., 2000). In one study, kindergarten teachers reported ATL-related

skills as the most important skills for children, while social skills and peer interactions were less critical (Foulks & Morrow, 1989). There is also evidence that teacher-reported ATL contributed as much as children's academic abilities to grade retention in kindergarten; the effect size for ATL was twice that for interpersonal skills (Huang, 2014).

Interestingly, however, we know little about the impact of early ATL on children's later social competence. A handful of studies link better ATL with more positive peer interactions and greater peer acceptance (Coolahan, Fantuzzo, Mendez, & McDermott, 2000; Fantuzzo et al., 2004; Hughes & Kwok, 2006), but these were cross-sectional or short-term (i.e., one-year). It therefore remains unclear whether ATL in kindergarten predicts children's subsequent social competence. Past evidence suggests that selected components of ATL are advantageous for socioemotional outcomes as well as for achievement. For example, just as attention facilitates the acquisition of academic material, it also appears to allow children to read and process social cues (Andrade et al., 2009). More broadly, ample research demonstrates that deficits in EF and EC are associated with higher levels of externalizing behaviors and lower levels of social skills (Eisenberg et al., 2001; Kochanska & Knaack, 2003; see Liew, 2012 for review). The present study addresses a gap in the literature by examining associations between children's ATL at age 5 and their externalizing problems and social skills at age 9.

ATL and Early Academic Skill

In a sparse but intriguing line of research, it appears that ATL have stronger positive associations with subsequent achievement among lower- than higher-achievers at school entry (Bodovski & Farkas, 2007; Li-Grining et al., 2010). Consequently, ATL may serve to narrow the gap between the highest- and lowest-achieving students. This gap is evident at kindergarten entry (West, Denton, & Germino-Hausken, 2000) and persists across the elementary school years (Duncan et al., 2007). Thus, ATL may be a worthy target for interventions aimed at promoting equity.

Both studies finding that ATL predict the greatest growth in achievement for children entering school with the lowest achievement scores were based on the same sample, the nationally representative Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS-K; Bodovski & Farkas, 2007; Li-Grining et al., 2010). To date, no research has replicated this pattern in a low-income sample. Based on the tendency for family- and individual-level risks to covary with low-income (Sameroff, Bartko, Baldwin, Baldwin, & Seifer, 1989), one might expect children with the fewest academic skills in a low-income sample to have multiple additional risks (e.g., exposure to violence, low parental warmth). If children with the highest cumulative risk benefit most from ATL, as the compensatory model would predict, then the tendency for children with the lowest initial academic scores to benefit most from ATL may be particularly pronounced in a low-income sample. This pattern would be consistent with other early educational experiences that have found to disproportionately benefit children of low socioeconomic status, such as high teacher expectations (Sorhagen, 2013) and instructional support (Hamre & Pianta, 2005). The present study is the first to test whether early academic skills moderate the link between age 5 ATL and age 9 achievement in a sample of predominantly low-income children.

ATL and Early Problem Behavior

If past findings regarding achievement apply to socioemotional outcomes, ATL should be more advantageous for growth in social competence for children with the lowest initial scores, or highest level of problem behavior. However, it is also possible that for social competence, ATL follow another pattern commonly found in development, in which initial differences between groups widen over time. This pattern of change reflects a cumulative growth model (DiPrete & Eirich, 2006; Morgan et al., 2011), in which children with lower initial scores are less likely than children with higher scores to be exposed to factors that promote growth, or they benefit less from those factors when they are exposed. A well-known example is that young children who have the strongest vocabularies tend to read more often than other children, thereby further enlarging their vocabularies; hence initial differences in skills grow over time (Stanovich, 1986).

It is difficult to predict which developmental model ATL will follow with respect to social competence. On the one hand, children who enter kindergarten with more behavior problems may benefit more from ATL because these skills provide opportunities for positive interactions with teachers and peers that would otherwise not arise. This scenario is consistent with research showing that peer acceptance is linked with greater positive social development for children with behavior problems (Garnezy, Masten, & Tellegen, 1984). On the other hand, a cumulative growth model may emerge if children who enter school with behavior problems establish long-lasting reputations with teachers and peers that are difficult to overcome. Research shows that early behavior problems correlate positively with teacher–child conflict and negatively with teacher–child closeness across the early elementary school years (Birch & Ladd, 1998; Blacher, Baker, & Eisenhower, 2009). Also, aggressive children are liked less than other children by both teachers (Mercer & DeRosier, 2008) and peers (Ladd & Burgess, 1999; Newcomb, Bukowski, & Pattee, 1993). Thus, it may be difficult for students with a reputation for poor behavior to overcome that expectation, even in the presence of adaptive ATL. In sum, both interaction scenarios are plausible, but have not yet been tested.

The Present Study

The present study poses three novel questions about ATL in kindergarten and achievement and behavior in middle childhood. First, we test whether a compensatory model of ATL and later achievement – whereby children with the lowest initial math and reading skills experience the greatest returns on their ATL – is found in a low-income sample, as it has previously in a national sample. Second, we provide the first longitudinal test of whether ATL is associated with later social competence (namely externalizing problems and social skills). Third, we test whether children’s initial problem behavior moderates the link between early ATL and later social competence. We tentatively expect a cumulative advantage model to describe the association between ATL and later social competence, such that children with the highest levels of initial problem behavior benefit least from ATL. This study is the first to depict social as well as academic growth in elementary school as a function of ATL at school entry. Results should suggest whether ATL exaggerates, attenuates, or acts independently of initial differences in competence within both

developmental domains. Given current calls for targeting early learning behaviors as a means of narrowing the achievement gap, it is important to understand whether ATL may hold similar promise in the domain of social competence.

Method

Participants

The participants for this study were drawn from the Fragile Families and Child Wellbeing Study, a predominantly low-income, minority sample that has been followed from birth through age 9. At baseline, the sample included nearly 4,900 children born between 1998 and 2000 across 20 U.S. cities. Children born to unmarried parents were oversampled ($n = 3,712$ vs. $n = 1,186$ children born to married parents), and cities were selected to be representative of all U.S. cities with populations of 200,000 or more (Reichman, Teitler, Garfinkle, & McLanahan, 2001). Mothers were interviewed in the hospital within 48 hours of the child's birth and fathers were interviewed soon after. Approval from both the Princeton University Institutional Review Board (IRB) and the individual hospitals' IRBs was secured (Reichman et al., 2001). The core study consisted of phone interviews when the child was 1, 3, 5, and 9 years.

The present study is restricted to a subsample of the core called the In-Home Longitudinal Study of Preschool Aged Children. Mothers who completed the age 5 core interview ($n = 3,700$ across 18 cities) were invited to participate in this substudy; 81% agreed but only 64% completed the in-home visit ($n = 2,366$). As part of the substudy, mothers were asked for permission to contact the child's kindergarten teacher. Prior to contacting teachers, approval was granted by the IRB at Teachers College, Columbia University as well as by public school boards (when required). In the majority of cities, written parental consent was obtained, but in five cities parents provided consent over the phone. Kindergarten teachers were contacted via mail and provided written consent. Kindergarten Teacher Surveys were completed for 1,039 children (69% response rate). An additional requirement for inclusion in our analytic sample was that children have data on at least one of the five outcome measures at age 9. This criterion resulted in the exclusion of 370 families, which brought the final analytic sample to 669 children. The majority of children were in 3rd (72%) or 4th (15%) grade at the age 9 assessment.

While it should be noted that the final analytic sample was no longer representative of mid-sized U.S. cities, these families were still predominantly disadvantaged. Indeed, over one half of the families had incomes that were less than 200% of the federal poverty threshold, a benchmark for economic hardships and an eligibility requirement for several types of public assistance (Halle et al., 2009), and another 15% had incomes below 300%, an eligibility cutpoint for the Children's Health Insurance Program in many states (Kaiser Commission on Medicaid and the Uninsured, 2014). Moreover, 64% of mothers were not married, 65% were ethnic minorities (i.e., African American or Hispanic), and only 14% had completed college. Nonetheless, the families in the analytic sample were slightly more advantaged than those in the original sample. For example, children in the analytic sample were significantly ($p < .05$) more likely to be white (32% vs. 21%), less likely to be black (43% vs. 47%) or Hispanic (22% vs. 27%), more likely to have married parents (36% vs. 24%), and more likely to have

a mother with some college experience or technical training (33% vs. 24%) or a college degree (14% vs. 11%).

Measures and Procedures

Approaches to Learning (ATL) at Age 5—Kindergarten teachers rated children’s ATL in kindergarten using a scale drawn from the ECLS-K. The Approaches to Learning scale consisted of the following 6 items ($\alpha = .93$) capturing children’s typical behaviors during learning activities: “pays attention during class,” “persists in classwork without being told,” “works independently,” “easily accepts changes in routine,” “organizes class materials,” and “eagerly accepts new ideas.” Teachers rated how true each statement was using the following 3-point scale: 1 (*never*), 2 (*somewhat or sometimes true*), and 3 (*very true or often true*). Scores were averaged across items. To ensure that our measure of ATL reflected behaviors only in the context of learning, we excluded the Self-Control scale (which captures social behaviors such as responding appropriately to peer pressure), which some past studies have included in their ATL composite (DiPrete & Jennings, 2012; Li-Grining et al., 2010).

Academic Skills and Problem Behavior at Age 5—Kindergarten teachers rated children’s early academic skills using two scales adopted from the ECLS-K. The reading scale included 3 items ($\alpha = .87$) tapping early literacy skills (story comprehension, reading, and print convention). The math scale included 3 items ($\alpha = .91$) tapping early numeracy skills (sorting/classification, understanding of quantity, and problem-solving strategies). Teachers rated the degree to which children acquired or demonstrated proficiency in each skill using the following 5-point scale: 1 (*not yet*), 2 (*beginning*), 3 (*in progress*), 4 (*intermediate*), and 5 (*proficient*). Items were averaged to create early reading and math composites. Although direct assessments of children’s academic skills at age 5 would have been preferable to teacher report to avert the possibility of shared method variance with ATL, only reading was assessed. Regression models in which this assessment (the Woodcock-Johnson Letter-Word Identification subtest; Woodcock & Johnson, 1989) was substituted for teacher-reported literacy skills produced comparable results.

Teachers also rated children’s problem behavior at age 5 using select items from the Teacher Report Form (Achenbach, 1991). Specifically, 15 items ($\alpha = .92$) from the Aggressive Behavior subscale were averaged to reflect children’s early problem behavior (sample items include “gets in many fights” and “threatens others”). Each item was rated using the following 3-point scale: 1 (*not true*), 2 (*somewhat or sometimes true*) and 3 (*very true or often true*).

Academic Achievement and Social Competence at Age 9—Children’s reading and math achievement was measured using the Passage Comprehension and Applied Problems subtests, respectively, of the Woodcock Johnson III Tests of Achievement (WJ-III; Woodcock, McGrew, & Mather, 2001). Passage Comprehension taps a child’s ability to understand what he/she reads. Applied Problems measures the child’s ability to analyze and solve math problems. These subtests were administered by trained interviewers during the in-home visit. The WJ-III is nationally normed by age (standard score of $M = 100$, $SD = 15$)

and has high test-retest reliability for this age group ($\alpha = .81-.94$). Standardized scores were used in analyses.

Children's social competence at age 9 was assessed via teacher report. Teachers rated children's externalizing problems and social skills using the Social Skills Rating System (SSRS; Gresham & Elliott, 2007). The Externalizing subscale consists of 6 items ($\alpha = .90$) tapping aggressive behaviors; sample items include "argues with others" and "threatens or bullies others." Social skills were tapped using the Assertion subscale, which consists of 5 items ($\alpha = .85$) capturing children's positive interpersonal skills; sample items include "invites others to join in activities" and "makes friends easily." For each item, teachers rated the frequency of the child's behavior on the following 3-point scale: 0 (*never*), 1 (*sometimes*), and 2 (*very often*). Items were averaged to create measures of externalizing problems and social skills.

Control Variables—Multivariate models controlled for key child and home characteristics that may influence both ATL and the outcomes. All controls except child's sex and mother's race/ethnicity (white, black, Hispanic, and other; collected at baseline) were collected at age 5. Maternal education was coded as less than high school, high school graduation or general equivalency diploma (GED), or some college or more. Maternal marital status was coded as married, cohabiting, or single. The family's poverty status reflected the ratio of total household income to that year's official poverty threshold. Following Stipek et al. (2010), children's performance on a receptive vocabulary task, the Peabody Picture Vocabulary Test (PPVT-III; Dunn & Dunn, 1997), represented cognitive ability.

Missing Data

Among the 669 families in the analytic sample, approximately 22% were missing data on at least one of the control variables. Each of these variables was missing for less than 5% of cases. Based on the assumption that data were missing at random (Allison, 2009), we conducted multiple imputation in Stata 11 to create five complete data sets with control and predictor variables. The ICE command in Stata (Royston, 2007) conducts multiple imputation based on a regression switching protocol using chained equations. While the dependent variables were used in imputation models for other missing variables, per the recommendation by von Hippel (2007), they themselves were not imputed. Thus, the number of participants varies slightly across outcomes, as noted in the tables. The five data sets were analyzed using the *mi beta* prefix for regression analyses in Stata, which combines coefficients and standard errors across imputed data sets and estimates standardized regression coefficients.

Results

The percentages, means, and standard deviations for all study variables are presented in Table 1. Bivariate correlations among the predictors at age 5 and the outcomes at age 9 are displayed in Table 2. As expected, age 5 ATL was significantly correlated with both academic and social outcomes at age 9. Specifically, early ATL was associated with greater math and reading achievement and social skills, and fewer externalizing problems, in middle childhood.

A series of multiple regression models were computed to examine the association between age 5 ATL and children's academic achievement and social competence at age 9. Of particular interest was whether these associations were moderated by early academic skills and early problem behavior, respectively. For all outcomes, ATL, the moderator, and the interaction term were entered into a simultaneous regression model. Specifically, models of age 9 academic outcomes included an interaction term multiplying age 5 ATL by age 5 teacher-reported academic skills (age 5 reading skill was entered in the model of reading achievement, and age 5 math skill was entered in the model of math achievement). Models of age 9 behavioral outcomes included an interaction between age 5 ATL and age 5 teacher-reported problem behavior. The question of whether ATL followed a compensatory or cumulative model for each outcome was answered by the sign and significance of the interaction term. If the interaction term was significant and shared the same sign as the main effect of ATL, it indicated a cumulative model in which ATL was more effective for those with the highest initial competence. If the interaction term was significant and had the opposite sign as the main effect of ATL, it indicated a compensatory model, in which ATL was more effective for those with the lowest initial competence. Per Aiken and West (1991), ATL, age 5 academic skills and age 5 problem behavior were mean-centered. As previously noted, all models included socio-demographic control variables; in addition, early problem behavior was controlled for in models predicting academic achievement, and early academic skill was controlled for in models predicting social competence. Preliminary analyses revealed that poverty status did not predict age 9 outcomes, so it was dropped from all models. Robust standard errors adjusted for clustering by city.

The Association between ATL and Academic Achievement

The results of the regression models predicting academic achievement are displayed in Table 3. There was a significant coefficient for age 5 ATL in the model of age 9 math achievement ($\beta = .15, p < .01$), which indicated that ATL was positively associated with math achievement when age 5 math was at its mean. As predicted, the interaction between ATL and early math was negative and significant in the prediction of math achievement ($\beta = -.11, p < .05$). Thus, a compensatory model was found, consistent with previous research, in which ATL was more beneficial for later math among children with lower levels of early math skills. The interaction was probed by calculating adjusted age 9 math achievement scores at selected high (1 SD above the mean) and low (1 SD below the mean) ATL scores for all levels of age 5 math skills (Figure 1). Results show that the difference between math achievement scores for children with low and high ATL was significant at the $p < .05$ level for children who scored between a 1 (*not yet proficient*) and 4 (*intermediate proficiency*) on age 5 math skills. The largest differences between low and high ATL were obtained for children who, on average, scored a 1 or 2 on age 5 math, corresponding to *not yet proficient* (.87 SD) and *just beginning to demonstrate proficiency* (.68 SD), respectively. A more moderate differential between low and high ATL was found for children whose math skills averaged 3, corresponding to *proficiency in progress* (.48 SD). A small differential was found for children whose math skills averaged a 4, indicating *intermediate proficiency* (.29 SD). For children who scored a 5 (*proficient*), the association between age 5 ATL and age 9 math was not statistically significant.

In the model of age 9 reading achievement (Table 3), the coefficient for ATL was not significant, indicating that ATL was not significantly associated with reading achievement at age 9 when age 5 reading skills was at its mean. There was, however, a significant negative interaction between ATL and age 5 reading ($\beta = -.10, p < .05$), which reflects a compensatory model. This interaction was probed by calculating adjusted age 9 reading achievement scores at high and low ATL scores (1 SD above and below the mean, respectively) according to each value of age 5 reading skills (Figure 2). Results indicate that the positive association between ATL and age 9 reading applied only to children who scored a 1 or 2 (i.e., were *not yet proficient* or demonstrated *beginning proficiency*) on age 5 reading skills. These reflect moderate differentials between high and low ATL (.50 and .32 of a standard deviation, respectively). Among children who scored between 3 and 5 on age 5 reading (i.e., whose proficiency was at least in progress), there was no significant association between ATL and age 9 reading achievement. Thus, while ATL was associated with higher achievement in math for children up through the intermediate level (i.e., who scored 4 or below), ATL was associated with higher achievement in reading for children who lacked proficiency in that subject (i.e., who scored below 3) at school entry.

The Association between ATL and Social Competence

The results of the regressions predicting age 9 social competence are displayed in Table 4. Since the measure of age 5 problem behavior was mean-centered, the following patterns represent the results for children with average levels of problem behavior. As expected, age 5 ATL was negatively associated with children's externalizing problems ($\beta = -.08, p < .05$) and positively associated with children's social skills ($\beta = .25, p < .001$) at age 9.

Early problem behavior was examined as a moderator of associations between ATL at age 5 and social competence at age 9. Results indicate that the interaction was significant only for externalizing problems ($\beta = -.10, p < .01$). The interaction was negative, indicating a cumulative model in which the negative association between ATL and externalizing problems was strongest for the children with the fewest behavior problems, or greatest behavioral competence, at age 5. The interaction was probed by calculating adjusted values of age 9 externalizing problems at high and low values of ATL (1 SD above and below the mean) at four values of age 5 problem behavior. These values were preferable to the scale's anchor points because problem behavior was so positively skewed. For example, 73% of children scored at or below the mean, and almost no one received the maximum score of 3. We therefore compared high and low ATL at the following values of age 5 problem behavior: the minimum score (1.0), the sample mean (1.20), 1 SD above the mean (1.50), and 2 SD above the mean (2.0). Results show that the difference in externalizing problems between children with high and low ATL was significant for those children who scored at or below the mean on age 5 problem behavior (Figure 3), who constituted the majority of the children in this sample. Among children who scored a 1.0 on age 5 problem behavior (the minimum), those with high ATL scored .32 standard deviations lower than those with low ATL on age 9 externalizing behavior. Among children who scored 1.2 on age 5 problem behavior (the mean), those with high ATL scored .21 SDs lower on externalizing than those with low ATL. Children who scored 1 or 2 SDs above the mean did not exhibit a statistically significant association between ATL and age 9 externalizing.

Discussion

The present study is the first to our knowledge to examine the implications of early ATL for both academic achievement and social competence in a sample of predominantly low-income children. Interestingly, the results highlight the moderating role of early academic skills and problem behavior and suggest that different developmental processes may be at play across domains. Specifically, ATL were more advantageous for boosting academic achievement for *less* academically competent students, but were more advantageous for reducing externalizing problems for *more* socially competent students (i.e., those with fewer problem behaviors). Thus, consistent with previous research (Bodovski & Farkas, 2007; Li-Grining et al., 2010), ATL may serve a compensatory function with respect to academic achievement, working to narrow the gap between high and low achievers over time. In contrast, ATL may follow a cumulative model with respect to problem behavior, by widening early gaps in competence over time.

ATL and Academic Achievement

As hypothesized, early academic skills moderated the link between age 5 ATL and age 9 achievement for both math and reading. The least academically competent children at kindergarten entry benefited the most from early ATL, consistent with results from the ECLS-K (Bodovski & Farkas, 2007; Li-Grining et al., 2010). ATL was positively associated with later math achievement for all children except those at the highest level of math proficiency at age 5. A different pattern emerged for reading, however, as ATL was positively associated with later reading only for children who were not proficient in reading at age 5. It is not immediately apparent why the association between ATL and academic achievement was not significant for children with the highest levels of early academic skills in our sample, as it had been in the ECLS-K (Bodovski & Farkas, 2007; Li-Grining et al., 2010).

One explanation for this difference may lie in the nature of the two studies' measures of early achievement. The ECLS-K directly assessed children's reading and math skills in kindergarten, whereas the FFCWS relied on teacher reports. Notably, the rating scale for teachers was sensitive to gradations in non-proficiency (represented by 4 out of the 5 response options), but not proficiency (represented by a single response option), in early math and reading. It is possible that children categorized as proficient by teachers actually represented a range of aptitudes that would have been distinguishable with a standardized test. Moreover, in contrast to standardized achievement tests, which reflect children's absolute ability, our teacher-report scale assessed children's ability relative to their peers. While these scores are expected to correlate, it is likely that they do not mirror each other; it is possible that children had high levels of skills compared to others in their class, but not other children nationwide. Ideally, the present test should be repeated in another low-income sample using a standardized achievement test, or even the very test that was used in the ECLS-K, to enable a comparison of findings across samples.

Unexpectedly, ATL promoted growth for children at a wider range of proficiencies in math than in reading. In that sense, ATL were more advantageous for math than reading. Past studies show that EF, which is tapped by several indicators of ATL, is more predictive of

growth in early math performance than reading achievement (Blair & Razza, 2007; Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009; Ponitz, McClelland, Matthews, & Morrison, 2009). Ponitz and colleagues (2009) speculated that this differentiation could be a result of the cognitive processes for reading becoming more automatic, and thus less dependent on EF, for literacy than for math over time. Such an explanation is consistent with the idea that early literacy tasks become increasingly difficult with respect to content, while early math tasks place increasing demands on children's regulatory functioning (Blair & Razza, 2007; Epsy et al., 2004). Another explanation for the difference across domains is that children may receive more help with reading than math at home from their parents, and thus their long-term reading scores are less dependent on their ATL in the classroom. Further research is necessary to better understand the specific links between ATL and achievement across both academic domains.

ATL and Behavioral Competence

A main objective of this study was to determine the implications of early ATL for children's later behavioral competence. Of interest was whether children's learning behaviors in educational contexts were linked with their behavioral competence in social contexts. ATL may protect against externalizing behavior because the skills it taps – such as attention, flexibility, and self-control – serve children in social contexts by helping them regulate their emotions, interpret social cues, and resolve conflict with peers. Indeed, we found that higher ATL was associated with fewer externalizing problems and greater social skills at age 9, even adjusting for age 5 problem behavior. These findings are consistent with short-term studies reporting associations between ATL and positive peer interactions in play (Coolahan et al., 2000; Fantuzzo et al., 2004; Hughes & Kwok, 2006).

In a novel line of inquiry, we also tested whether the association between ATL and later behavior followed a compensatory pattern, in which children with the lowest initial levels of behavioral competence benefited most from ATL, or a cumulative growth pattern, in which children with the highest initial levels of behavioral competence benefited most from ATL. Results supported the cumulative model, as the link between higher ATL and fewer externalizing problems was evident only among children with average or low levels of early problem behavior. Thus, higher ATL accentuated differences in social trajectories over time, although it narrowed differences in academic trajectories over time.

The finding that ATL did not predict fewer externalizing problems for children with high levels of early problem behavior is significant in light of past research on the consequences of young children's disruptive behavior in the classroom. Specifically, early problem behaviors appear to result in a negative reputation that biases teachers and peers against children (Hamre & Pianta, 2001; Harris et al., 1992; Wentzel & Asher, 1995). Thus, children with serious early problem behaviors may not be recognized or affirmed for their displays of higher ATL. Furthermore, children who exhibit early problem behaviors may not have as many opportunities to benefit socially from ATL-related skills, as they may have fewer interactions with peers owing to separation from classmates due to misconduct or rejection. Nevertheless, such children may benefit from ATL academically because they work well independently in the classroom or receive help from parents outside the

classroom. It is as yet unclear how children with early problem behaviors are able to use ATL to their advantage academically. It would be helpful for future studies to investigate the profiles of children with early problem behaviors to understand whether they differentially display ATL during academic and social activities, and whether some subgroups benefit more than others from ATL.

There was no evidence of moderation for social skills, suggesting that ATL benefitted all children similarly regardless of their early problem behaviors. Although externalizing behavior and social skills are both facets of socioemotional competence, they are typically viewed as different domains with unique etiologies. Cross-domain research is needed to understand why ATL is susceptible to moderation only for externalizing problems. One possibility is that externalizing behaviors are largely the product of family processes, as they are closely associated with parenting style (Erickson, Sroufe, & Egeland, 1985), the quality of the parent-child attachment relationship (Rubin & Burgess, 2002), and interparental conflict (Cummings, Goeke-Morey, & Papp, 2004). Thus, these behaviors may be less affected by school behavior than are social skills, which while influenced by parents, are deeply rooted in (and in fact defined by) peer relationships (see Ladd, 1999). Alternatively, it may be that the origins of aggression have a stronger genetic component than those of social skills; however, in the absence of empirical evidence, these propositions are purely speculative.

Conclusions and Limitations

In sum, our findings shed new light on the role of early ATL for both academic achievement and social competence in middle childhood. The fact that ATL skills were most helpful for children with lower levels of academic skills is encouraging in that it suggests that ATL may serve a compensatory role for children at greatest academic risk. The results from the socioemotional domain are also promising in that they suggest that early ATL have significant implications for social skills across all children, regardless of early problem behavior. Additionally, early ATL were associated with reduced externalizing problems for children without high levels of early problem behavior. Thus, strengthening children's early ATL may be another fruitful avenue to increasing their long-term social competence. To rigorously test this supposition, it will be necessary to conduct an intervention to improve children's ATL and then assess growth in academic achievement and behavior at varying levels of initial competence in both domains.

To date, only one curriculum has been designed specifically to promote ATL: The Evidence-Based Program for Integrated Curricula, or EPIC, integrates instruction in literacy and math with units on attention control, frustration tolerance, group learning, and task approach (Fantuzzo, Gadsden, & McDermott, 2011). Although program impacts have not yet been reported, other curricula have succeeded in closely related aims. For example, preschoolers' EF has been improved by the *Tools of the Mind* curriculum, which targets self-regulation via teacher-directed exercises (Diamond, Barnett, Thomas, & Munro, 2007) and via interventions that coach teachers on behavior management strategies (e.g., The Chicago Readiness Project; Raver et al., 2011). Direct skill trainings, such as those used to enhance attention among preschoolers (Rueda et al., 2005), or strategies that embed self-control into

classroom routines, such as games during circle time (Tominey & McClelland, 2011), have also been successful. Even in the absence of a curriculum, teachers can promote children's ATL by avoiding rote teaching strategies; not relying on external rewards to motivate students; connecting content to children's interests and experiences; modeling ATL; and emphasizing mastery over performance (Hyson, 2008). Moreover, Hyson (2008) encourages teachers to regularly assess children's ATL and endorses the measure used here (i.e., ECLS-K) along with other measures such as the Learning-to-Learn Scales (McDermott et al., 2011).

It should be kept in mind that interventions to improve ATL for all children need not close, and may even inadvertently widen, early gaps in social competence. Indeed, our results indicated that ATL was associated with fewer externalizing behaviors among children with low or average, but not high levels, initial levels of problem behavior. Thus, efforts to enhance ATL may ultimately be more successful for all children when accompanied by targeted interventions that address problem behaviors already in evidence. It may also be fruitful to address the processes that contribute to cumulative growth models such as the ones found here. For example, given that young children's social preferences for peers are shaped by their observations of whether teachers find the peers desirable (Hughes & Kwok, 2006), it is critical that teachers carefully monitor how their impressions influence each child's experiences in the classroom.

Although the present study demonstrates long-term associations between early ATL and later academic achievement and social competence among predominantly disadvantaged children, it has several limitations. First, although it measured academic skill and social competence at both ages 5 and 9, there were notable differences in the assessments over time. Specifically, academic skills were assessed via teacher report at age 5, but were directly assessed at age 9. However, a robustness check confirmed that a direct assessment of reading at age 5 produced results similar to teacher-reported reading. In addition, the measures of problem behavior differed across waves (Teacher Report Form vs. Social Skills Rating Scale). A related limitation is that our measures of social competence were limited to teacher report at both ages 5 and 9 (albeit by different teachers). Although the teacher's assessment of a child's behavior should be more relevant than a parent's for classroom behavior, it is still subject to bias. However, supplementary models predicting child-reported externalizing problems at age 9 (per the Strengths and Difficulties Questionnaire; Goodman, Meltzer, & Bailey, 1998) yielded the same interaction between ATL and early problem behavior that models of teacher-reported externalizing at age 9 did. It should also be noted that teachers completed the kindergarten surveys at different points across the school year and thus there is not a common reference on which all children can be compared. Future studies that supplement teacher reports with observational data, direct assessments, or peer nominations would add to our understanding of how early ATL shapes competence in middle childhood.

Second, this study may suffer from omitted variable bias. It is possible that unmeasured characteristics of high-quality classrooms and schools were associated with both higher ATL and better academic and social outcomes. Future studies should try to identify and control for relevant measures of classroom and school quality. Third, due to attrition and low

teacher response rates, our analytic sample at age 9 no longer mirrored the original FFCWS sample. In particular, the families in our analyses were more advantaged than those lost over time. Perhaps as a result, the children in our sample performed at or close to the national mean on standardized measures of cognitive ability at age 5 (i.e., M on PPVT = 97) and academic achievement at age 9 (i.e., M on reading = 95, M on math = 101). Thus, additional work with other low-income samples is needed to determine whether the patterns found in this study are generalizable to this population. Finally, a fourth limitation is that given the low prevalence of problem behaviors at age 5, we should be cautious about extrapolating the association between ATL and later social competence to children with the highest level of behavior problems. Future work with samples of children who demonstrate greater variability in early problem behavior is needed to determine whether the patterns reported here apply to children who enter school with severe early externalizing problems.

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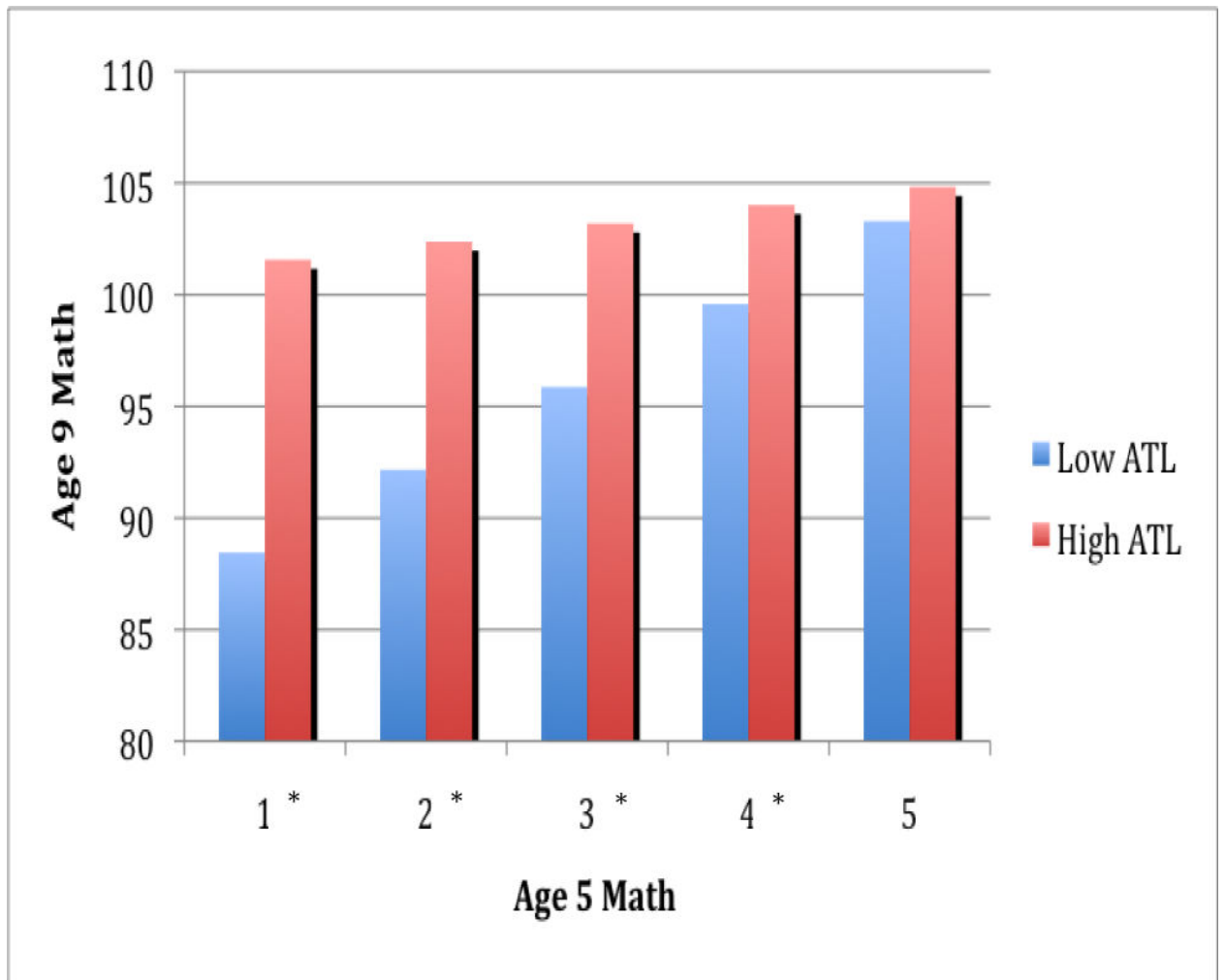


Figure 1.

The association between ATL and age 9 math achievement as a function of age 5 math skills. Within levels of age 5 math skills, a significant ($p < .05$) difference between low and high ATL (1 SD below and above the mean, respectively) is denoted by an asterisk (*) on the x-axis.

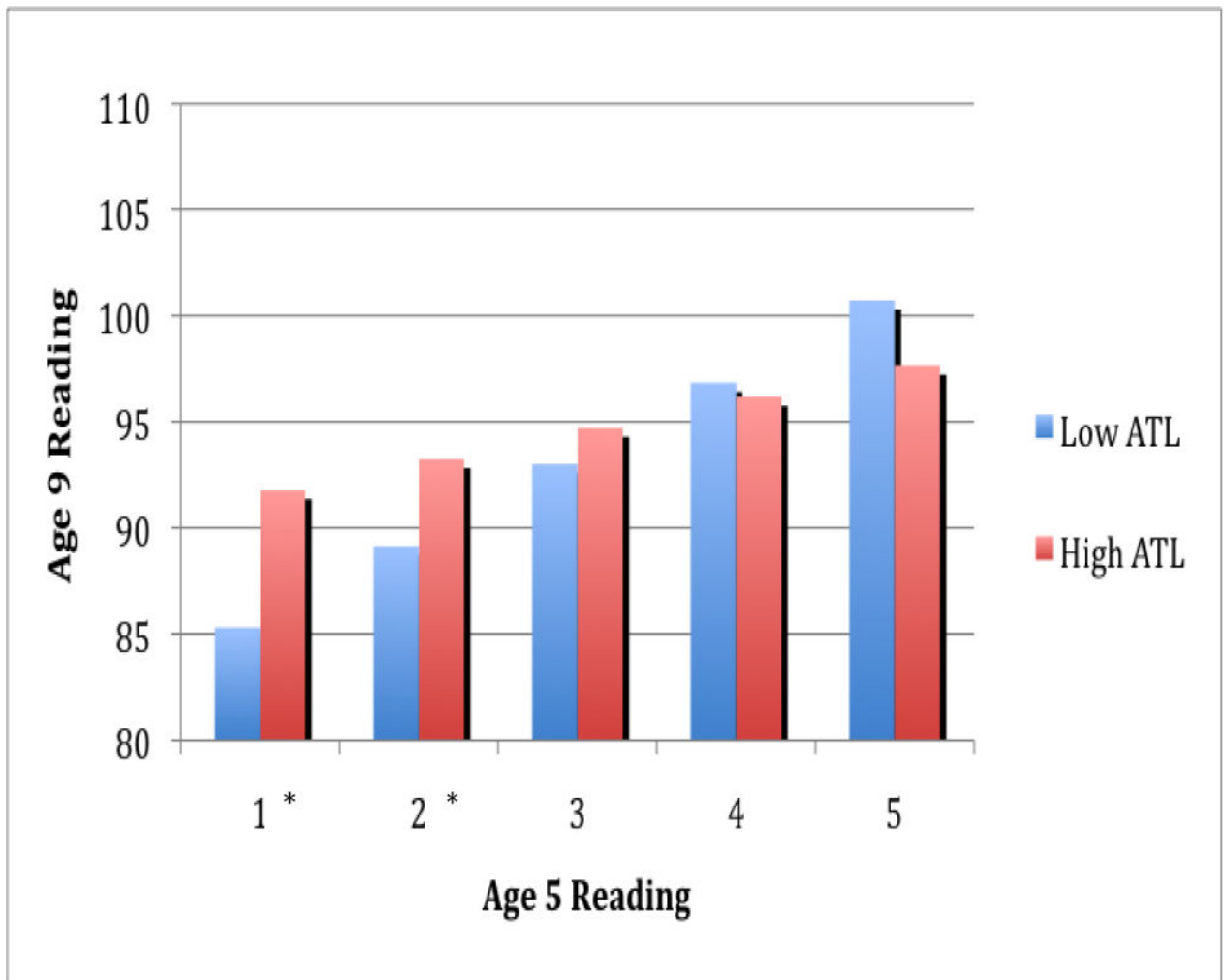


Figure 2.

The association between ATL and age 9 reading achievement as a function of age 5 reading skills. Within levels of age 5 reading skills, a significant ($p < .05$) difference between low and high ATL (1 SD below and above the mean, respectively) is denoted by an asterisk (*) on the x-axis.

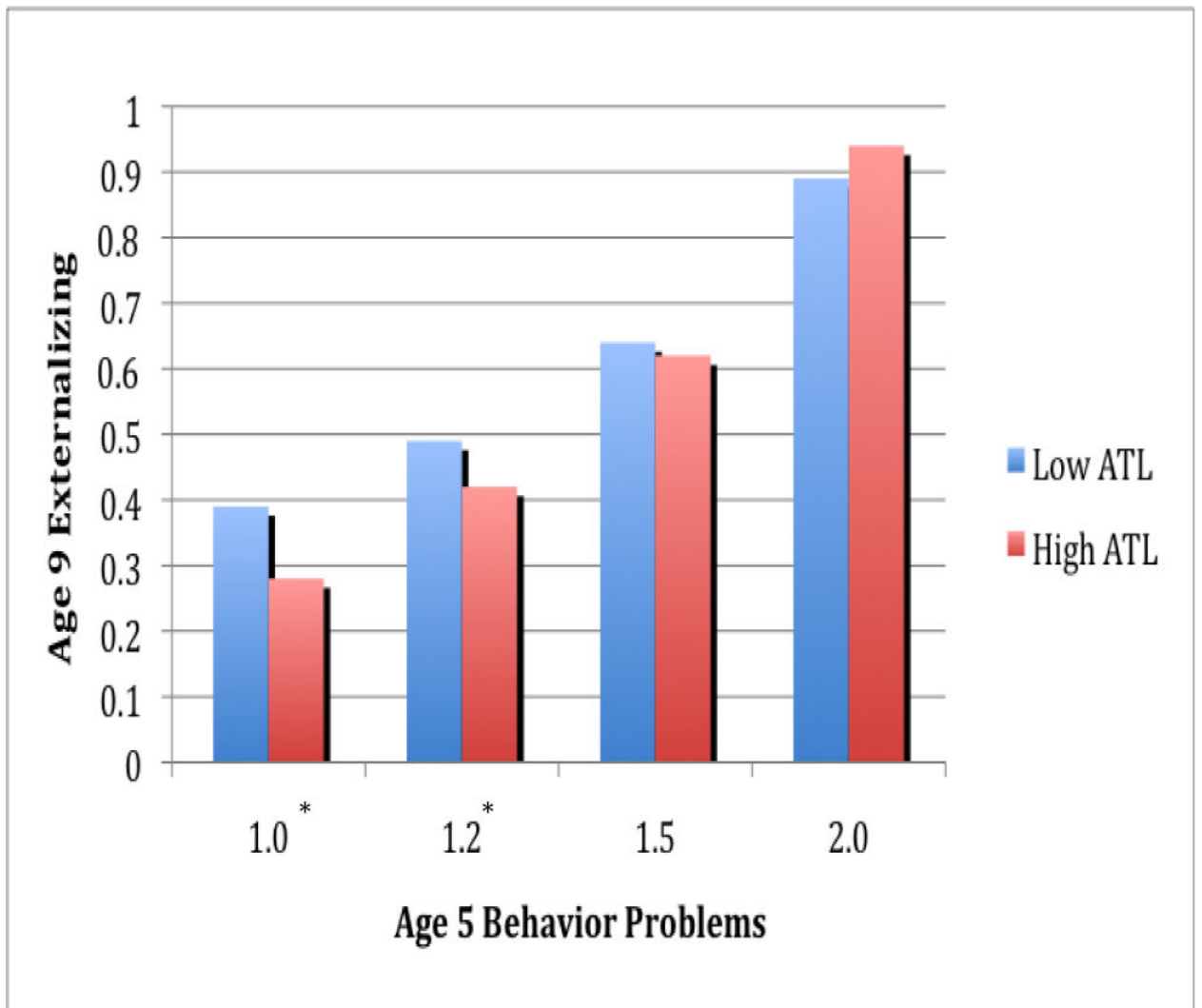


Figure 3.

The association between ATL and age 9 externalizing problems as a function of age 5 behavior problems (i.e., lowest, mean, and 1 SD above mean). Within levels of age 5 behavior problems, a significant ($p < .05$) difference between low and high ATL (1 SD below and above the mean, respectively) is denoted by an asterisk (*) on the x-axis.

Table 1

Descriptive Statistics for Control, Predictors, and Outcome Variables

Variable	<i>M</i>	<i>SD</i>	%
Controls			
Child male			47.83
Maternal race/ethnicity			
White			31.50
Black			42.82
Hispanic			21.85
Other			3.83
Maternal education			
Less than high school			23.18
High school graduation/GED			23.79
Some college or more			53.03
Maternal marital status			
Single			34.81
Cohabiting			29.25
Married			35.94
Child receptive vocabulary	97.25	15.27	
Predictors and Moderators			
Age 5 approaches to learning (ATL)	2.41	0.57	
Age 5 math skills	3.90	1.03	
Age 5 reading skills	3.67	1.13	
Age 5 problem behavior	1.21	0.34	
Outcomes			
Age 9 academic achievement			
Math achievement	100.73	15.10	
Reading achievement	94.85	12.86	
Age 9 social competence			
Externalizing behaviors	0.45	0.46	
Social skills	1.23	0.42	

Note. Calculations are based on five multiple imputed data sets. *N* = 669.

Table 2
Correlations among Measures of ATL, Age 5 Moderators, and Age 9 Outcomes

	1.	2.	3.	4.	5.	6.	7.
1. Age 5 approaches to learning (ATL)	–						
2. Age 5 math skills	.58	–					
3. Age 5 reading skills	.62	.81	–				
4. Age 5 problem behavior	-.55	-.24	-.26	–			
5. Age 9 math achievement	.40	.44	.47	-.23	–		
6. Age 9 reading achievement	.35	.45	.47	-.20	.65	–	
7. Age 9 externalizing problems	-.37	-.21	-.21	.47	-.25	-.28	–
8. Age 9 social skills	.38	.23	.27	-.30	.29	.25	-.53

Note. Table presents bivariate correlations. All correlations are significant at $p < .001$. Bold values reflect correlations considered to be moderate or high (i.e., $r > .30$; Cohen, 1988).

Table 3

Results of Multivariate Models Predicting Academic Achievement at Age 9

	Math achievement(<i>n</i> = 652)		Reading achievement(<i>n</i> = 652)	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
ATL	4.14	1.52	.15*	.10
Age 5 academic skills [^]	2.29	.61	.15**	2.68
ATL* academic skills	-2.54	.94	-.11*	-.09
Male	1.31	.91	.04	-.05
African American	-2.69	1.63	-.09	1.56
Hispanic	-2.60	1.06	-.07*	1.49
Other ethnicity	3.73	1.54	.05*	2.33
Less than hs degree	1.65	1.33	.04	1.40
Greater than hs degree	2.35	1.02	.09*	.95
Single parent	-.53	1.15	-.02	.86
Cohabiting parent	-1.87	1.40	-.06	1.08
Receptive vocabulary	.32	.04	.32***	.03
Age 5 problem behavior	-2.50	1.59	-.06	1.47
<i>R</i> ²		.37***		.38***

Note. ATL = Approaches to learning.

[^] Early reading skills was entered in the model predicting reading achievement, and early math skills was entered in the model predicting math achievement.

* *p* < .05;

** *p* < .01;

*** *p* < .001.

Table 4

Results of Multivariate Models Predicting Social Competence at Age 9

	Externalizing problems(<i>n</i> = 661)		Social skills(<i>n</i> = 662)	
	<i>B</i>	<i>SE</i>	β	<i>SE</i>
ATL	-.06	.03	-.08*	.04
Age 5 problem behavior	.58	.06	.44***	.07
ATL* problem behavior	.16	.07	.10*	.08
Male	.11	.03	.12***	.03
African American	.18	.02	.20***	.03
Hispanic	.02	.06	.01	.04
Other ethnicity	-.01	.04	.00	.07
Less than hs degree	.01	.06	.01	.04
Greater than hs degree	-.03	.04	-.03	.03
Single parent	.10	.05	.11	.05
Cohabiting parent	.10	.03	.10***	.04
Receptive vocabulary	.00	.00	.00	.00
Academic skills [^]	-.01	.02	-.02	.02
<i>R</i> ²		.30***		.16***

Note. ATL = Approaches to learning.

[^] A composite of early math and reading skills was entered in the model.

* *p* < .05;

** *p* < .01;

*** *p* < .001