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Children's Developing Work Habits From Middle Childhood to Early Adolescence: Cascading Effects for Academic Outcomes in Adolescence and Adulthood

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Children's Developing Work Habits From Middle Childhood to Early Adolescence: Cascading Effects for Academic Outcomes in Adolescence and Adulthood

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Children's work habits at school include being a hard worker, turning in work on time, following classroom rules, and putting forward one's best effort. Models on youth character, noncognitive skills, and social-emotional learning suggest that self-management skills like work habits are critical for individuals' subsequent academic success. Using data from 1,124 children in the NICHD Study of Early Childcare and Youth Development (49% female; 77% White), we examined children's developing work habits from first to sixth grade and their developmental cascading effects on academic outcomes at the beginning and end of high school as well as at age 26. The findings on differential stability of work habits (i.e., bivariate correlations) suggest that children were likely to maintain their relative position among peers from first to sixth grade. The complementary findings on mean-level changes from the latent growth curves suggest that children's work habits exhibited mean-level increases over the same period, meaning that children's work habits became more advanced from first to sixth grade. Models used to examine the developmental cascades of work habits suggest that children's work habits at first grade and the growth in children's work habits from first to sixth grade (a) directly predicted their academic outcomes at the beginning and the end of high school, and (b) indirectly predicted their educational attainment at age 26 through their academic outcomes during adolescence. These findings underscore the importance of foundational noncognitive skills during middle childhood that predict individuals' academic outcomes up to 20 years later in adulthood.

Keywords: work habits, academic achievement, educational attainment, noncognitive, character

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Students' success at school is not merely a function of their subject-specific knowledge and abilities. Over the last few decades, scholars and educators have increasingly recognized the importance of other underlying skills for academic success. Students, for example, who have mastered material can still receive dismal grades if they forget to submit their work or submit work riddled with careless errors. One's ability to follow classroom procedures also influences how well students function within their

class. These examples highlight the importance of children's *work habits* in the classroom.

Work habits include being a hard worker, turning in work on time, following classroom rules, and putting forward one's best effort among other indicators (Hamre & Pianta, 2001; Kataoka & Vandell, 2013; Pierce, Hamm, & Vandell, 1999; Vandell & Corasaniti, 1990). Work habits or specific aspects of work habits are prominent in frameworks of noncognitive skills (Kautz, Heckman, Diris, Ter Weel, & Borghans, 2014), social-emotional learning (Weissberg, Durlak, Domitrovich, & Gullotta, 2015), performance character (Lickona & Davidson, 2005), and soft skills (Lippman, Ryberg, Carney, & Moore, 2015). In prior research, children's work habits have been reliably measured throughout grade school and are predictive of later adjustment (Belsky et al., 2007; NICHD Early Child Care Research Network, 2005b; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). Scholars have argued that individuals' work habits are important throughout life - from the kindergarten classroom to the workplace (Lippman et al., 2015; McClelland, Kessenich, & Morrison, 2003; Yuen, Gysbers, Chan, Lau, & Shea, 2010).

Despite their proposed importance for individuals' academic and occupational success, work habits have been studied to a lesser extent compared to other self-management skills, such as emotion regulation and self-control (Eisenberg, Spinrad, & Knafo-Noam, 2015; Lippman et al., 2015). The goal of this study was to examine the developmental changes in children's work habits across middle childhood and early adolescence (i.e., Grades 1 through 6), and to examine subsequent academic outcomes during middle and late adolescence (i.e., beginning and end of high school) and during adulthood (i.e., age 26).

Children's Developing Work Habits

Developmental changes in any phenomena, like children's work habits, can be described in terms of two types of change (Caspi, Roberts, & Shiner, 2005; McCall, 1981; Rutter, 1989). The first type of change focuses on changes in children's relative position compared with others or "the relative consistency of individual differences" over time (McCall, 1981, p. 3). This type of change has several labels, including relative stability, rank-order stability, changes in interindividual differences, and differential continuity and change (Caspi et al., 2005). One of the most common indicators of differential continuity is bivariate correlations. The second type of change focuses on "developmental functions" (McCall, 1981, p. 2) or mean-level changes over time, also called intraindividual change and mean-level continuity and change (Caspi et al., 2005). These two types of change are distinct; for example, children may maintain their same relative position (i.e., evidence differential continuity) but still experience mean-level increases over time as children's skills become more advanced. Two common tests of mean-level change are growth curves and repeated-measures analysis of variance techniques. Responding to the calls by McCall (1981); Caspi, Roberts, and Shiner (2005); and others (Rutter, 1989) on the importance of examining both types of change, the first aim of this study was to examine the development of work habits in these two regards. We use Caspi et al.'s (2005) terms of differential continuity and mean-level change to refer to these two complementary aspects of development as they reflect the two types of continuity and change we expect in work habits.

The empirical research to date on children's work habits has focused on differential continuity. Reliable individual differences in work habits and related constructs have emerged as early as prekindergarten and are evident throughout grade school (Cooper & Speece, 1988; McClelland, Morrison, & Holmes, 2000, 2003; Pierce et al., 1999; Rimm-Kaufman et al., 2009). Children who have stronger work habits than their peers at one time point are likely to maintain that advantaged position over a one year period during elementary and middle school ($r = .47–.66$; Kataoka & Vandell, 2013; O'Donnell & Kirkner, 2014; Pierce, Bolt, & Vandell, 2010). Differential continuity has been attributed to continuity in genetics and environments, known as the cumulative continuity principle (Caspi et al., 2005), as well as bidirectional person ↔ setting microprocesses (Lerner, Phelps, Forman, & Bowers, 2009).

Findings of short-term differential continuity do not provide insight into whether there are mean-level changes. It is possible to have continuity in terms of one's relative position among peers regardless of whether children's work habits, on average, increase, decrease, or are maintained over the same developmental period. Though scholars have not examined mean-level changes in work habits specifically, existing research on approaches to learning (e.g., works independently, pays attention, follows classroom rules), a construct that overlaps with work habits, suggests that there is little or no mean-level change during preschool or the preschool to first grade transition (McClelland & Morrison, 2003; McDermott et al., 2018), but that there are mean-level changes for some children from kindergarten through second grade depending on children's demographic characteristics and their parents' behaviors (Buek, 2018). Given this potential for mean-level change during elementary school, the first aim of the current study also included charting the mean-level changes in children's work habits from first through sixth grade, which spans the middle childhood and early adolescent developmental periods.

Developmental theories suggest that middle childhood and early adolescence may be times when children experience substantial growth in their work habits. Aligned with bioecological theory (Bronfenbrenner & Morris, 2006), children's work habits are likely to develop during these periods due to advances in cognitive, psychosocial, and self-management competencies (e.g., interpersonal skills, effortful control), increased motivation to enact these skills, and elevated situational demands in class (McDermott, Rikoon, & Fantuzzo, 2014). As children progress through middle childhood into early adolescence, their focus increasingly shifts toward demonstrating competence (Erikson, 1993), and they face increasing demands in the classroom to focus their attention, organize multiple tasks, and succeed on more rigorous academic assignments (Eccles, Midgley, & Adler, 1984). These situational demands and the teacher scaffolding that often accompanies these increased challenges should foster positive growth in work habits during middle childhood and early adolescence (Vandenbroucke, Spilt, Verschueren, Piccinin, & Baeyens, 2018).

Moreover, positive youth development (PYD) theories argue that the strengths students bring to settings influence person ↔ setting microprocesses (Lerner et al., 2009), which in turn shape individuals' development and the overall setting. Strong work habits help position students to take full advantage of the resources and learning opportunities within classrooms. Productive person ↔ context microprocesses will further strengthen children's work

habits over time and support subsequent positive or problematic adjustment more broadly (Dodge et al., 2009; Masten & Cicchetti, 2010), which brings us to the second aim of the current study.

Developmental Cascades of Children's Work Habits on Their Later Academic Outcomes

A second aim of the current study was to examine the potential developmental cascades of children's work habits on their subsequent academic outcomes. Developmental cascades occur when individuals' adjustment and cumulative development in one area, like work habits, helps explain more widespread functioning later in life (Dodge et al., 2009; Masten & Cicchetti, 2010). Relevant to the current study, the model argues that "competence begets competence as the skills formed in one period of development become the tools for achieving success in the future" (Masten, Desjardins, Mccormick, Kuo, & Long, 2010, p. 680). In this case, we argue that children's developing work habits are foundational tools that enable them to succeed academically during subsequent developmental periods.

Aligned with PYD perspectives, frameworks of social-emotional learning (SEL) and character development focus on the intrapersonal and interpersonal skills children need to succeed in classrooms as well as in other contexts. Children's ability to manage their emotions and behavior in everyday life is a core intrapersonal skill in these frameworks (i.e., self-management skills in SEL and performance virtues in character frameworks; Baehr, 2017; Lickona & Davidson, 2005; Peterson & Seligman, 2004; Weissberg et al., 2015). According to SEL frameworks, self-management skills like work habits directly impact a variety of positive academic outcomes, including improved homework completion and academic achievement in the immediate future, as well as higher graduation rates and optimal college outcomes in the long run (Lickona & Davidson, 2005; Weissberg et al., 2015).

Prior research suggests that children's work habits predict their academic outcomes. Teachers' perceptions and self-reports of early adolescents' work habits were linked to higher academic course track recommendations from teachers, course mastery, and grades in secondary school (Farkas, Grobe, Sheehan, & Shuan, 1990; Takei & Shouse, 2008; Timmermans, de Boer, & van der Werf, 2016; Yuen et al., 2010). In addition, 10th grade work habits predicted college attainment 10 years later even after controlling for academic achievement and demographic background characteristics (Lleras, 2008). McClelland, Acock, Piccinin, Rhea, and Stallings (2013) found that preschool-age skills related to work habits, such as attention span and persistence, predicted college attainment in adulthood directly and indirectly via children's math and reading achievement at age 7. In fact, work habits were stronger predictors of academic achievement than other academic behaviors like absenteeism (Farkas et al., 1990).

Prior studies examining the positive links between work habits and individuals' academic outcomes have largely examined works habits at one time point (Farkas et al., 1990; Lleras, 2008; Mc-Clelland et al., 2013). As such, the extent to which initial levels *and* the growth of work habits in childhood both predict academic outcomes at different stages of individuals' lives is less clear. Consequently, we extend upon this body of research by examining if the development in children's work habits positively predicts their short- and long-term academic outcomes across adolescence and adulthood. Specifically, we expect that children with higher work habits in first grade and children who demonstrate increasing work habits from first to sixth grade will have higher educational attainment in adulthood and that these associations will be partially explained by their stronger academic outcomes at the beginning and end of high school.

In this study, we control for a host of child- and family-level factors. The child-level factors included child gender, ethnicity/race, temperament, and prior academic achievement given their associations with children's work habits and academic outcomes (Buek, 2018; Farkas et al., 1990; Hamre & Pianta, 2001; Kataoka & Vandell, 2013; Timmermans et al., 2016). The family-level factors included indicators of family demographics (e.g., parent education) and parenting processes, such as maternal sensitivity and quality of the home environment, which are associated with children's work habits and academic outcomes (Belsky et al., 2007; Pierce et al., 1999).

Current Study

Prior research using the data in the current study (i.e., NICHD Study of Early Child Care and Youth Development [SECCYD]), have found that children's work habits are positively related to the concurrent academic achievement and social-emotional outcomes at first grade (NICHD Early Child Care Research Network, 2005b) and at fifth grade (Belsky et al., 2007). In addition, parenting behavior and some indicators of childcare are predictive of children's work habits (Belsky et al., 2007; NICHD Early Child Care Research Network, 2005b). The current study builds on this work via two new research aims. Our first aim was to describe the development of children's work habits by examining both differential continuity and mean-level change from middle childhood to early adolescence (Caspi et al., 2005; McCall, 1981). Due to continuity in genetics, settings, and person-setting processes, we expected that children would exhibit differential continuity (i.e., relative position) in their work habits during middle childhood through early adolescence (Hypothesis 1). Based on maturing developmental systems and increasing situational demands in school that give rise to the development of work habits, we also expected that children would exhibit growth or mean-level increases in their work habits during middle childhood through early adolescence (Hypothesis 2).

Our second aim was to test a developmental cascades model in which children's developing work habits predict their academic outcomes at the beginning and end of high school as well as at age 26, controlling for child and family characteristics. Based on PYD, SEL, and character frameworks, we expected work habits in first grade and growth from first to sixth grade to directly and positively predict academic outcomes at middle (i.e., academic achievement at the beginning of high school) and late adolescence (i.e., grades, advanced classes, and college selectivity at the end of high school) as well as in adulthood (educational attainment at age 26; Hypothesis 3). Developmental cascade models suggest that, in addition to these direct effects, indirect pathways would link work habits to later academic outcomes (Hypothesis 4).

Method

Participants

The current study utilized data from the NICHD SECCYD. Participants were recruited from hospitals shortly after the birth of a child in 1991 in 10 different U.S. locations (for complete study information, see https://www.nichd.nih.gov/research/supported/seccyd/overview; NICHD Early Child Care Research Network, 2005a). A total of 1,364 parents and their children (48% female; 75% White, 13% Black, 7% Hispanic, and 6% other) completed a follow-up home visit interview at 1 month and became study participants. In the present study, the analytic sample consisted of 1,124 children (49% female; 77% White, 12% Black, 6% Hispanic, and 5% other) for whom teacher report of child work habits was available during at least one time point. In this analytic sample, 28% of the mothers had no more than a high school education, 28% had an average income no greater than 200% above the poverty level across early childhood, and 23% were of minority race or ethnicity. The data used in this study were approved under three IRB protocols at University of California, Irvine with the following project titles (and IRB protocol numbers): Study of Early Child Care & Youth Development (IRB HS#2006–5347), Occupying Idle Hands: Out-of-School Time and Successful Navigation of the High School Years (IRB HS#2009–6811), and Are There Enduring and Meaningful Effects of Out-of-School Time? (IRB HS#2017–3847).

Measures

The data used in this paper span from 1 month of age through 26 years of age. Data were collected at six time points from 1 to 54 months of age, at six time points during elementary and middle school, at the beginning and end of high school, and during young adulthood. Teacher reports of the study children's work habits were collected during the elementary and middle school years. Adolescents' academic outcomes were measured at the beginning and end of high school. Educational attainment was measured at age 26. Finally, child- and family-level covariates were collected when children were 1 month of age through first grade. The items are listed in Table S1.

Work habits. Children's work habits were reported by their classroom teachers each year from first through sixth grade using the Mock Report Card (Pierce et al., 1999). The label *work habits* and the items that comprise work habits originated from the Madison (Wisconsin) Metropolitan School District report card with similar items being used in the Dallas (Texas) Independent School District's report card used for elementary school students (Vandell & Corasaniti, 1990). Items included: "Follows classroom procedures," "Works well independently," "Works neatly and carefully," "Uses time wisely," "Completes work promptly," and "Keeps material organized." The scale was the average of all six items with higher scores representing stronger work habits (1 = *very poor*, 5 = *very good*; Cronbach's alpha's = .95–.96). This measure of work habits has been used in other studies where it demonstrated excellent reliability at all six grade levels in this study, and correlations with academic and other socioemotional constructs (Belsky et al., 2007; Kataoka & Vandell, 2013; Pierce et al., 1999; Pierce et al., 2010; Rimm-Kaufman et al., 2009).

Adolescent academic outcomes. Adolescent academic outcomes included participants' academic achievement scores in middle adolescence and three self-reported academic outcomes in late adolescence. First, adolescents' *academic achievement* at the beginning of high school was measured with three subtests of the Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R): applied problems, passage comprehension, and picture vocabulary (Woodcock & Johnson, 1989). The standardized scores were used in the present study (national $M = 100$, $SD = 15$). Following prior procedures (Vandell, Belsky, Burchinal, Steinberg, Vandergrift, & NICHD Early Child Care Research Network, 2010), we used all three tests as indicators of a composite of middle adolescents' academic achievement.

Second, adolescents reported three academic outcomes at the end of high school through an online survey, including their *overall grades*, *advanced classes*, and *college selectivity* (Vandell, Burchinal, & Pierce, 2016). Adolescents reported what *grades* they typically received in high school, which was scored 1 (mostly below Ds) to 8 (mostly As). In addition, adolescents indicated the total number of honors and advanced placement (AP) classes taken (0 = no honors/AP classes to 4 = 4 or more honors/AP classes) in high school. Their responses from the two reports were summed to create a variable called *advanced classes*. Lastly, adolescents indicated their plans to attend a 2- or 4-year university after high school. Adolescents who planned to go to college ($n = 531$; 81% of this wave's sample) reported the name and location of the college. Based on the scoring by Barron's Profile of American Colleges in the year of students' graduation from high school, the *college selectivity* was scored (Barron's Educational Series, 2008): 1 = *noncompetitive* to 6 = *most competitive* (Vandell et al., 2016). Adolescents who did not indicate plans to attend college ($n = 128$; 19%) were coded with a score of 0.

Adult academic outcomes. Finally, participants reported their educational attainment when they were 26 or 27 years old. Participants responded to a 9-point scale probing the highest level of education they have attained. Responses ranged from 1 = *no high school diploma* to 9 = *doctoral degree*. Similar scales of educational attainment have been used in prior nationally representative longitudinal studies and have evidenced high predictive validity (Lleras, 2008).

Covariates. Child- and family-level indicators associated with work habits or academic outcomes were included in our analyses as covariates. Child-level covariates included academic achievement at 54 months, temperament, gender (0 = male), and ethnicity/race (0 = White). Children's academic achievement at 54 months of age was measured with the mean of standardized children's scores on three subtests from the WJ-R: applied problems, picture vocabulary, and letter-word identification (Woodcock & Johnson, 1989). Further, mothers reported on their children's temperament when children were 6 months old via an adaptation of the Infant Temperament Questionnaire ($\alpha = .83$; 1 = *almost never*, 6 = *almost always*; Carey & McDevitt, 1978). A mean-composite scale was created across all 55 items, with higher scores indicating more difficult temperaments.

Family-level covariates were composites across six time points in early childhood, namely when the child was 1, 6, 15, 24, 36, and 54 months and included the proportion of time points in which the mother was employed, the mean family income-to-needs ratio, the proportion of time points in which the family was a single-parent household, the mean maternal depression score (Center for Epidemiological Studies Depression Scale; 20 items regarding the fre-

quency of certain feelings or behaviors; $\alpha = .88-.91$; $1 = rarely$ *or none of the time*, $4 = most or all of the time$; Radloff, 1977), maternal sensitivity rated during observations of semistructured free-play sessions (NICHD Early Child Care Research Network, 2005a; $\alpha = .70-.84$), and the mean quality of the home environment (Home Observation for Measurement of the Environment inventory score; Bradley & Caldwell, 1979). Maternal education in years was measured at the 1-month home visit. These indicators are reliable measures and have been used in several studies with the NICHD SECCYD data (Vandell et al., 2016; Vandell, Lee, Whitaker, & Pierce, 2020). Descriptive and correlational statistics of continuous covariates are provided in Table S2.

Missing Data Analyses

Of the 1,364 children in the original sample, 240 (18%) children did not have teacher-reported work habits in any wave and were omitted from the analytic sample. A total of 1,124 children were included in the analytic sample as they had work habit data for at least one time point from first through sixth grade. Within the analytic sample, approximately 78% ($n = 880$) completed the WJ-R achievement tests at the beginning of high school, 68% ($n = 769$) reported their academic outcomes at the end of high school, and 72% ($n = 809$) reported their educational attainment at age 26. There were no significant differences across the child- and family-level covariates between participants with available and missing data at the beginning of high school. Participants with available data at the end of high school and at age 26 were more likely to be female, $\chi^2(1) = 6.96-20.81$, $p < .001$ to $p = .008$, and White, $\chi^2(3) = 28.54-34.90$, $p < .001$ than those with missing data. Participants with available data at the end of high school and at age 26 were also more likely to come from families with higher maternal education, $t(1122) = 5.52-7.43$, $p < .001$; income-to-needs ratios, $t(1115) = 3.53-4.94$, $p < .001$; HOME inventory scores, $t(1116) = 6.38-7.79$, $p < .001$; and maternal sensitivity, $t(1116) = 5.13-7.82$, $p < .001$; as well as lower prevalence of single parenthood, $t(1122) = -5.29--4.62$, $p < .001$ and maternal depression, $t(1116) = -3.32--2.33$, $p = .001-0.01$; than those with missing data. To help account for the missing data, we used full information maximum likelihood in our latent growth curve models and included the child- and family-level indicators that demonstrated differences as covariates (Enders, 2010).

Plan of Analysis

We first conducted measurement invariance tests examining the extent to which children's work habits functioned similarly from first to sixth grade (Grimm, Ram, & Estabrook, 2017). A change in the comparative fit index (CFI) of 0.01 or less between two nested models indicated that the measures were invariant.

Tests of hypotheses. Our first two hypotheses focused on the development of children's work habits. To test our first hypothesis positing differential continuity in work habits in childhood and early adolescence, we estimated zero-order correlations between mean-composite scales of children's work habits at first to sixth grade. To test our second hypothesis positing mean-level increases in work habits, we estimated latent growth curve (LGC) models using a structural equation modeling (SEM) framework in Mplus 8.0 (Muthén & Muthén, 1998–2017). We first estimated and

compared three nested models that specified different functional forms of the change in children's work habits from first to sixth grade: (a) a no change model (i.e., intercept only), (b) a linear change model, and (c) a quadratic change model. We then examined the change in chi-square estimates between models, multiple indicators of model goodness of fit for each model (i.e., root mean square estimation of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), and standardized root mean residual (SRMR)), and the statistical significance of the means and variances of the intercepts and slopes for each model to determine the best fitting LGC model (Grimm et al., 2017). In all models, we set the intercept at first grade.

Hypotheses 3 and 4 focused on the developmental cascades from work habits to academic outcomes. To test our third hypothesis, we estimated direct pathways from children's work habits at first grade and the slope (change from first to sixth grade) to each academic outcome. Specifically, we tested a conditional, structural equation model to predict pathways from the work habits trajectory parameters to individuals' academic outcomes at the beginning and end of high school as well as in adulthood. At the beginning of high school, adolescents' academic achievement was a mean composite variable of standardized measures of WJ-R achievement scores (Vandell et al., 2010). At the end of high school, participants' academic outcomes included their academic grades, number of advanced courses, and selectivity of the college they planned to attend. Each of these indicators was included as a measured variable and covariances among these three indicators were estimated. In adulthood, individuals' educational attainment was included as a measured variable. We included children's early achievement scores, temperament, gender, and ethnicity/race along with maternal education, income-to-needs ratio, single-parent households, HOME inventory, as well as maternal depression, sensitivity, and work as covariates predicting participants' work habits trajectories and academic outcomes. We adjusted these variables such that the intercepts in our analyses are estimates at the zero-values of all covariates.

Finally, we tested our fourth hypothesis by examining whether children's work habits *indirectly* predicted late adolescent and adult academic outcomes via earlier academic outcomes. For example, we expected that children's work habits would positively predict their academic achievement at the beginning of high school, which in turn, would positively predict their academic outcomes at the end of high school. Indirect effects were estimated using the MODEL INDIRECT command (Grimm et al., 2017; Muthén & Muthén, 1998–2017).

Robustness checks. We included two robustness check analyses. First, we reestimated our structural equation model using cumulative scores of the covariates that were collected concurrently with children's work habits in middle childhood (i.e., first, third, and fifth grades; Vandell et al., 2020). These covariates included family income-to-needs ratio, single-parent household, HOME inventory, maternal work, maternal sensitivity, and maternal depression.

Second, we reestimated our main structural equation model with controls for work habits at the beginning and end of high school to determine if work habits or indicators of academic achievement predict academic attainment at age 26. The closest construct available at these time points was work orientation. Work orientation is a subscale of the Psychosocial Maturity Inventory and measures

individuals' work skills, propensity toward competent work performance, and ability to complete individuals' obligations (e.g., "I find it hard to stick to anything that takes a long time to do"; α = .79–.82; 1 = *strongly agree*, 4 = *strongly disagree*; Greenberger, Josselson, Knerr, & Knerr, 1975). Children's work habits from first to sixth grade were significantly correlated with their adolescent work orientation (r's = .12–.20, $p <$ .05). In our analyses, we added predictive pathways from child- and family-level covariates to work orientation at the beginning (i.e., age 15 years) and end of high school. We also added covariances between WJ-R scores and work orientation at the beginning of high school, as well as academic outcomes and work orientation at the end of high school. Finally, we added predictive paths from work orientation at the beginning of high school to academic outcomes at the end of high school, as well as paths from work orientation at the end of high school age 26 college degree attainment at age 26.

Results

Children's Developing Work Habits From First to Sixth Grade

Differential continuity. Our first hypothesis was that children would exhibit differential continuity in their work habits over time; that is, children generally would maintain their relative position among their peers over time (Caspi et al., 2005). In support of this hypothesis, the zero-order correlations across first to sixth grade work habits in Table 1 were strong (r = .54–.72; Cohen, 1992). Although all correlations were large in size, the correlations decreased in magnitude across time points as would be expected. For example, the correlations between children's first grade work habits and later work habits decreased across second to sixth grades (r's = .64–.54).

Mean-level change. We tested our second hypothesis that children's work habits would exhibit mean-level increases from first through sixth grade. First, results from our preliminary measurement invariance tests indicated work habits evidenced full strong invariance over time (Table S3). Second, results from our latent growth curve analyses indicated that a linear growth model provided the most parsimonious and best fitting description of the data, $\chi^2(21) = 68.40$, $p <$ .001, RMSEA, 90% CI = 0.045 [0.033, 0.057], CFI = 0.985, TLI = 0.989, SRMR = 0.056. The linear model was a significant improvement over the intercept-only model, $\Delta\chi^2(3) = 101.100$, $p <$ .001. Although there was a significant difference in chi-square between the linear model and the more complex quadratic change model, $\Delta\chi^2(4) = 28.727$, $p <$ .001 and significant variances in the linear and quadratic slopes in the quadratic growth model, the means of the linear and quadratic slope in this model were not statistically different from zero (see Table 2). Hence, we determined that a linear change model was the best fitting model and more easily interpretable given the nonsignificant means of the linear and quadratic slopes in the quadratic change model. In addition, prior work on constructs similar to work habits has not demonstrated quadratic change (Buek, 2018).

As shown in Figure 1, the average initial level of children's work habits in first grade fell near the middle of the original scale and was significantly different from zero (Mean$_{intercept}$ = 3.54, SE = 0.03, $p <$ .001). As predicted, children's work habits evidenced small significant increases from first to sixth grade (Mean$_{slope}$ = 0.03, SE = 0.01, $p <$ .001). Furthermore, the correlation between the latent intercept and slope indicated that children with higher work habits in first grade had smaller increases over time ($r = -.48$ $p <$ .001). Finally, we found significant variance in the initial level (Variance$_{intercept}$ = 0.79, SE = 0.04, $p <$ .001) and rate of growth (Variance$_{slope}$ = 0.01, SE = 0.002, $p <$ .001) in children's work habits, indicating sufficient

Table 1
Correlational and Descriptive Statistics of Main Study Variables

Indicator	1	2	3	4	5	6	7	8	9	10	11	12	13
Work habits													
1. Grade 1	—												
2. Grade 2	.64	—											
3. Grade 3	.64	.72	—										
4. Grade 4	.59	.62	.68	—									
5. Grade 5	.56	.60	.63	.68	—								
6. Grade 6	.54	.54	.61	.61	.65	—							
Beginning of high school outcomes													
7. WJ-R passage comprehension	.30	.31	.37	.36	.34	.36	—						
8. WJ-R applied problems	.33	.34	.37	.37	.36	.38	.67	—					
9. WJ-R picture vocabulary	.21	.16	.24	.24	.23	.27	.69	.58	—				
End of high school outcomes													
10. Grades	.35	.39	.42	.44	.44	.49	.38	.39	.31	—			
11. College choice selectivity	.35	.35	.42	.40	.44	.48	.43	.46	.36	.57	—		
12. # of advanced classes	.34	.37	.41	.39	.41	.43	.51	.53	.42	.51	.56	—	
Age 26 outcomes													
13. Educational attainment	.29	.34	.39	.38	.42	.41	.38	.37	.30	.51	.48	.45	—
M	3.55	3.63	3.58	3.63	3.70	3.69	107.80	102.96	100.02	5.42	3.57	3.02	5.24
SD	1.05	1.11	1.09	1.07	1.04	1.12	15.74	14.25	14.79	1.47	2.98	2.14	1.63
Min	1	1	1	1	1	1	44	48	34	1	0	0	1
Max	5	5	5	5	5	5	160	168	158	7	8	6	9
Observations	1,008	920	993	932	942	880	880	880	882	770	764	659	809

Note. WJ-R = Woodcock-Johnson Psycho-Educational Battery-Revised. All correlations were statistically significant at the $p <$ .001 level.

Table 2

Model Fit Comparison, Means, and Variances for the Unconditional Latent Growth Analyses of Children's Work Habits From First to Sixth Grade

	Teachers' report of child's work habits (first–sixth grade)										
Model	χ^2	df	p	$\Delta\chi^2$	Δdf	p	RMSEA	RMSEA 90% CI	CFI	TLI	SRMR
No growth	169.496	24	.000	—	—	—	0.073	[0.063, 0.084]	0.954	0.971	0.061
Linear	68.396	21	.000	101.100	3	.000	0.045	[0.033, 0.057]	0.985	0.989	0.056
Quadratic	39.669	17	.001	28.727	4	.000	0.034	[0.020, 0.049]	0.993	0.994	0.039

Linear model	M	SE	p	Variance	SE	p
Intercept	3.54	0.03	.000	0.79	0.04	.000
Linear slope	0.03	0.01	.000	0.01	0.002	.000

Quadratic model	M	SE	p	Variance	SE	p
Intercept	3.54	0.03	.000	0.76	0.05	.000
Linear slope	0.03	0.02	.143	0.06	0.02	.001
Quadratic slope	0.00	0.00	.924	0.003	0.001	.000

Note. RMSEA = root mean square estimation of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index; SRMR = standardized root mean residual.

variability to conduct inferential analyses with these latent constructs.

Direct and Indirect Cascading Effects of Work Habits on Academic Outcomes

Our third hypothesis stated that children's work habits would *directly* predict stronger academic outcomes at the beginning and end of high school as well as at age 26. Our fourth hypothesis posited that children's initial level and growth in work habits would *indirectly* predict late adolescent and early adult academic outcomes via earlier academic outcomes. To test these hypotheses, we expanded upon the model described in the previous section to estimate a conditional model with the work habits trajectories predicting subsequent academic outcomes in

adolescence and adulthood (see Figure 2). We also included child- and family-level covariates to predict participants' work habits intercept and slope, as well as each indicator of their academic outcomes (see Tables S4 and S5 for all structural equation model estimates). The structural equation model evidenced good to excellent model fit, $\chi^2(130) = 205.70$, $p < .001$, RMSEA 90% CI = 0.02 [0.018, 0.030], CFI = 0.99, TLI = 0.97, SRMR = 0.02. In this conditional LGC model, the mean and variance of children's first grade work habits remained significant (Mean$_{intercept}$ = 1.77, SE = 0.48, $p < .001$; Variance$_{intercept}$ = 0.54, SE = 0.03, $p < .001$). However, only the variance of the rate of growth of work habits remained significant in the conditional model (Mean$_{slope}$ = −0.06, SE = 0.11, $p = .555$; Variance$_{slope}$ = 0.01, SE = 0.00, $p < .001$). To
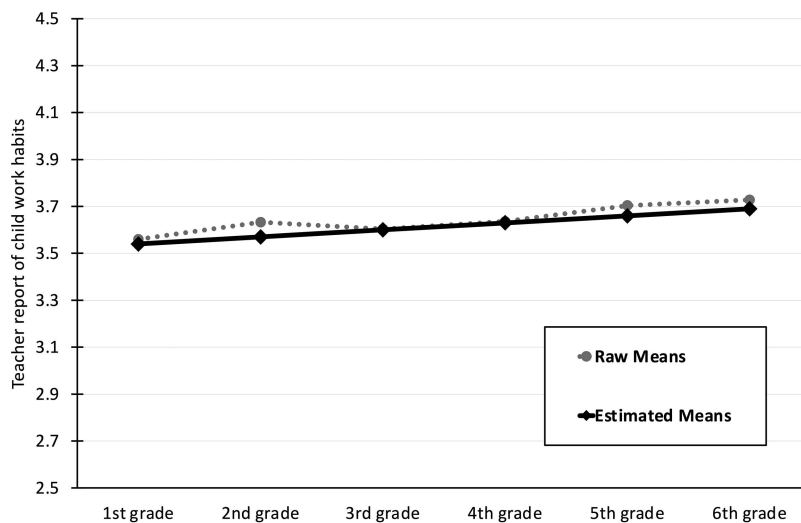

Figure 1. Raw and estimated linear growth means of teacher reports of child work habits from first to sixth grade.
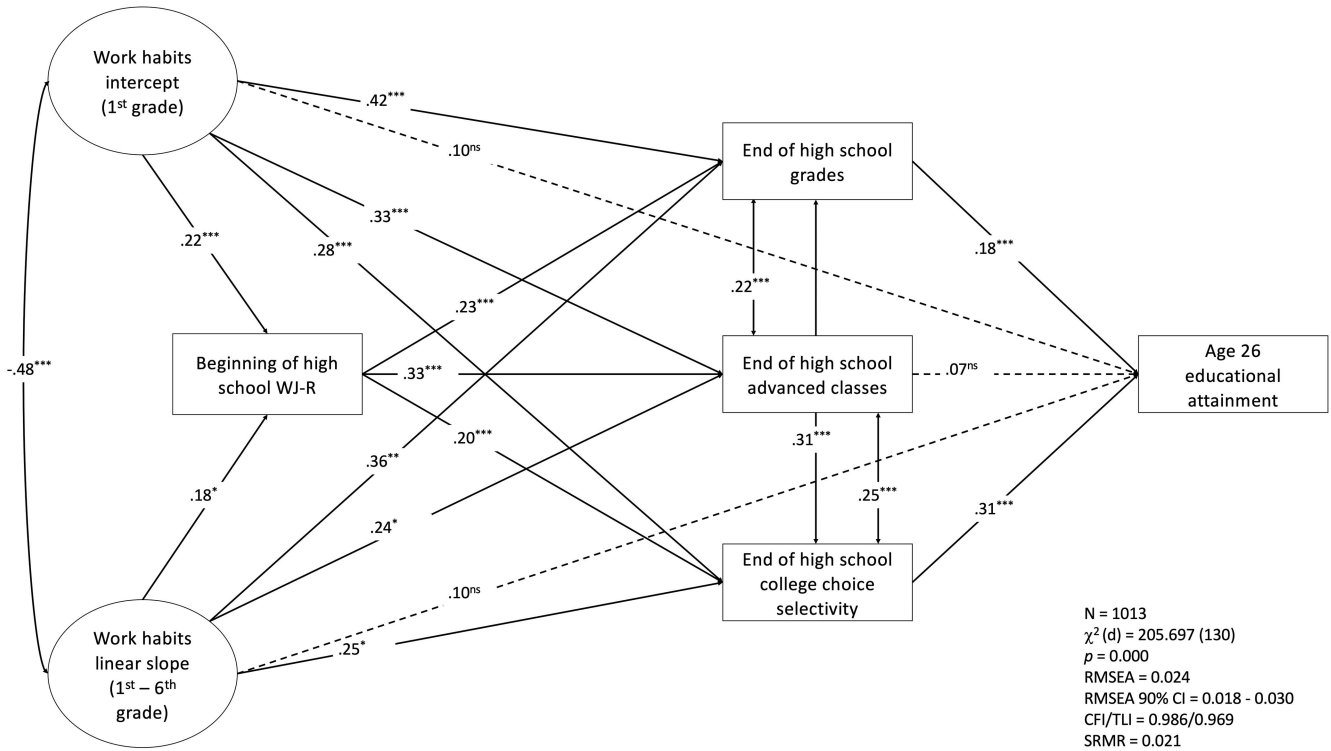
Figure 2. Standardized results from structural equation modeling. Continuous lines are significant paths, and dotted lines are nonsignificant paths. Covariates and measurement models not shown for simplicity. WJ-R = Woodcock-Johnson Psycho-Educational Battery-Revised. * $p < .05$. ** $p < .01$. *** $p < .001$.

offer a better sense of the effects of the work habits trajectories on the academic outcomes, standardized total, direct, and indirect effects are presented in Table 3.

Direct effects. In support of our third hypothesis, children's developing work habits from first to sixth grade positively predicted their subsequent academic outcomes at the beginning and end of high school. As shown in Figure 2 and Table 3, children with higher work habits in first grade were more likely to have higher academic achievement at the beginning of high school ($\beta = 0.22$, $SE = 0.04$, $p < .001$), as well as more likely to have higher grades ($\beta = 0.42$, $SE = 0.06$, $p < .001$), take more advanced classes ($\beta = 0.33$, $SE = 0.05$, $p < .001$), and report more selective colleges ($\beta = 0.28$, $SE = 0.05$, $p < .001$) at the end of high school. Further, the increases in children's work habits from first to sixth grade predicted higher academic achievement at the beginning of high school ($\beta = 0.18$, $SE = 0.06$, $p < .05$), as well as higher grades ($\beta = 0.36$, $SE = 0.06$, $p < .01$), more advanced classes ($\beta = 0.24$, $SE = 0.09$, $p < .05$), and more selective colleges ($\beta = 0.25$, $SE = 0.10$, $p < .05$) at the end of high school. However, neither the initial intercept nor the linear slope of work habits directly predicted educational attainment at age 26 (intercept: $\beta = 0.10$, $SE = 0.06$, $p = .102$; slope: $\beta = 0.10$, $SE = 0.11$, $p = .335$). In summary, children's work habits at first grade and changes in their work habits directly predicted their academic outcomes at the beginning and end of high school, but did not directly predict their educational attainment at age 26.

Indirect effects. In addition to the direct effects of work habits on participants' academic outcomes at the end of high

school and adulthood, there were indirect effects as well (see Table 3). In particular, participants' academic achievement at the beginning of high school mediated the positive relations between their work habits in first grade and their end of high school grades ($\beta = 0.05$, 95% CI [0.03, 0.08]), advanced classes ($\beta = 0.07$, 95% CI [0.05, 0.11]), and college choice selectivity ($\beta = 0.05$, 95% CI [0.02, 0.07]). Likewise, participants' academic achievement at the beginning of high school mediated the positive relations between the increases in children's work habits and their grades ($\beta = 0.04$, 95% CI [0.02, 0.17]), advanced classes ($\beta = 0.06$, 95% CI [0.03, 0.10]), and college choice selectivity ($\beta = 0.04$, 95% CI [0.01, 0.07]) at the end of high school.

We also expected children's first grade work habits and the increases in their work habits from first to sixth grade to indirectly predict their educational attainment at age 26 via their adolescent academic outcomes at the beginning and end of high school. The findings largely supported both of these expectations. Children's work habits in first grade significantly predicted their adult educational attainment indirectly via their cascading academic outcomes at the beginning and end of high school ($\beta = 0.21$, 95% CI [0.15, 0.30]). Finally, increases in children's work habits significantly predicted their adult educational attainment indirectly via their adolescent academic outcomes ($\beta = 0.18$, 95% CI [0.11, 0.29]). In sum, children's first grade work habits and increases in work habits from first to sixth grade indirectly predicted academic outcomes at the end of high school and age 26 via earlier adolescent academic outcomes.

Table 3

Total, Direct, and Indirect Effects of Work Habits Trajectories on Academic Outcomes

Effects	β	95% Confidence Intervals	
		Lower bound	Upper bound
Intercept to grades			
Total effect	0.48	0.38	0.59
Total direct	0.42	0.32	0.55
Total indirect (via WJ-R)	0.05	0.03	0.08
Intercept to advanced classes			
Total effect	0.40	0.30	0.51
Total direct	0.33	0.23	0.44
Total indirect (via WJ-R)	0.07	0.05	0.11
Intercept to college selectivity			
Total effect	0.32	0.22	0.44
Total direct	0.28	0.17	0.39
Total indirect (via WJ-R)	0.05	0.02	0.07
Intercept to educational attainment			
Total effect	0.31	0.22	0.41
Total direct	0.10[a]	−0.02	0.23
Total indirect	0.21	0.15	0.30
Via grades	0.08	0.04	0.12
Via advanced classes	0.02[a]	−0.01	0.06
Via college selectivity	0.09	0.05	0.14
Via WJ-R and grades	0.01[a]	0.00	0.02
Via WJ-R and advanced classes	0.01[a]	0.00	0.01
Via WJ-R and college selectivity	0.01	0.01	0.03
Slope to grades			
Total effect	0.40	0.25	0.63
Total direct	0.36	0.20	0.59
Total indirect (via WJ-R)	0.04	0.02	0.07
Slope to advanced classes			
Total effect	0.30	0.15	0.50
Total direct	0.24	0.09	0.44
Total indirect (via WJ-R)	0.06	0.03	0.10
Slope to college selectivity			
Total effect	0.28	0.11	0.48
Total direct	0.25	0.08	0.45
Total indirect (via WJ-R)	0.04	0.01	0.07
Intercept to educational attainment			
Total effect	0.28	0.12	0.51
Total direct	0.10[a]	−0.10	0.32
Total indirect	0.18	0.11	0.29
Via grades	0.06	0.03	0.12
Via advanced classes	0.02[a]	−0.01	0.05
Via college choice selectivity	0.08	0.03	0.15
Via WJ-R and grades	0.01[a]	0.00	0.01
Via WJ-R and advanced classes	0.00[a]	0.00	0.01
Via WJ-R and college selectivity	0.01[a]	0.00	0.02

Note. WJ-R = Woodcock-Johnson-Revised at the beginning of high school.
[a] Coefficients with confidence intervals encompassing 0 and deemed non-significant.

Robustness checks. We estimated two robustness checks. Our robustness check reestimating the model using the covariates across middle childhood (e.g., income-to-needs ratio, single-parent household) yielded similar model fit and standardized effects (see Figure S1). Our second robustness check included work orientation at the beginning and end of high school to account for possible within-time associations between work habits and achievement. The findings shown in Figure S2 are similar to those of the main model. Children's work habits at first grade and the change in

work habits predicted their academic achievement at the beginning of high school as well as their academic outcomes at the end of high school. Adolescents' academic outcomes at the end of high school predicted their educational attainment at age 26. In addition, work habits at first grade predicted work orientation at the beginning of high school, which, in turn predicted adolescents' grades, advance classes, and college selectivity at the end of high school. Work orientation at the end of high school did not significantly predict education attainment.

Discussion

Based on noncognitive, SEL, and character frameworks, the goals of this study were to chart the development in children's work habits from middle childhood to early adolescence and describe the cascading academic correlates in adolescence and adulthood. Our first two hypotheses were supported, suggesting that children's work habits evidenced small mean-level increases and strong differential stability from first to sixth grade. The findings also supported our second two hypotheses such that children's works habits in first grade and the growth in work habits from first to sixth grade predicted higher academic achievement at the beginning of high school; overall grades, advanced classes, and college selectivity at the end of high school; and educational attainment at age 26. These findings demonstrate cascading developmental effects of childhood work habits at the beginning and end of high school, and then to adulthood.

Mean-Level Changes and Differential Stability in Children's Work Habits

In 1981, McCall articulated two aspects of developmental continuity and change: differential stability (i.e., stability in interindividual differences) and mean-level changes (i.e., intraindividual changes). Though McCall (1981); Caspi et al. (2005), and Rutter (1989) have articulated how these two types of change are complementary and that information on both aspects of change is necessary to understand development, at the time and even to this day, many studies typically only highlight one of these aspects and often focus on only short-term stability. Our findings on strong differential stability and significant mean-level increases in work habits suggest that children are likely to stay in their relative position compared with their peers as their work habits get more advanced from middle childhood to early adolescence. Over the 5-year period, children's work habits evidenced strong correlations, particularly across 1-year periods (i.e., $r > .50$ is a large effect size; Cohen, 1992). Thus, children who had more advanced work habits than their peers at one time point were likely to maintain that advantage over time; however, correlations less than 1.00 also means that there was some shifting among individuals' relative position from one year to the next. Those relative shifts coincide with the individual variability in the growth of children's work habits (i.e., the variance in the slope from the growth curves) where some children are increasing at faster or slower rates. In other words, the differential rates of growth accumulate over time and will lead to less differential stability (or more differential change; Caspi et al., 2005) as shown in the slightly decreasing correlations estimated over longer time frames.

These patterns are fitting given the complexity of children's work habits. Work habits theoretically are comprised of a number

of fundamental self-management skills, including active listening, emotion regulation, focus, persistence, and planning. Change in complex multifaceted phenomena like work habits could be prompted by changes in any one of these fundamental skills as well as changes in the extent to which children can harness multiple skills in concert. Scholars in the character field have argued that the field needs to chart how skills differentiate over time and give rise to new, more complex skills (Clement & Bollinger, 2017). One direction for future research is to chart which fundamental self-management skills give rise to children's work habits. Another direction is how early work habits give rise to more complex work habits. Our robustness check analyses that included adolescents' work orientation are an example of this where childhood work habits may provide the foundation for individuals' later work orientations.

Another key finding is that children with higher work habits in first grade had relatively smaller increases over time, which is consistent with prior studies demonstrating less growth in children's approaches to learning for those who were already thriving (Buek, 2018; McDermott et al., 2014). This association could represent ceiling effects or differential timing in growth. Children with less developed work habits in first grade may have more room to grow suggesting potential for interventions targeting children who start with more limited work habits.

Developmental Cascades of Work Habits to Academic Outcomes

The second goal of this study was to describe the potential developmental cascades from children's work habits to academic outcomes during adolescence and adulthood. In the current findings, children's work habits in first grade and increases from first to sixth grade *directly* predicted individuals' academic achievement 9 years later (at the beginning of high school), as well as grades, advanced classes, and college selectivity 12 years later (at the end of high school). Finally, children's work habits predicted individuals' academic outcomes at the end of high school and higher educational attainment by age 26 *indirectly* through earlier academic achievement measured at the beginning of high school. All of these associations emerged even after controlling for a host of important child- and family-level covariates, including children's prior academic achievement. These patterns align with prior work on the direct and indirect effects of approaches to learning (McClelland et al., 2013); however, they also extend prior work by examining much later developmental outcomes and consider how these outcomes are associated with changes in children's work habits across childhood rather than just the predictive value of children's work habits at a single time point. The indirect associations we found suggest that later success builds on the earlier success of academic outcomes for which work habits may play a role in establishing. One important direction for future research is to identify the mechanisms by which work habits might influence each type of academic outcome. The practice of good work habits may reciprocally improve the capacity of underlying system functions that support work habits—like organizing thought, sustaining attention, and learning and synthesizing material—as well as important social factors like fostering positive teacher perceptions and expectations.

One central implication of these findings is the potential for developing work habits among young students. Because first grade work habits and increases in work habits from first to sixth grade both predicted academic outcomes as far into development as age 26, it may be fruitful to foster work habits during the elementary school years. Development in children's work habits will result from maturation of various developmental systems and contextual influences (Bronfenbrenner & Morris, 2006). Changes in cognitive processes, for instance, afford children increased capacity to regulate themselves better, to track their work more efficiently, to be less easily distracted while following classroom procedures, and to work more neatly on assignments. That said, children's work habits likely are also influenced by their surroundings. Positive teacher–child interactions, for example, can help shape children's self-regulation in positive ways, which may contribute to positive work habits (Vandenbroucke et al., 2018).

In these data, stronger work habits were also associated with living in more educated and academically stimulating family environments. Much of the literature on family involvement in children's education focuses on parents helping students with school assignments and being involved in the school (e.g., parent–teacher conferences; Hill & Tyson, 2009). It is worth examining how parents intentionally nurture foundational skills that enable children to have strong work habits in the classroom, such as how to organize their schoolwork, be persistent, and manage their time. Moreover, we argue that scholars need to examine how developmental processes in multiple contexts (e.g., family, classroom) including high quality afterschool activities (Kataoka & Vandell, 2013) influence children's work habits.

Limitations and Future Directions

There are several limitations to the present study. First, though we included a host of child- and family-level covariates, caution should be taken regarding causal claims as NICHD SECCYD is a longitudinal, correlational study. Second, the NICHD-SECCYD sample was drawn across the U.S. but is predominantly White (75%) and middle-class. Future studies using a more diverse sample is needed to provide credence to the generalizability of our findings.

One contribution of this study is being the first to our knowledge to chart the growth in children's work habits from first to sixth grade. One clear future direction is to examine continuing changes in work habits through adolescence and adulthood as critical skills for individuals' academic and occupational success (Lippman et al., 2015; Yuen et al., 2010). As individuals progress from primary school to secondary school and to the workforce, work habits may not only shift in terms of the level of the same constructs over time, but certain aspects may become more salient than others, and work habits overall may increase in complexity as individuals age. Our robustness check analyses including work orientation begin to address this issue by demonstrating that children's work habits predicted their adolescent work orientation.

Conclusion

Findings from the current study may be informative for policy-making and potential academic interventions in the K–12 school system. It may be fruitful to consider the ways in which teachers

and parents already positively shape children's work habits and how they might capitalize on those naturally occurring behaviors to promote strong work habits for all children. These efforts align with well-established, school-based social and emotional learning programs (Weissberg et al., 2015), and may already be an untested benefit of such programs given the connections between fundamental self-management skills and work habits. Findings of this study indicate that children's developing work habits may be foundational for their academic outcomes into adulthood.

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