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Relating Kindergarten Attention to Subsequent Developmental Pathways of Classroom Engagement in Elementary School

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Abstract We examine the relationship between children's kindergarten attention skills and developmental patterns of classroom engagement throughout elementary school in disadvantaged urban neighbourhoods. Kindergarten measures include teacher ratings of classroom behavior, direct assessments of number knowledge and receptive vocabulary, and parent-reported family characteristics. From grades 1 through 6, teachers also rated children's classroom engagement. Semi-parametric mixture modeling generated three distinct trajectories of classroom engagement (n=1369, 50% boys). Higher levels of kindergarten attention were proportionately associated with greater chances of belonging to better classroom engagement trajectories compared to the lowest classroom engagement trajectory. In fact, improvements in kindergarten attention reliably increased the likelihood of belonging to more productive classroom engagement trajectories throughout elementary school, above and beyond confounding child and family factors. Measuring the development of classroom productivity is pertinent because such dispositions represent precursors to mental health, task-orientation, and persistence in high school and workplace behavior in adulthood.

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Abbreviations

MLPS	Montreal longitudinal preschool study
PPVT	Peabody picture vocabulary test
NKT	Number knowledge test
CE	Classroom engagement
SBQ	Social behavior questionnaire
MOC	Mixtures of curves
BIC	Bayesian information criterion

Making sure that all children are ready to learn at school entry remains an international preoccupation, given the virtually axiomatic link between individual academic success and subsequent social, economic, and health outcomes (Heckman 2006; High and the Committee on Early Childhood, Adoption, and Dependant Care and Council on School Health 2008). Approximately one in five children show some form of developmental psychopathology during the transition to formal schooling (Carter et al. 2010). Such numbers not only indicate the potential for dropout but also a life course of difficulties in social and occupational functioning (Entwisle et al. 2005; Vitaro et al. 2005).

A recent consortium, led by an economist, inquired about what kindergarten characteristics matter most in predicting third grade achievement in math and reading (Duncan et al. 2007). The resulting research endeavour implemented a remarkably controlled prospective associational design across six international data sets, comprising approximately 36,000 children. Singular analyses of each data set and a subsequent meta-analysis which consolidated the results found that kindergarten math skills showed the most predictive

power, with verbal skills in second place. Behavior and social skills in kindergarten showed no significant influence on later achievement. However, attention, treated as distinct from cognitive and socio-behavioral factors, ranked third in predicting subsequent achievement. Remarkably, this study included a substantial amount of control variables which were common across data sets. The timing of the outcomes was very meaningful given that achievement patterns tend to stabilize by the middle of elementary school (Alexander and Entwisle 1998).

Kindergarten attention, being singled out as an important predictor of first and third grade math and reading achievement, highlights its value in conceptual models of school readiness and assessment. Executive function theorists view attention as an integral component of inhibitory control which accounts for its own variance in kindergarten cognitive skills, apart from general intelligence (Blair 2002; Blair and Razza 2007). The executive attention system seems pivotal in modulating reactivity, including approach, avoidance, and inhibition, and effortful control of behavior in response to cognitive, emotional, and social situational demands on self-regulation (Chang and Burns 2005; Dennis and Brotman 2003).

During early childhood, there is rapid growth and development in frontal and prefrontal brain regions which are recruited for self-regulation of attention (Marsh et al. 2008). Although comparatively less dramatic in terms of growth, these features continue to develop throughout middle childhood (Marsh et al. 2008). As preschool children experience improvements in effortful control, they also become increasingly able to inhibit impulsive responses and delay gratification (Kochanska et al. 2000). This process hones the ability to suppress competing and often less effortful responses in the service of higher, more demanding goals. Consequently, it is not surprising that teacher appraisals of classroom attention skills predict subsequent cognitive and behavioral performance in children (Duncan et al. 2007; Pagani et al. 2010a) and adolescents (Duckworth and Seligman 2005).

Attention skills, as early as preschool, provide the foundation of goal-based self-control behavior (Mischel et al. 1989) and are a prominent correlate and precursor to math and literacy skills in kindergarten (Blair and Razza 2007). Rather compelling evidence from several longitudinal studies suggest that early attention problems are prospectively associated with a number of challenges, including: reading underachievement and disability (McGee et al. 1991); use of special education services (MacDonald and Achenbach 1999); psychosocial maladjustment in high school (Mischel et al. 1989); and compromised educational attainment and coping in the face of stress and frustration (Shoda et al. 1990). Problems with attention in nationally representative samples of typically developing American and Canadian school age children predict long-term reductions in human capital and present comparatively more important risks than those associated with physical health problems (Currie and Stabile 2006). In fact, even low levels of attention problems in young students pose significant risks. Thus, mastery of such skills seems crucial for staying on a low-risk behavioral course toward successful academic performance and high school completion (Pagani et al. 2008b; Vitaro et al. 2005).

Could attention at a life-course turning point like formal school entry influence important learning-related behaviors that ultimately play a role in achievement (Fredricks et al. 2004)? Kindergarten is meant to consolidate social, behavioral, and cognitive skills in order to benefit subsequent formal and incremental learning from first grade onward. It is also a time when children learn to focus their behavior on teacher-directed activities and follow formal and informal rules in the classroom setting (McDermott et al. 2001). In their broadest form, "learning-related behaviors" reflect a constellation of skills that include but are not limited to self-discipline, self-investment, and productivity over pleasure despite boredom and/or frustration (Duckworth and Seligman 2005). Although these productivity characteristics are likely rooted in effortful control, they capture the larger realm of expected behavior in the classroom as students are expected to become more autonomous learners.

The pioneering work of McKinney et al. (1975) has underscored the importance of learning-related classroom behaviors which reflect focus, independence, and task-orientation, beyond the contribution of IQ. Using similar, yet distinct constructs, this finding has been recently replicated with more rigorous analyses of larger samples of children (Schaefer and McDermott 1999; Yen et al. 2004) and adolescents (Duckworth and Seligman 2006). In fact, when measured as academic self-discipline in the fall of eighth grade, it accounts for more than twice as much variance as IQ in predicting final grades, school attendance, and earnestness of getting homework done (Duckworth and Seligman 2005). Longer spanning prospective studies have established both lagged and cumulative effects of learning behaviors on achievement. First grade achievement in language and math is reliably estimated by cognitive self-control in learning situations, operationalized as problem-solving and task focus (Normandeau and Guay 1998). In fact, teacher ratings of children's engagement in first grade, measured as interest-participation and attention span, predict both standardized achievement and teacher-assigned grades throughout elementary school (Alexander et al. 1993) and academic attainment by early adulthood (Entwisle et al. 2005). These findings underscore the important life-course transition from preschool to elementary school and the added pertinence of establishing how a cost-efficient and accessible disposition like classroom attention predicts subsequent developmental pathways of learning-related behavior.

Not all kindergarten children master this form of cognitive control which sets the course for productive functioning in elementary school. In fact, apart from the above studies, very little is known about the prospective influence of attention on the subsequent course of learning-related behavior in typically developing children. Moreover, with few exceptions, most studies on either school readiness or learning-related behavior have generally focused on achievement as a product to the detriment of other process-oriented developmental outcomes.

As a learning-related behavior, classroom engagement could represent one such process-oriented outcome variable. This construct generally refers to observable and measurable child characteristics during learning-related activities that occur in instructional settings (McWayne et al. 2004). More particularly, our view of classroom engagement as a personal disposition benefits from several existing conceptual frameworks: (1) It is classified within the realm of behavioral school engagement, which emphasizes its malleability, responsivity to contextual features, and amenability to environmental change (Fredricks et al. (2004); (2) It considers "learning-related skills" such as self-control, persistence, organization, and the ability to engage in independent and group work as essential to success (McClelland et al. 2006); and lastly (3) It attempts to include attentional and emotional regulation, cognitive flexibility, and organization (Li-Grining et al. 2010). Integration of these essential features culminates in a "classroom engaged" child who is self-confident, cooperative, self-controlled, compliant and follows teacher instructions, and who contemplates effective decisions and completes work on time and independently. These behaviors lay the foundation for increasing advantage or risk for short- and long-term academic and personal success (Cunha et al. 2006; DiPrete and Eirich 2006). Evidently, student engagement in the classroom reflects, in large part, self regulation skills which are influenced by temperament and higher order cognitive executive function processes. In particular, sustained attention, which comprises both task-oriented attention and low impulsivity, predicts academic and behavioral adjustment (Razza et al. 2010) while a lacktherof is linked with disorders such as ADHD (Barkley 2012). It could be argued that much of classroom life requires age appropriate sustained attention skills such as listening with care and concentrating on learning-related activities directed by the teacher. An important contribution would be to examine the practical implications of this idea.

Hence, the present study examines the relationship between attention in the kindergarten classroom and subsequent developmental patterns of classroom engagement from grades 1 through 6 in children from disadvantaged neighbourhoods of Montreal (Canada). Studying developmental patterns in the form of trajectories should help identify the degree to which distinct subgroups either need reinforcement or enrichment for positive development or, at the other extreme, intervention due to higher risk for developmental psychopathology. We attempt to isolate the direct influence of attention by controlling for family and child characteristics that could potentially explain its relationship with classroom engagement (McClelland et al. 2007; Razza et al. 2010). Early attention problems and their associated correlates might also hinder later learning through their negative effect on emerging literacy and numeracy skills (Bull and Scerif 2001; Greenfield Spira and Fischel 2005). Similarly, early aggressive, prosocial, and internalizing characteristics have established links with subsequent academic performance in children (Feshbach and Feshbach 1987; Normandeau and Guay 1998). Once these factors are controlled, we expect to find a significant relationship between kindergarten attention skills and elementary school trajectories of classroom engagement, given that both characteristics are theoretically rooted in cognitive control.

Method

Participants

Children in this study represent a selected subsample from The Montreal Longitudinal Preschool Study (MLPS), which comprises several sequential longitudinal cohorts launched from the fall of 1997 to 2000 (see Duncan et al. 2007 for more information). At the launch of each sequential cohort of the MLPS, 4- and 5-year-old French-speaking children were enrolled in preschool in disadvantaged areas of Montreal (Quebec, Canada). Each sequential cohort represents one-third of its catchment area and was selected following an accord between school board administrators, local school committees, and teachers. Data was Institutional Review Board approved and collected only after active multilevel consent was obtained from all data sources (children, parents, and teachers from kindergarten to grade 6). For methodological reasons, we limit ourselves to the sample of children in kindergarten from the 1997–1998 through to the 1999–2000 school year (n=1369).[1]

French is the official language of instruction in Quebec. Two-thirds of children were linguistic-majority with parents born in Canada and French as their primary language. The remaining one-third of children were linguistic-minority with parents not born in Canada and speaking a mother tongue other than French or English at home. Mother tongue was not found influential on the key variables in this study.

[1] Data for the PPVT, which represents an important control variable, was not available in the 2000–2001 cohort.

Measures: Dependent Variable (from Grades 1 Through 6)

Classroom Engagement Trajectories In spring of grades 1 through 6, teachers rated children's classroom engagement (CE) behaviors using an 8-item scale (average Cronbach alpha from grades 1 through 6=0.90): Plays and works cooperatively with other children at a level appropriate for age; Demonstrates self-control; Shows self-confidence; Follows directions; Completes work on time; Works independently; Capable of making decisions; and Follows rules and task instructions. Potential responses ranged from 1 (*never*) to 5 (*always*). Higher scale scores indicate a higher degree of CE behaviors. This learning-related behavioral outcome is substantively indicative of productivity, compliance, and task-orientation in the classroom (Pagani et al. 2010a, b). There is significant stability across the 6 year span of the study (Pearson Correlations ranging from 0.49 to 0.51, $p<0.001$).

Measures: Predictor

Attention Skills In the fall and spring of kindergarten (acting as control and predictor, respectively), teachers completed a 4-item attention skills subscale from Social Behavior Questionnaire (SBQ, Tremblay et al. 1991). Attention items, rated from 1 (*often or very true*) to 3 (*never or not true*) include: Listens attentively; Easily distractible; Unable to concentrate; and Inattentive (average kindergarten Cronbach alpha=0.82). These were reverse scored (except for listens attentively) and summed for a scale score. Higher scores indicate better attention skills. The end of kindergarten (spring) measure served as the predictor. This factor is substantively and statistically related with impulsivity (Pagani et al. 2009).

Measures: Covariates

Child Behavioral Characteristics The SBQ also comprises the following factors: Hyperactive (5 items, α=0.90); Emotional distress (5 items, α=0.75); Physical Aggression (7 items, α=0.72); and Prosocial behavior (9 items, α=0.92). All of the SBQ items were rated on a Likert scale with response options 1 (never or not true), 2 (sometimes or somewhat true), or 3 (often or very true). Items were scored such that a higher value on the scale would indicate a higher degree of the factor. The SBQ represents a good predictor of future psychosocial adjustment and school success (Dobkin et al. 1995; Pagani et al. 2001). All factors were averaged from spring and fall of kindergarten scores.

Child Cognitive Skills (1) The Number Knowledge Test (NKT, abridged version) was administered individually to children by trained examiners to test basic knowledge of numbers (Okamoto and Case 1996). The NKT, adjusted for 5-year-olds, measures knowledge of the number sequence from one to ten; knowledge of the one to one correspondence in which a sequence is mapped onto objects being counted; understanding the cardinal value of each number; understanding the generative rule which relates adjacent cardinal values; and understanding that each successive number represents a set which contains more objects. (2) The Peabody Picture Vocabulary Test (PPVT, French adaptation, Dunn et al. 1993) was also administered by trained examiners to test vocabulary knowledge. This test consists of 175 vocabulary items which increase in difficulty throughout the test. The French version has been standardized by Dunn et al. (1993) and is highly correlated with other French vocabulary and intelligence tests. An average of spring and fall kindergarten scores was computed for both cognitive skills measures.

Family Characteristics In kindergarten, parents provided the data on family variables that could possibly influence the key variables in this study. Variables included family configuration (intact or not), maternal education (years), and the importance parent's accorded to their child's school success (based on a Likert-type scale ranging from 1 to 7).

Data Analytic Strategy

The overall objective is to examine how life-course patterns of classroom engagement in elementary school are predicted from kindergarten teacher ratings of attention. We assume population heterogeneity (Richters 1997) for both our variables. The chief advantage of our study is the availability of annual data on the developmental nature and course of classroom engagement over a 6 year childhood period. With this data it was possible for us to estimate several intercepts rather than one, allowing us to identify distinctive clusters of children showing similar nature and developmental course of classroom engagement from grades 1 through 6. Next, the strategy was to correctly model the relationship between attention skills in the spring of kindergarten and subsequent trajectories of teacher-rated CE from grades 1 through 6. Our interest is in correctly modelling the relationship between attention skills at the end of kindergarten and subsequent trajectories of teacher-rated CE throughout elementary school. Once we have established this link, we must reduce the possibility of competing explanations and minimize the possibility of omitted variable bias. These are likely to arise from unobserved family or child characteristics, which might be statistically or substantively correlated with our key variables. In order to secure an unbiased estimation of the predictor, our equations account for child factors (sex, NKT, PPVT, hyperactive, prosocial, aggressive, and emotional distress) and family factors

(family configuration and maternal education, importance accorded to child achievement) measured in kindergarten. The results bear upon two increasingly controlled models, estimated with loglinear regressions (using the CATMOD procedure in SAS).

For an unbiased estimation of β1, our primary equation conditions out concurrent cognitive skills and other FAM and CHILD measures that could influence β1 estimates either directly or indirectly:

$$CE_{iPRIM} = a_1 + \beta_1 ATT_{iSK} + \gamma_1 FAM_i + \gamma_2 CHILD_i + e_i$$

Where CE_{iPRIM} represents the elementary school trajectory of CE behavior, ATT_{iSK} represents teacher ratings of attention in the spring of kindergarten, and FAM_i and $CHILD_i$ represent family and child control variables for each individual $child_i$. Finally, a_1 and e_i represent the constant and the stochastic error term, respectively. It is realistic to think that even large numbers of demographic and personal control variables cannot capture all of the important dimensions of FAM and CHILD. That is, it remains possible that Model 1 can produce biased estimates of β1 especially given that children enter kindergarten in the fall with varying levels of attention. Many preschool factors could influence kindergarten entry attention. To best isolate the attention factor as a predictor in our model, it would be best to remove any lingering unmeasured preschool influences that could confound the relationship we aim to examine. As a proxy for such lingering unmeasured influential factors, we estimate more powerful version of Model 1 with stricter power against omitted-variable bias by including the influence of child attention in the fall of kindergarten (ATT_{iFK}). This secondary more stringent model is as follows:

$$CE_{iPRIM} = a_1 + \beta_1 ATT_{iSK} + \beta_2 ATT_{iFK} + \gamma_1 FAM_i + \gamma_2 CHILD_i + e_i$$

Given that the kindergarten entry attention ($ATT_{iFK)}$ variance is brought down to zero, this more stringent model can be *alternatively* interpreted as how increases or decreases in attention, during kindergarten either due to maturation or to the curriculum, influence subsequent trajectories of CE behavior for each individual $child_i$. This approach is rigorous and has been increasingly used in school readiness studies with population-based samples (Duncan et al. 2007; Pagani et al. 2010a; Romano et al. 2010).

Results

Using an accelerated model across the cohorts, the analyses adopt a clustering over time approach by aiming to identify qualitatively distinct developmental pathways for the CE variable from grades 1 through 6. All participants had at least three valid teacher ratings on the CE measure. In order to respect the pattern-centered orientation, we opted for a semi-parametric, mixture modeling technique (TRAJ, Jones et al. 2001; Nagin and Tremblay 1999). With this technique, the differences among the groups are based primarily on several intercepts, rather than a combination of one intercept and one slope, as in Growth Curve Modelling. As such, we used the General Nonlinear Mixtures of Curves Program (MOC, Boulerice 2001), which is based on the original semi-parametric group-based approach (see Broidy et al., 2003 and Pagani et al. 2008a). Its general time function represents a major advantage because it facilitates the estimation of distinct trajectories, or clusters of individuals with similar features over time. This statistical procedure yields, for every subject, the probability of being classified in each of the trajectories. More specifically, based on this posterior group probability, individuals are assigned to the trajectory group for which they have the highest probability of belonging (see Nagin 2005 for a technical explanation). As such, this type of trajectory modeling describes the features of its trajectories (e.g., rising, falling, stable, or quadratic) and the estimated proportion of the population belonging to each trajectory type (see Nagin and Tremblay 1999 for an illustration of the technique). To increase reliability, CE trajectories were generated using all available data from the cohorts available, as is typically recommended in mixture modeling of accelerated data. Given our interest in understanding developmental features of this variable from the beginning to the end of elementary school, the general time function in MOC represents a major advantage because it facilitates the estimation of distinct trajectories with data from longitudinal accelerated designs. The best fitting model was selected using the Bayesian Information Criterion (BIC) and the most adequate entropy, which represents an index of mixture separation. Though other best-fitting model indices of fit remain important, such as the examination of residuals and comparisons of fitted versus observed values, the model that minimizes the BIC was preferred. We considered the BIC with and without corrections for entropy (represented as ICL-BIC).

Model Estimates and Fit Compared to the alternative two and four group models (which showed less and more mixture separation, respectively), we favoured a three group negative binomial mixture model. Visual inspection also showed few differences between the three group and four group model. The criteria for this three group model indicate a very good fit, with corrections for entropy (ICL-BIC= 27,391) and corrections for entropy without (BIC=22664). In other words, three CE trajectories emerged from the available data, which comprises an accelerated model including all three kindergarten cohorts of children, -2 log (likelihood)=22,466, df=19744, with entropy index=2,363.6.

The three group model comprises a Low trajectory=23% (of which 65%=boys and 35%=girls), Medium trajectory=34% (of which 53%=boys and 47%=girls), and High trajectory=43% (of which 41%=boys and 59%=girls). The mean mixture probabilities are reported in Table 1 and the posterior mean-fitted and observed values for the trajectories in elementary school are illustrated in Fig. 1(a) and (b), respectively. We observed sex differences in trajectory membership, χ^2 (2)=70.38, $p>0.0001$. There were 18% more girls than boys in the High CE trajectory and 30% more boys than girls in the Low CE trajectory.

We had to attend to attrition prior to examining the prospective association between kindergarten attention skills and subsequent CE trajectories. From the selected MLPS cohorts of 1369 kindergarten children, 1,080 had covariate data. We implemented multiple imputation of this 20% by using an iterative method based on EM algorithm (NORM) which draws values from the conditional distribution of the variables, depending on the available and valid observations from the original data set (for technical details see Schafer 1999). Table 2 reports descriptive statistics of key variables and family and child controls in the study.

In Model 1, we examine the relationship between kindergarten attention skills and CE during elementary school using loglinear regressions, while controlling for child and family factors that might provide competing explanations. Coefficients in Table 3 indicate that attention skills were significantly associated with an increased likelihood of membership in more productive elementary school CE trajectories. The influence of attention skills was quite proportionate, in that higher levels of attention predicted greater chances of belongingness to the High and Medium CE trajectories, compared to the Low CE trajectory.

In Model 2, we verify the above relationship while adding kindergarten entry attention as a control in the model. As reported in Table 4, kindergarten attention remained a significant predictor and proportionately linked with subsequent CE trajectories. Albeit kindergarten entry attention showed no significant influence, there is a noteworthy change in the predictive power of both the independent variable and its covariates on the probability associated with belonging to the CE trajectories. Contrasts of maximum likelihood estimates indicate that increases in attention skills predicted significantly better chances of belonging to the High CE trajectory, compared to the Low trajectory. A one unit improvement in attention by the end of kindergarten predicted better chances of belonging to the High CE trajectory, by 45%, compared to the lowest CE trajectory. Similarly, unit increases in attention predicted better chances of belonging to the Medium CE trajectory, by 23%, compared to the Low CE trajectory. Lastly, unit increases in attention by the end of kindergarten predicted better chances of belonging to the High CE trajectory, by 17%, compared to the Medium CE trajectory.

The final results also highlight the significant unique contributions made by the covariates in predicting membership to specific CE trajectories. Foremost, we observed significant sex differences. Compared to boys, girls were more likely to belong to the High CE trajectory compared to the Low trajectory. Nevertheless, no sex by attention skills interaction was found. Second, the results reveal a relationship between physical aggression and subsequent CE trajectories. Higher physical aggression scores in kindergarten were associated with lower chances of belonging to the High CE trajectory, compared to the Low CE trajectory (10% less) and Medium CE trajectory (8% less). Finally, number knowledge predicted CE. Higher NKT scores in kindergarten were associated with better chances of belonging to the High and Medium CE trajectories, compared to the lowest trajectory (12% and 15% more), respectively.

Discussion

There are important costs and risks associated with attention deficits in childhood. These include but are not limited to academic difficulties and high school dropout (Currie and Stabile 2006; Pagani et al. 2008a, b), unemployment (Caspi and Silva 1995), and problematic substance use (Jestor et al. 2008). Even lower levels of inattention, typically considered benign because they do not achieve a clinical threshold, pose significant risks for underachievement and its long-term consequences (Currie and Stabile 2006).

Children not only need specific cognitive skills but also attention skills for participating in learning activities and classroom life. Our observations suggest that kindergarten attention skills represent an integral part of the groundwork for subsequent developmental pathways of classroom engagement which promise personal success. Not surprisingly, boys were more likely to show more disengaged behavior. Regardless of sex, higher levels of kindergarten attention

Table 1 Mean mixture probabilities for children showing low, medium, and high classroom engagement from grades 1 through 6, as reported by teachers

Group membership	Low classroom engagement trajectory	Medium classroom engagement trajectory	High classroom engagement trajectory
Prior Probabilities	0.43	0.33	0.23
Posterior Probabilities	0.43	0.33	0.23

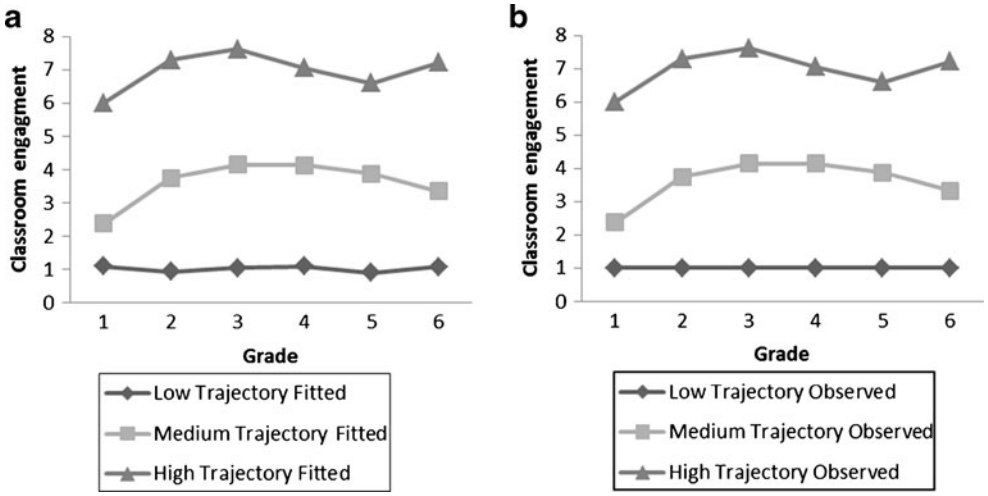

Fig. 1 Trajectories of classroom engagement throughout elementary school, based on fitted (**a**) and observed (**b**) values

were associated with better chances of belonging to the high and medium classroom engagement trajectories compared to the lower classroom engagement trajectory. Our findings when individual differences in attention skills at kindergarten entry are put to zero suggest that improvements in attention during kindergarten translate into better chances of following an optimal pathway of productive, compliant, and task-oriented classroom behaviors throughout elementary school. These improvements in attention likely help children become increasingly able to inhibit impulsive responses and delay gratification (Kochanska et al. 2000). Although these results are based on typically developing children in a province that has generous social programming, disadvantaged urban Montreal neighbourhoods remain characterized by cumulative psychosocial risk (Pagani et al. 1998) and child underachievement (Pagani et al. 1999).

Table 2 Descriptive statistics of key variables and family and child controls in the study

Variable and data source	Mean	Standard deviation
Child Age (years)	6.13	0.03
Maternal Age (years)	25.34	5.10
Kindergarten entry attention (TR)	6.06	2.43
Kindergarten end attention (TR)	6.20	2.48
Maternal importance accorded to child achievement	4.72	1.08
Maternal education	12.25	3.38
Family configuration (1 = intact and 0 = not intact)	0.66	0.47
Kindergarten physical aggression (TR)	19.73	2.48
Kindergarten emotional distress (TR)	13.60	1.90
Kindergarten hyperactive behavior (TR)	12.90	2.70
Kindergarten prosocial behavior (TR)	19.94	4.76
Kindergarten number knowledge (IT)	13.21	3.79
Kindergarten receptive vocabulary (IT)	59.43	24.15

Teacher-rated = TR and individually-tested = IT

The prospective association between kindergarten attention and habitual dispositions toward more or less classroom engagement could represent different manifestations of the same constellation of skills that underlie inhibitory control. In other words, our study also examined heterotypic continuity - heterogeneity of two behaviors which probably reflect common underlying neural processes. These common underlying mechanisms may contribute to multiple behavioral traits and dynamic relations that can implicate one system in the development of another (Putnam et al. 2008). Our related variables might be associated because they are part of a developmental continuum of executive function processes that help modulate behavior according to the self-regulation demands (i.e., cognitive, emotional and social) of specific situations (Chang and Burns 2005). This would explain why learning-related classroom behaviors account for their own variance in cognitive skills, beyond

Table 3 The unique contribution of end-of-kindergarten attention skills in predicting trajectories of classroom engagement from grades 1 through 6, with family and child controls

Variable and data source	df	χ^2
Intercept	2	3.30
Sex	2	6.12*
Kindergarten-end attention (TR)	2	72.29***
Maternal importance accorded to child achievement	4	1.12
Maternal education	4	2.10
Family configuration	4	9.29
Kindergarten physical aggression (TR)	2	5.40
Kindergarten emotional distress (TR)	2	5.58
Kindergarten hyperactive behavior (TR)	2	4.96
Kindergarten prosocial behavior (TR)	2	4.17
Kindergarten number knowledge (IT)	2	42.33***
Kindergarten receptive vocabulary (IT)	2	1.16

Teacher-rated = TR and individually-tested = IT

*$p \leq 0.05$, ***$p \leq 0.001$

Table 4 The association between end-of- kindergarten attention skills and classroom engagement trajectories in elementary school, while controlling for kindergarten-entry attention

Variable and data source	df	χ^2
Intercept	2	1.11
Sex	2	6.39*
Kindergarten entry attention (TR)	2	1.91
Kindergarten end attention (TR)	2	56.66***
Maternal importance accorded to child achievement	4	1.00
Maternal education	4	2.14
Family configuration	4	8.89
Kindergarten physical aggression (TR)	2	6.06*
Kindergarten emotional distress (TR)	2	3.94
Kindergarten hyperactive behavior (TR)	2	3.67
Kindergarten prosocial behavior (TR)	2	2.76
Kindergarten number knowledge (IT)	2	38.56***
Kindergarten receptive vocabulary (IT)	2	1.06

Teacher-rated = TR and individually-tested = IT

*$p \leq 0.05$, ***$p \leq 0.001$

general intelligence. Classroom engagement, as measured here, likely represents a distal operationalization of the executive processes associated with productive behavior.

We found other prospective associations above and beyond the influence of kindergarten attention skills. Early math skills forecast more positive developmental pathways of classroom engagement. On one hand, it could be that children with early mastery of the precursors to mathematics experience more self-efficacy in the classroom environment and that these personal dispositions help set the course for more productive learning-related behaviors. On the other hand, it could be that the same developmental executive function processes that account for attention as a precursor of informal math skills in early childhood also support dispositions toward task-orientation, compliance, and cooperativeness. The latter explanation is supported by findings which indicate that math skills predict direct assessments of executive functioning (Blair and Razza 2007; McClelland et al. 2007).

Blair and Razza (2007) suggest that problems with attention probably obstruct evaluative cognitive processing and decision-making of strategy choice in challenging learning situations. This undermining process begins in early childhood, a time when the development of attention is required for honing the requisite cognitive skills for learning to read and understand arithmetic. Although these explanations are beyond the scope of our data set and analyses, it remains clear that early number skills, assessed by the number knowledge test, account for an important part of the leftover variance in the main objective of this study.

We also found that teacher-rated aggression in kindergarten forecasts risks for less optimal pathways of classroom engagement. With similar measures and children born a decade earlier from the same catchment area, Vitaro et al. (2005) found that externalizing characteristics in kindergarten predicted high school dropout by age 23. Physical aggression and restlessness are likely influenced by flawed processes which inhibit impulsivity and delay of gratification (Mischel et al. 1988, 1989). Caspi et al. (1998) argue that these characteristics shape future labor-market outcomes, not only because they shape educational attainment but also because they affect labor-market behaviors.

At a glance, one could argue that our objective could have been addressed using a more holistic approach such as growth curve modeling. Studying life-course pathways using distinct trajectories allows us to examine homotypic continuity— which refers to showing characteristic similarity in behaviors over time (Caspi et al. 1998). Most importantly, this approach would not have allowed us to examine differential continuity which reflects between-group qualitative differences due to populational heterogeneity and the maintenance of a stable relative position in a population (Richters 1997).

Although some may view the conceptual overlap between the predictor and outcome as a limitation,[2] the findings from this study suggest a compelling tale of developmental continuity. Specifically, the results suggest a chain of sequential behavioral characteristics (emanating from the underlying latent characteristic of inhibitory control) that evolve with growth, development, and autonomy requirements from the environment. This thinking is not original, as we have seen early behavioral precursors time and again within the established child development literature: kindergarten aggression predicting adolescent conduct disorder symptoms (Tremblay et al. 1994); early onset conduct disorder predicting later antisocial personality disorder (Moffitt and Caspi 2001); and finally, kindergarten impulsivity predicting pre-adolescent gambling involvement and infant televiewing predicting more sophisticated screen media consumption in pre-adolescence (Pagani et al. 2009, 2010b respectively). Albeit conceptual

[2] Indeed, there may be conceptual interdependence between the constructs of attention and classroom engagement. The kindergarten correlation between the four most suspected CE items (in the form of one factor: follows directions; completes work on time; works independently; and follows rules and task instructions) and the attention predictor is 0.08 ($p<0.05$). Separate correlations between each item and the attention predictor resulted in correlations of 0.56, 0.46, 0.52, and 0.46, respectively. While this significant correlation supports the idea of conceptual overlap between the two constructs, both assessed at kindergarten by the same data source, researchers and clinicians and teachers may not find it as meaningful to measure the attention factor in the upper grades given that children face increasing demands from the school environment (above and beyond commonly requested kindergarten behaviors). Thus, classroom engagement, as a measure, likely represents a more applicable estimate in behavioral classroom research because it is developmentally adapted to student-environment fit processes in elementary school.

overlap may be argued, the contribution from all of these advancements, including our results, is the identification of a developmental chain of measureable precursor behaviors.

Two more points merit further discussion. First, teachers were the unique data source for both key variables in this study, with the exception of the control variables. From a shared method variance point of view, this could be seen as a limitation of the study. Nevertheless, safe for the beginning and end of kindergarten year data, different teachers provided information on classroom engagement from grades 1 through 6. Having seven different teacher reporters from year to year alleviates much concern about confounding between data points and ensured some form of independence in measures from 1 year to the next. Second, this study clearly addresses classroom manifestations of attentive behavior and not its more fundamental cognitive construct. On one hand, teacher observations of classroom attention will never be as valid and precise as direct measures of the cognitive construct of attention. On the other hand, teachers, who spend six to seven hours per day in school-related activities, can reliably report whether a particular child listens attentively, is easily distractible, has difficulties concentrating, and is generally inattentive compared to classmates. Kindergarten teacher reports might present an advantage because they are based on typical classroom behaviors, rated by a regular, task-related observer who is qualified to set the standard of expected behavior. The robustness of the attention factor in this study and of teacher ratings compared to direct observations in six international data sets (Duncan et al. 2007) attests to the reliability of teacher reports for assessing many child characteristics in the classroom. As a rule rather than an exception, school based (classroom) research which ultimately informs and influences children's and educational policies uses both cost-efficient and easy to use measures.

Implications for Research, Policy, and Practice

From a cost-benefit perspective, our findings highlight the practical and predictive value of teacher assessments in kindergarten. Because even low levels of inattention influence long-term human capital (Currie and Stabile 2006), this study on typically developing children, indicates how cost-effective teacher assessments translate into the development and maintenance of less than optimal productive classroom behavior over the long term. Measuring long-term productivity is interesting because it is not part of the typical outcomes assessed in studies of attention skills in young children.

Why would the study of classroom engagement be important? We contend that the school environment is a prototype of the adult work environment and that individuals develop behavioral dispositions which eventually crystallize by the end of childhood (Lleras 2008). That is, the defining features of our teacher-reported measure of classroom engagement strongly resemble adult workplace behavior (Bowles et al. 2001). This suggests developmental stability in human behavior across contexts and developmental periods. As human development takes its course both socially and intellectually, a person-environment fit perspective predicts that engagement behaviors, regardless of context, determine schooling and employment prospects (Bowles and Gintis 2002; Nyhus and Pons 2005). What is more, these can ultimately promote or undermine social and economic stratification processes (Farkas 2003).

Our findings make a compelling case for classroom engagement, and its attentional precursor as malleable targets for early intervention. These behaviors are easily measured because they are concrete and identifiable by teachers who typically handle large groups. Of course, early identification and early remediation represent the least costly form of intervention, thus favouring interventions prior to formal school entry. In fact, there is evidence that attention and its associated executive function characteristics are responsive to intervention during early childhood (Diamond et al. 2007; Lillard and Else-Quest 2006). Universal approaches to bolstering attention skills in kindergarten children might translate into stable and productive pathways toward learning in elementary school. Because our study uses a linear approach to a supposedly complex question, the next step would be investigations of mediating and moderating processes in order to better understand the relationship between attention and subsequent person-environment fit issues in the classroom. We encourage others with similar population-based data sets to extend our findings.

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References

Alexander, K., & Entwisle, D. (1998). Facilitating the transition to first grade: the nature of transition and research on factors affecting it. *Elementary School Journal, 98*, 351–364.

Alexander, K. L., Entwisle, D. R., & Dauber, S. L. (1993). First-grade classroom behavior: its short-and long-term consequences for school performance. *Child Development, 64*, 801–814.

Barkley, R. A. (2012). *Executive functioning and self-regulation: Extended phenotype, synthesis, and clinical implications*. New York: Guilford.

Blair, C. (2002). School readiness: integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*, 111–135.

Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development, 78*, 647–663.

Boulerice, B. (2001). *General nonlinear mixtures of curves statistical software program.* Unpublished statistical software program (http://lib.stat.cmu.edu/R/CRAN/).

Bowles, S., & Gintis, H. (2002). Schooling in capitalist America Revisited. *Sociology of Education, 75*, 1–18.

Bowles, S., Gintis, H., & Osborne, M. (2001). The determinants of earnings: a behavioral approach. *Journal of Economic Literature, 39*, 1137–1176.

Broidy, L. M., Nagin, D. S., Tremblay, R. E., Bates, J. E., Brame, B., Dodge, K. A., Fergusson, D., Horwood, J. L., Loeber, R., Laird, R., Lynam, D. R., Moffitt, T. E., Pettit, G. S., & Vitaro, F. (2003). Developmental trajectories of childhood disruptive behaviors and adolescent delinquency: A six site, cross-national study. *Developmental Psychology, 39*, 222–245.

Bull, R., & Scerif, G. (2001). Executive functioning as a predictor of children's mathematics ability: inhibition, switching, and working memory. *Developmental Neuropsychology, 19*, 273–293.

Carter, A. S., Wagmiller, R. J., Gray, S. A., McCarthy, K. J., Horwitz, S. M., & Briggs-Gowan, M. J. (2010). Prevalence of DSM-IV disorder in a representative, healthy birth cohort at school entry: sociodemographic risks and social adaptation. *Journal of the American Academy of Child and Adolescent Psychiatry, 49*, 686–698.

Caspi, A., & Silva, P. (1995). Temperamental qualities at age three predict personality traits in young adulthood: longitudinal evidence from a birth cohort. *Child Development, 66*, 486–498.

Caspi, A., Wright, B., Moffitt, T. E., & Silva, P. A. (1998). Early failure in the labor market: childhood and adolescent predictors of unemployment in the transition to adulthood. *American Sociological Review, 63*, 424–451.

Chang, F., & Burns, B. (2005). Attention in preschoolers: associations with effortful control and motivation. *Child Development, 76*, 247–263.

Cunha, F., Heckman, J. J., Lochner, L. J., & Masterov, D. V. (2006). Interpreting evidence on life skill formation. In E. A. Hanushek & F. Welch (Eds.), *Handbook of the economics of education* (pp. 697–812). Amsterdam: North Holland.

Currie, J., & Stabile, M. (2006). Child mental health and human capital accumulation: the case of ADHD. *Journal of Health Economics, 25*, 1094–1118.

Dennis, T., & Brotman, L. (2003). Effortful control, attention, and aggressive behavior in preschoolers at risk for conduct problems. *Annals of the New York Academy of Sciences, 1008*, 252–255.

Diamond, A., Barnett, W. S., Thomas, J., & Munro, S. (2007). Preschool program improves cognitive control. *Science, 318*, 1387–1388.

DiPrete, T. A., & Eirich, G. M. (2006). Cumulative advantage as a mechanism for inequality: a review of theoretical and empirical developments. *American Sociological Review, 71*, 515–541.

Dobkin, P. L., Tremblay, R. E., Masse, L. C., & Vitaro, F. (1995). Individual and peer characteristics in predicting boys' early onset of substance abuse: a seven-year longitudinal study. *Child Development, 66*, 1198–1214.

Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science, 16*, 939–944.

Duckworth, A., & Seligman, M. (2006). Self-discipline gives girls the edge: gender in self-discipline, grades, and achievement test scores. *Journal of Educational Psychology, 98*, 198–208.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., et al. (2007). School readiness and later achievement. *Developmental Psychology, 43*, 1428–1446.

Dunn, L. M., Thériault-Whalen, C. M., & Dunn, L. M. (Eds.). (1993). *Peabody picture vocabulary test-revised: French adaptation*. Toronto: Psycan.

Entwisle, D. R., Alexander, K. L., & Olson, L. S. (2005). First grade and educational attainment by age 22: a new story 1. *American Journal of Sociology, 110*, 1458–1502.

Farkas, G. (2003). Cognitive and noncognitive traits and behaviors in stratification processes. *Annual Review of Sociology, 29*, 541–562.

Feshbach, N., & Feshbach, S. (1987). Affective processes and academic achievement. *Child Development, 58*, 1335–1347.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: potential of the concept, state of the evidence. *Review of Educational Research, 74*, 59.

Greenfield Spira, E., & Fischel, J. E. (2005). The impact of preschool inattention, hyperactivity, and impulsivity on social and academic development: a review. *Journal of Child Psychology and Psychiatry, 46*, 755–773.

Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. *Science, 312*, 1900–1902.

High, P. C., & the Committee on Early Childhood, Adoption, and Dependant Care and Council on School Health. (2008). School readiness. *Pediatrics, 121*, 1008–1015.

Jestor, J. M., Nigg, J. T., Buu, A., Puttler, L. I., Glass, J. M., Heitzeg, M. M., et al. (2008). Trajectories of childhood aggression and inattention/hyperactivity: differential effects on substance abuse in adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry, 47*, 1–8.

Jones, B., Nagin, D., & Roeder, K. (2001). A SAS procedure based on mixture models for estimating developmental trajectories. *Sociological Methods and Research, 29*, 374–393.

Kochanska, G., Murray, K., & Harlan, E. (2000). Effortful control in early childhood: continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36*, 220–232.

Li-Grining, C. P., Votruba-Drzal, E., Maldonado-Carreno, C., & Hass, K. (2010). Children's early approaches to learning and academic trajectories through fifth grade. *Developmental Psychology, 46*, 1063–1077.

Lillard, A., & Else-Quest, N. (2006). The early years: evaluating Montessori education. *Science, 313*, 1893–1894.

Lleras, C. (2008). Do skills and behaviors in high school matter? The contribution of noncognitive factors in explaining differences in educational attainment and earnings. *Social Science Research, 37*, 888–902.

MacDonald, V., & Achenbach, T. (1999). Attention problems versus conduct problems as 6-year predictors of signs of disturbance in a national sample. *Journal of the American Academy of Child & Adolescent Psychiatry, 38*, 1254.

Marsh, R., Gerber, A. J., & Peterson, B. S. (2008). Neuroimaging studies of normal brain development and their relevance for understanding childhood neuropsychiatric disorders. *Journal of the American Academy of Child & Adolescent Psychiatry, 47*, 1233–1251.

McClelland, M. M., Acock, A. C., & Morrison, F. J. (2006). The impact of kindergarten learning-related skills on academic trajectories at the end of elementary school. *Early Childhood Research Quarterly, 21*, 471–490.

McClelland, M. M., Cameron, C. E., Connor, C. M., Farris, C. L., Jewkes, A. M., & Morrison, F. J. (2007). Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology, 43*, 947–959.

McDermott, P., Mordell, M., & Stoltzfus, J. (2001). The organization of student performance in American schools: discipline, motivation, verbal learning, and nonverbal learning. *Journal of Educational Psychology, 93*, 65–76.

McGee, R., Partridge, F., Williams, S., & Silva, P. (1991). A twelve-year follow-up of preschool hyperactive children. *Journal of American Academy of Child & Adolescent Psychiatry, 30*, 224.

McKinney, J. D., Mason, J., Perkerson, K., & Clifford, M. (1975). Relationship between classroom behavior and academic achievement. *Journal of Educational Psychology, 87*, 198–203.

McWayne, C. M., Fantuzzo, J. W., & McDermott, P. A. (2004). Preschool competency in context: an investigation of the unique contribution of child competencies to early academic success. *Developmental Psychology, 40*, 633–645.

Mischel, W., Shoda, Y., & Peake, P. K. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology, 54*, 687–696.

Mischel, W., Shoda, Y., & Rodriguez, M. I. (1989). Delay of gratification in children. *Science, 244*, 933–938.

Moffitt, T. E., & Caspi, A. (2001). Childhood predictors differentiate life-course persistent and adolescence limited antisocial pathways, among males and females. *Development & Psychopathology, 13*, 355–375.

Nagin, D. (2005). Analyzing developmental trajectories: a semi-parametric, group-based approach. *Psychological Methods, 4*, 139–157.

Nagin, D., & Tremblay, R. E. (1999). Trajectories of boys' physical aggression, opposition, and hyperactivity on the path to physically violent and nonviolent juvenile delinquency. *Child Development, 70*, 1181–1196.

Normandeau, S., & Guay, F. (1998). Preschool behavior and first-grade school achievement: the mediational role of cognitive self-control. *Journal of Educational Psychology, 90*, 111–121.

Nyhus, E. K., & Pons, E. (2005). The effects of personality on earnings. *Journal of Economic Psychology, 26*, 363–384.

Okamoto, Y., & Case, R. (1996). Exploring the microstructure of children's central conceptual structures in the domain of number. *Monographs of the Society for Research in Child Development, 61*, 27–58.

Pagani, L. S., Tremblay, R. E., Vitaro, F., Kerr, M. A., & McDuff, P. (1998). The impact of family transition on the development of delinquency in adolescent boys: a 9-year longitudinal study. *Journal of Child Psychology and Psychiatry, 39*, 489–499.

Pagani, L. S., Boulerice, B., Tremblay, R. E., & Vitaro, F. (1999). Effects of poverty on academic failure and delinquency in boys: a change and process model approach. *Journal of Child Psychology and Psychiatry, 40*, 1209–1219.

Pagani, L., Tremblay, R. E., Vitaro, F., Boulerice, B., & McDuff, P. (2001). Effects of grade retention on academic performance and behavioral development. *Development and Psychopathology, 13*, 297–315.

Pagani, L., Japel, C., Vaillancourt, T., Coté, S., & Tremblay, R. E. (2008a). Links between life course trajectories of family dysfunction and anxiety during middle childhood. *Journal of Abnormal Child Psychology, 36*, 41–53.

Pagani, L., Vitaro, F., Tremblay, R., McDuff, P., Japel, C., & Larose, S. (2008b). When predictions fail: the case of unexpected pathways toward high school dropout. *Journal of Social Issues, 64*, 175–194.

Pagani, L., Derevensky, J. L., & Japel, C. (2009). Predicting gambling behavior in sixth grade from kindergarten impulsivity: a tale of developmental continuity. *Archives of Pediatrics and Adolescent Medicine, 163*, 238–243.

Pagani, L., Fitzpatrick, C., Archambault, I., & Janosz, M. (2010a). School readiness and later achievement: a French-Canadian replication and extension. *Developmental Psychology, 46*(5), 984–994.

Pagani, L. S., Fitzpatrick, C. F., Barnett, T. A., & Dubow, E. (2010b). Prospective associations between early childhood televiewing and later mental and physical health. *Archives of Pediatric and Adolescent Medicine, 164*, 425–431.

Putnam, S., Rothbart, M., & Gartstein, M. (2008). Homotypic and heterotypic continuity of fine-grained temperament during infancy, toddlerhood, and early childhood. *Infant and Child Development, 17*, 387–405.

Razza, R. A., Martin, A., & Brooks-Gunn, J. (2010). Associations among family environment, sustained attention, and school readiness for low-income children. *Developmental Psychology, 46*, 1528–1542.

Richters, J. E. (1997). The Hubble hypothesis and the developmentalist's dilemma. *Development and Psychopathology, 9*, 193–229.

Romano, E., Kohen, D., Babchishin, L., & Pagani, L. (2010). School readiness and later achievement: replication and extension study using a nation-wide Canadian survey. *Developmental Psychology, 46*, 995–1007.

Schaefer, B., & McDermott, P. (1999). Learning behavior and intelligence as explanations for children's scholastic achievement. *Journal of School Psychology, 37*, 299–313.

Schafer, J. L. (1999). Multiple imputation: a primer. *Statistical Methods in Medical Research, 8*, 3.

Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: identifying diagnostic conditions. *Developmental Psychology, 26*, 978–986.

Tremblay, R. E., Loeber, R., Gagnon, C., Charlebois, P., Larivée, S., & LeBlanc, M. (1991). Disruptive boys with stable and unstable high fighting behavior patterns during junior elementary school. *Journal of Abnormal Child Psychology, 19*, 285–300.

Tremblay, R. E., Pihl, R. O., Vitaro, F., & Dobkin, P. L. (1994). Predicting early onset of male antisocial behavior from preschool behavior: a test of two personality theories. *Archives of General Psychiatry, 51*, 732–739.

Vitaro, F., Brendgen, M., Larose, S., & Tremblay, R. E. (2005). Kindergarten disruptive behaviors, protective factors, and educational achievement by early adulthood. *Journal of Educational Psychology, 97*, 617–629.

Yen, C., Konold, T., & McDermott, P. (2004). Does learning behavior augment cognitive ability as an indicator of academic achievement? *Journal of School Psychology, 42*, 157–169.

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