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Identifying Latent Classes of Behavioral Risk Based on Early Childhood

Manifestations of Self-Control

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This study explored early childhood manifestations of self-control in a nationally representative cohort of kindergarten children. Finite mixture modeling was used to identify five latent classes of children based on parent and teacher reports of self control across three waves of data. These were a *low impairment*, teacher report ($n = 5,047$, 29.3%), *low impairment*, parent and teacher report ($n = 2,889$, 16.8%), *moderate impairment*, teacher report ($n = 5,267$, 30.6%), *moderate impairment*, parent report ($n = 2,415$, 14.0%), and *severely impaired* subgroups ($n = 1,594$, 9.3%). Parental stress, externalizing behaviors, and interpersonal skills deficits were important differentiators across class memberships. The *severely impaired* subgroup possessed an array of neurocognitive deficits, behavioral problems, and learning difficulties relative to other classes. To forestall life-course problem behaviors for impaired children appropriate screening and intervention is warranted.

Keywords: *self-control; childhood behavior problems; externalizing behaviors; psychopathology*

It has been nearly 20 years since Gottfredson and Hirschi's (1990) self-control theory appeared in their landmark *A General Theory of Crime*. The work has been massively successful in sociological criminology garnering scores of empirical tests and more than 2,000 citations. To date, the overwhelming majority of this scholarship has examined links between having low self-control—being impulsive, having a bad temper, preferring action to verbal or cognitive pursuits, lacking appreciation and aptitude for delayed gratification, and being egocentric or narcissistic—and engaging in antisocial behaviors. Across a diversity

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of methodological and analytical domains (e.g., adolescent and adult respondents, community and correctional samples, attitudinal and behavioral measures, cross-sectional and longitudinal designs, and an array of dependent variables), self-control theory has been empirically supported and this support tends to be moderate to strong (see DeLisi & Berg, 2006; DeLisi, Conis, & Beaver, 2008; Gottfredson, 2005, 2007; Pratt & Cullen, 2000).

The logic of Gottfredson and Hirschi's (1990) theory squares nicely with psychological research, which shows that a diminished capacity to exercise self-control underlies much of the liability to problem behaviors across the life course. Impulse control problems have been shown to predict a host of maladaptive behaviors including criminal offending, substance abuse, and a wide range of psychiatric disorders occurring in childhood, adolescence, and adulthood (Barkley, 2005; Strayhorn, 2002; Tarter et al., 2003; Vaughn, DeLisi, Beaver, Wright, & Howard, 2007; Vaughn, Litschge, DeLisi, Beaver, & McMillen, 2008; Vaughn, Newhill, DeLisi, Howard, & Beaver, 2008; Wills, Anette, Mendoza, Gibbons, & Brody, 2007; Wills & Dishion, 2004). Conversely, research has indicated that high levels of self-control are associated with greater mental health stability, enhanced relationships, academic performance, and female gender (Duckworth & Seligman, 2005; Else-Quest, Shibley-Hyde, Goldsmith, & Van Hulle, 2006; Tangney, Baumeister, & Boone, 2004). In short, self-control is an important determinant of both prosocial and antisocial outcomes.

The reason that these behaviors are so intertwined with self-control is that focused concentration, planning, goal pursuits, and adaptive inhibition of problematic and ultimately unsuccessful behaviors are key elements of effective self-governance (Fishbein, 2000). These capacities are referred to as executive functions and are critical for mediating one's biological vulnerabilities in conjunction with environmental contingencies. As noted by Moffitt (1990, p. 115),

The normal functions of the frontal lobes of the brain include sustaining attention and concentration, abstract reasoning and concept formation, goal formulation, anticipation and planning, programming and initiation of purposive sequences of motor behavior, effective self-monitoring of behavior and self-awareness, and inhibition of unsuccessful, inappropriate, or impulsive behaviors, with adaptive shifting to alternative behaviors. These functions are commonly referred to as executive functions, and they hold consequent implications for social judgment, self-control, responsiveness to punishment, and ethical behavior.

Impairments in these areas of the brain have been found to be related to insults to the prefrontal cortex (Anderson, Bechara, Damasio, Tranel, & Damasio, 1999). In this way, self-control overlaps with constructs, such as impulsivity, neurobehavioral disinhibition, and other forms of diminished executive governance capacity (Barkley, 1997; Beaver, Wright, & DeLisi, 2007; Strayhorn, 2002). Self-control also converges with behavioral components of psychopathic personality features that involve impulse control problems and persistent irresponsible behavior (Cleckley, 1975; Vaughn & DeLisi, 2008). These constructs and their attendant neurocognitive relation to antisocial outcomes have been extensively studied in the behavioral sciences (DeLisi, 2005; Moffitt, 1990; Raine, 2002). Overall, these studies indicate that the self-control construct is central to the study of psychopathology and problem behavior.

Despite extensive research among adolescents and adults, less is known about the early manifestations of self-control in childhood and how it varies across subgroups of children. For instance, in a recent study, Blair and Razza (2007) found that self-control possessed independent effects in predicting math and literacy performance independent of IQ in a sample of low-income 3- to 5-year-olds. Research on self-control in kindergarten and first grade children found that measures of neuropsychological deficits were associated with an index of low self-control even after partitioning the effects of parental and neighborhood influences and controlling for prior levels of self-control (Beaver et al., 2007). Similarly, children who score low in effortful control are more likely to exhibit high levels of externalizing conduct problems compared with youth who score high in effortful control (Zhou et al., 2007). Increased research attention to self-regulation in early childhood is important because understanding the early expression of self-control may lend knowledge to prevention and intervention protocols that blunt the harmful consequences of deficient self-regulation. Although attention and reward delay generally increase as children become older (Logue, 1995), impairments in brain regions such as the prefrontal cortex may inhibit normal developmental increases in self-control (Knoch & Fehr, 2007). Thus, although studies of self-control in relation to psychopathology in adults and older adolescents are useful, research on the self-control prodrome in childhood is critical.

The purpose of the present study was to explore the variation of self-control in a large, nationally representative sample of kindergarteners. Specifically, three research goals were advanced: (a) to examine the underlying variability of self-control based on parental and teacher reports of self-regulation and impulsivity using finite mixture statistical modeling, (b) to describe and validate identified latent classes based on a rich set of external covariates, such as demographic characteristics, motor skills, cognitive skills, parenting, externalizing behaviors, social interactions, and (c) to test which external covariates were significant predictors of class membership, particularly membership in low or impaired self-control subgroup(s).

Method

Sample

This study uses data from the Early Childhood Longitudinal Survey–Kindergarten Class of 1998–1999 (ECLS-K). The ECLS-K is a nationally representative cohort of children drawn from approximately 1,000 kindergarten programs and collected by the National Center for Education Statistics (NCES). Six waves of data have been collected thus far with the first wave of data collected in the fall of kindergarten (1998). During the spring of 1999, the second set of interviews took place. The third wave of data was collected on a subsample of all subjects during the fall of first grade. The fourth wave of data was collected in the spring of first grade. The fifth and sixth rounds of interviews were conducted in third grade and fifth grade, respectively. In total, more than 20,000 children were included in the ECLS-K. Additional information pertaining to the complex sampling strategy employed and design issues can be found elsewhere (NCES, 1999).

Employing a multirater measurement strategy makes the ECLS-K a rich and appealing data set to examine the manifestations of self-control early in life. The data were collected via one-on-one assessment of children and parent and teacher reports using standardized questionnaires. The mother was usually the parent providing reports. If mothers were not available, then the other parent or guardian was interviewed. Response rates for parents were high (>90.0%). The full ECLS-K sample and the sample of twins have been used by previous researchers exploring the correlates of low self-control (Beaver et al., 2007; Beaver & Wright, 2005; Wright & Beaver, 2005). Using both parental and teacher reports has many advantages. One of which is that data collected from teachers can help measure conduct that occurs away from parents (Harris, 1998). We used data collected at Waves 1, 2, and 4 because the self-control measures were altered at Wave 5. In total, the analytic sample comprised 17,212 children. Descriptive characteristics of the study sample are shown in Table 1.

Measures

Self-control. Childhood levels of self-control were measured by using a version of the Social Skills Rating Scale (SSRS; Gresham & Elliott, 1990). With the SSRS, parents and teachers were asked a series of questions, ranging from 1 (*never*) to 4 (*very often*), pertaining to multiple domains of the child's personality, development, and functioning. Items indicated the child's ability to control behavior by respecting the property rights of others, controlling temper, accepting peer ideas for group activities, and responding appropriately to pressure from peers. Parent measures of self-control and impulsivity were used across three waves. This allowed assessment of convergence between rater's and across time. Importantly, these self-control scales have been shown to be reliable and valid measures of childhood levels of self-control used by previous researchers analyzing the ECLS-K (Beaver et al., 2007; Beaver & Wright, 2005; Wright & Beaver, 2005). For both scales, higher values reflected lower levels of self-control.

External Covariates

A full range of covariates were used to provide external validation of the latent classes that were identified and deepened the description of these subgroups. In addition to demographic characteristics, we specifically employed assessments of fine and gross motor skills. These were derived from direct one-on-one assessments of children at Wave 1. Cognitive skills assessments were available at Waves 1 and 2. Several variables were available to evaluate family influences and these included parental involvement, family rules, physical punishment, affection, and parental stress. Family influence variables were assessed at Waves 1 and 2. The approaches to learning scale was used which assessed the extent to which a child's behaviors affects their learning environment and includes items that rate attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization (higher scores indicate greater problems) using both teacher and parental reports.

Several scales were available across three waves to assess behavioral and interpersonal skills. The interpersonal skills scale had five items that rate the child's skill in such tasks as

Table 1
Descriptive Characteristics of Study Sample^a (N = 17,212)

	<i>N (%)</i>	<i>M (SD)</i>
Gender		
Female	8,417 (48.9)	
Male	8,795 (51.1)	
Race		
White	9,770 (56.7)	
Youth of color	7,452 (43.3)	
Fine motor skills (W1)		5.87 (2.03)
Gross motor skills (W1)		6.37 (1.84)
Parental involvement (W1)		25.01 (4.41)
Family rules (W2)		2.24 (0.89)
Physical punishment (W2)		0.23 (0.44)
Affection (W2)		14.78 (1.51)
Parental stress (W2)		12.17 (3.21)
Externalizing behaviors (W1) ^b		1.61 (0.63)
Externalizing behaviors(W2)		1.66 (0.64)
Externalizing behaviors(W4)		1.66 (0.64)
Interpersonal skills (W1) ^b		2.02 (0.62)
Interpersonal skills (W2)		1.88 (0.64)
Interpersonal skills (W4)		1.90 (0.64)
Social interaction (W1) ^c		1.63 (0.52)
Social interaction (W2)		1.54 (0.49)
Social interaction (W4)		1.57 (0.51)
Approaches to learning (W1) ^c		1.88 (0.48)
Approaches to learning (W2)		1.87 (0.48)
Approaches to learning (W4)		1.90 (0.49)
Approaches to learning (W1) ^b		2.01 (0.67)
Approaches to learning (W2)		1.88 (0.68)
Approaches to learning (W4)		1.96 (0.71)
Cognitive skills (W1)		152.75 (26.05)
Cognitive skills (W2)		152.69 (25.64)
Neighborhood resources (W2) ^c		17.17 (1.547)

^aDescriptive data on indicator variables used to form latent classes are found in Table 2.

^bTeacher report.

^cParental report.

forming friendships, helping other children, and showing sensitivity to the feelings of other people (again, higher scores indicate more problems with interpersonal skills). Externalizing problem behaviors scale included assessments of acting out behaviors such as arguing and fighting. In addition, a measure of neighborhood resources measured at wave two was used.

Analyses

Statistical analyses were executed in several phases. First, we employed finite mixture analysis to identify homogeneous subgroups in the data based on indicators of self-control

derived from both parent and teacher reports. Latent profile models were executed with the Huber–White sandwich estimator function in Latent GOLD 4.0 to maintain robustness due to potential clustering effects and endogeneity in the data. Latent profile analysis is a model-based finite mixture modeling technique that employs maximum likelihood methods in order to identify underlying and qualitatively distinct subgroups in data. This technique is appropriate for ordinal and continuous mixed measures, whereas latent class analysis is used for categorical indicators. However, the resultant identified subgroups were referred to as classes.

The Bayesian information criterion (BIC), Akaike information criterion (AIC), and several other fit indices and plots were utilized to arrive at a conceptual meaningful number of latent classes. Rather than testing a class solution specified a priori, the fit of a series of different models was examined. A single-class model was examined first and classes were added until no further improvements were observed. An improvement in model fit results in a lower value on the BIC. Second, following the identification of the optimal fit in latent classes, we validated these classes using a range of external covariates previously described using one-way analysis of variance (ANOVA) and chi-square tests. Finally, validation analyses were extended by employing polytomous logistic regression to predict membership in latent classes. We were particularly interested in which variables would predict low self-control. Robust standard errors to control for clustering were used in multivariate polytomous regression models. Further, bootstrap procedures were used to provide a sensitivity analysis with regard to these models. Postclustering statistical analyses were carried out using the software package STATA 9.2.

Results

Latent Class Analysis

A total of five LPA models were examined, ranging from one to five classes. Each model was estimated with 20 random starts and no problems with local maxima were found. Inspection of zero-order correlations indicated that local dependence was not a problem. The indicator variables all significantly contributed to the formation of latent subgroups (see Table 2). Based on the BIC and the AIC, the five-class model was the best fit to the data. The conceptual fit of the models was examined through visual inspection. This involved plotting the estimated mean values for each self-control indicator by each class (see Figure 1). Classes were distinguishable, well balanced, and followed a severity-based gradient with respect to parental reports. On several classes the parental and teacher reports did not always agree; thus there is crossover among some classes as shown in Figure 1.

Importantly, however, both parent and teacher reports converged with respect to Class 5 ($n = 1,594$, 9.3%). This subgroup of children was assessed across raters as displaying the lowest levels of self-control and highest levels of impulsivity. Classes 2, 3, and 4 were rated by teachers as possessing higher levels of self-control compared to Classes 1 and 5. Class 3 ($n = 2,889$, 16.8%) was rated by both parents and teachers as displaying high levels of self-control and low levels of impulsivity. The greatest discrepancy occurring between parent and teacher reports was with Class 4 ($n = 2,415$, 14.0%), which was rated as low in self-control and highly impulsive by parents, but not by teachers.

Table 2
Summary of Parent and Teacher Reports of Self-Control
in Kindergarten and First Grade

Indicator Variable	<i>M</i>	<i>SD</i>	Wald	<i>p</i> Value	<i>R</i> ²
Parent impulsivity (Wave 1)	1.95	0.67	2,063.48	<.0001	.353
Parent impulsivity (Wave 2)	1.93	0.68	2,118.79	<.0001	.365
Parent impulsivity (Wave 4)	1.86	0.65	2,110.30	<.0001	.359
Parent self-control (Wave 1)	2.16	0.51	4,793.16	<.0001	.401
Parent self-control (Wave 2)	2.11	0.50	5,296.51	<.0001	.424
Parent self-control (Wave 4)	2.04	0.50	4,812.60	<.0001	.390
Teacher self-control (Wave 1)	1.91	0.61	6,796.10	<.0001	.439
Teacher self-control (Wave 2)	1.82	0.63	8,720.26	<.0001	.498
Teacher self-control (Wave 4)	1.83	0.62	3,431.72	<.0001	.289

NOTE: Wald, *R*², and *p* values indicate the relative contribution of variables to the formation of latent classes.

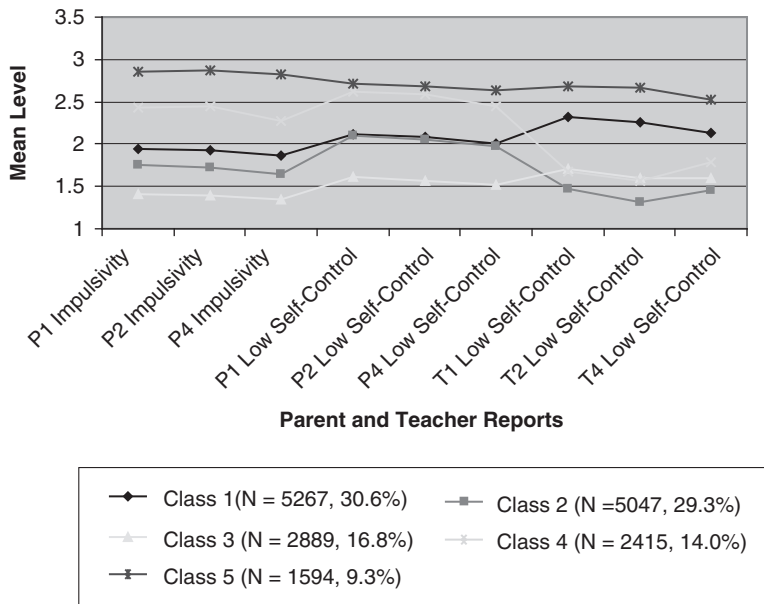
Validation of Latent Classes

A comparative analysis of the five-class solution was conducted by examining univariate contrasts across external covariates. Chi-square tests revealed that class composition differences by gender ($\chi^2 = 560.90, p < .001$) and race ($\chi^2 = 27.37, p < .001$) with male children much more likely to be classified in classes (Class 1, 59.0% and Class 5, 68.5%) that demonstrated moderately low levels of self-control. White youth were more likely to be classified in classes possessing higher levels of self-control. The most impaired subgroup, Class 5, comprised somewhat more minority (53.4%) than White youth.

One-way analysis of variance (ANOVA) with Bonferroni and Games–Howell post hoc comparisons revealed significant differences in means across all external covariates (see Table 3). Classes 2 and 3, *low impairment*, teacher report and *low impairment*, parent report, had higher levels of fine and gross motor skills, parental involvement, affection, and less externalizing behaviors across all waves. These two classes also had fewer problems with interpersonal skills, social interactions, approaches to learning and demonstrated greater cognitive skills. Parents also reported less stress. In contrast, Class 5, *severely impaired*, had higher mean levels of externalizing problems across all waves and reports of their social interactions, interpersonal skills, and approaches to learning pointed toward higher problems levels than the other classes. Cognitive skills ($M = 136.69, SD = 24.44$ and $M = 136.66, SD = 26.56$) were significantly lower than other classes across both waves. Class 5 also displayed the lowest levels of fine ($M = 4.90, SD = 2.24$) and gross motor skills ($M = 5.94, SD = 2.02$). This class also had less parental involvement, affection, and more physical punishment and parents reported more stress than the other classes.

Class 1, *moderate impairment*, teacher report, did not possess the overall pattern of problem severity that characterized Class 5, but were reported to have moderate problems with externalizing problems, interpersonal skills, and approaches to learning. This class also had moderate levels of affection and involvement from parents. Their cognitive skills ($M = 148.54, SD = 25.58$ and $M = 148.50, SD = 25.23$) were significantly higher than Class 5, yet significantly lower than Classes 2 and 3. Class 4, *moderate impairment*, parent report,

Figure 1
Latent Classes Based on Self-Control and Impulsivity in the Early Childhood Longitudinal Study—Kindergarten Cohort



Note: P1 impulsivity = Parent report of impulsivity at Wave 1; P2 impulsivity = Parent report of impulsivity at Wave 2; P4 impulsivity = Parent report of impulsivity at Wave 4; P1 low self-control = Parent report of low self-control at Wave 1; P2 low self-control = Parent report of low self-control at Wave 2; P4 low self-control = Parent report of low self-control at Wave 4; T1 = Teacher report of low self-control at Wave 1; T2 = Teacher report of low self-control at Wave 2; T4 = Teacher report of low self-control at Wave 4.

displayed a similar pattern as Class 1, yet had lower mean levels of externalizing problems, less problems in interpersonal skills and approaches to learning as rated by teachers.

Although mean differences between classes were statistically significant, these results are capitalizing on large sample size. Thus, we computed zero-order effect sizes using Cohen's (1988) criteria and found that the results indicated meaningful differences between classes. For example, differences between Class 5 (*severely impaired*) and Class 2 (*low impairment—teacher report*) included gross motor skills ($d = 0.33$), physical punishment ($d = 0.37$), Wave 1 externalizing behaviors ($d = 2.02$), Wave 1 interpersonal skills ($d = 2.04$), Wave 1 parental reports of social interactions ($d = 0.23$), Wave 1 teacher reports of approaches to learning ($d = 1.87$), and Wave 1 cognitive skills ($d = 0.97$).

Predicting Class Membership

Polytomous logistic regression models were run predicting class membership with Class 2 (*high self-control*) serving as the base or reference category. We were particularly interested in

Table 3
Univariate Contrasts Among Five-Class Solution Using Chi-Square and ANOVA

Covariates	Class 1 (Moderate, Teacher, N = 5,267)		Class 2 (Low, Teacher, N = 5,047)		Class 3 (Low, Parent and Teacher, N = 2,889)		Class 4 (Moderate, Parent, N = 2,415)		Class 5 (Severely Impaired, N = 1,594)		χ^2	F	p Value
	%	M (SD)	%	M (SD)	%	M (SD)	%	M (SD)	%	M (SD)			
Gender											560.90		<.001
Female	41.0	57.5	55.8	51.2	51.2	31.5	31.5	31.5	31.5	31.5			<.001
Male	59.0	42.5	44.2	48.8	48.8	68.5	68.5	68.5	68.5	68.5			<.001
Ethnicity											27.37		<.001
White	53.2	65.5	58.1	52.3	52.3	46.6	46.6	46.6	46.6	46.6			<.001
Children of Color	46.8	34.5	41.9	47.7	47.7	53.4	53.4	53.4	53.4	53.4			<.001
Fine motor skills	5.69 (2.03)	6.27 (1.85)	6.24 (1.92)	5.63 (2.07)	5.63 (2.07)	4.90 (2.24)	4.90 (2.24)	4.90 (2.24)	4.90 (2.24)	4.90 (2.24)	168.95		<.001
Gross motor skills	6.23 (1.93)	6.56 (1.68)	6.58 (1.69)	6.34 (1.86)	6.34 (1.86)	5.94 (2.02)	5.94 (2.02)	5.94 (2.02)	5.94 (2.02)	5.94 (2.02)	45.54		<.001
Parental involvement (W1)	24.85 (4.45)	25.14 (4.17)	25.88 (4.35)	24.49 (4.51)	24.49 (4.51)	24.36 (4.77)	24.36 (4.77)	24.36 (4.77)	24.36 (4.77)	24.36 (4.77)	42.34		<.001
Family rules (W2)	2.27 (0.90)	2.23 (0.88)	2.31 (0.88)	2.15 (0.91)	2.15 (0.91)	2.18 (0.93)	2.18 (0.93)	2.18 (0.93)	2.18 (0.93)	2.18 (0.93)	12.81		<.001
Physical punishment (W2)	0.23 (0.44)	0.18 (0.40)	0.16 (0.38)	0.31 (0.50)	0.31 (0.50)	0.35 (0.51)	0.35 (0.51)	0.35 (0.51)	0.35 (0.51)	0.35 (0.51)	76.12		<.001
Affection (W2)	14.77 (1.53)	14.77 (1.46)	15.18 (1.27)	14.53 (1.60)	14.53 (1.60)	14.51 (1.71)	14.51 (1.71)	14.51 (1.71)	14.51 (1.71)	14.51 (1.71)	75.51		<.001
Parental stress (W2)	12.15 (3.02)	11.80 (2.79)	10.62 (2.40)	13.53 (3.52)	13.53 (3.52)	14.26 (3.90)	14.26 (3.90)	14.26 (3.90)	14.26 (3.90)	14.26 (3.90)	474.73		<.001
Externalizing behaviors (W1) ^a	1.92 (0.62)	1.26 (0.32)	1.38 (0.42)	1.44 (0.43)	1.44 (0.43)	2.41 (0.74)	2.41 (0.74)	2.41 (0.74)	2.41 (0.74)	2.41 (0.74)	2,065.97		<.001
Externalizing behaviors (W2)	1.98 (0.61)	1.28 (0.33)	1.41 (0.43)	1.50 (0.44)	1.50 (0.44)	2.50 (0.72)	2.50 (0.72)	2.50 (0.72)	2.50 (0.72)	2.50 (0.72)	2,463.07		<.001
Externalizing behaviors (W4)	1.93 (0.65)	1.32 (0.37)	1.42 (0.45)	1.59 (0.54)	1.59 (0.54)	2.42 (0.72)	2.42 (0.72)	2.42 (0.72)	2.42 (0.72)	2.42 (0.72)	1,505.69		<.001
Interpersonal skills (W1) ^a	2.35 (0.52)	1.66 (0.49)	1.83 (0.54)	1.86 (0.53)	1.86 (0.53)	2.68 (0.51)	2.68 (0.51)	2.68 (0.51)	2.68 (0.51)	2.68 (0.51)	1,699.72		<.001
Interpersonal skills (W2)	2.26 (0.53)	1.46 (0.43)	1.66 (0.54)	1.71 (0.51)	1.71 (0.51)	2.62 (0.50)	2.62 (0.50)	2.62 (0.50)	2.62 (0.50)	2.62 (0.50)	2,515.12		<.001
Interpersonal skills (W4)	2.18 (0.61)	1.56 (0.48)	1.67 (0.55)	1.88 (0.58)	1.88 (0.58)	2.53 (0.59)	2.53 (0.59)	2.53 (0.59)	2.53 (0.59)	2.53 (0.59)	1,201.11		<.001
Social interaction (W1) ^b	1.64 (0.51)	1.61 (0.50)	1.52 (0.50)	1.68 (0.53)	1.68 (0.53)	1.74 (0.60)	1.74 (0.60)	1.74 (0.60)	1.74 (0.60)	1.74 (0.60)	44.73		<.001
Social interaction (W2)	1.56 (0.49)	1.52 (0.46)	1.42 (0.46)	1.60 (0.52)	1.60 (0.52)	1.69 (0.56)	1.69 (0.56)	1.69 (0.56)	1.69 (0.56)	1.69 (0.56)	81.62		<.001
Social interaction (W4)	1.58 (0.50)	1.54 (0.48)	1.44 (0.47)	1.62 (0.53)	1.62 (0.53)	1.77 (0.59)	1.77 (0.59)	1.77 (0.59)	1.77 (0.59)	1.77 (0.59)	106.95		<.001
Approaches to learning (W1) ^b	1.93 (0.47)	1.84 (0.45)	1.73 (0.46)	1.94 (0.48)	1.94 (0.48)	2.04 (0.52)	2.04 (0.52)	2.04 (0.52)	2.04 (0.52)	2.04 (0.52)	134.67		<.001
Approaches to learning (W2)	1.92 (0.47)	1.83 (0.45)	1.69 (0.47)	1.93 (0.47)	1.93 (0.47)	2.08 (0.51)	2.08 (0.51)	2.08 (0.51)	2.08 (0.51)	2.08 (0.51)	203.20		<.001
Approaches to learning (W4)	1.95 (0.48)	1.86 (0.46)	1.71 (0.47)	1.98 (0.58)	1.98 (0.58)	2.12 (0.51)	2.12 (0.51)	2.12 (0.51)	2.12 (0.51)	2.12 (0.51)	218.24		<.001
Approaches to learning (W1) ^a	2.32 (0.60)	1.65 (0.53)	1.82 (0.59)	1.89 (0.60)	1.89 (0.60)	2.67 (0.56)	2.67 (0.56)	2.67 (0.56)	2.67 (0.56)	2.67 (0.56)	1,374.19		<.001
Approaches to learning (W2)	2.21 (0.63)	1.49 (0.49)	1.68 (0.59)	1.67 (0.59)	1.67 (0.59)	2.60 (0.60)	2.60 (0.60)	2.60 (0.60)	2.60 (0.60)	2.60 (0.60)	1,656.43		<.001
Approaches to learning (W4)	2.22 (0.67)	1.63 (0.57)	1.73 (0.63)	1.97 (0.66)	1.97 (0.66)	2.60 (0.60)	2.60 (0.60)	2.60 (0.60)	2.60 (0.60)	2.60 (0.60)	906.52		<.001
Cognitive skills (W1)	148.54 (25.58)	160.51 (24.39)	159.53 (25.29)	147.95 (24.41)	147.95 (24.41)	136.69 (24.44)	136.69 (24.44)	136.69 (24.44)	136.69 (24.44)	136.69 (24.44)	335.48		<.001
Cognitive skills (W2)	148.50 (25.23)	160.17 (23.13)	159.28 (24.29)	148.31 (24.93)	148.31 (24.93)	136.66 (26.56)	136.66 (26.56)	136.66 (26.56)	136.66 (26.56)	136.66 (26.56)	368.68		<.001
Neighborhood resources (W2) ^b	17.16 (1.47)	17.31 (1.39)	17.40 (1.27)	16.91 (1.78)	16.91 (1.78)	16.66 (2.06)	16.66 (2.06)	16.66 (2.06)	16.66 (2.06)	16.66 (2.06)	82.44		<.001

NOTE: Descriptive data on indicator variables used to form latent classes are found in Table 2.

^aTeacher report.

^bParental report.

Table 4
Polytomous Regression Predicting Class Membership

Base = Class Two	Class One	Class Three	Class Four	Class Five
Level of impairment	<i>Moderate</i>	<i>Low</i>	<i>Moderate</i>	<i>Severe</i>
Source	Teacher	Parent and teacher	Teacher	Parent and teacher
Predictors	RRR	RRR	RRR	RRR
Gender	1.09	1.09	1.01	0.98
Race	1.31***	1.57***	1.13*	1.14
Fine motor skills (W1)	1.03*	1.02	0.95**	0.98
Gross motor skills (W1)	1.04*	1.02	1.02	1.07**
Parental involvement (W1)	0.99	1.00	0.99	1.01
Family rules (W2)	1.04	1.05	0.94*	0.97
Physical punishment (W2)	1.12	0.91	1.54***	1.48***
Affection (W2)	1.00	1.09***	0.97	1.01
Parental stress (W2)	1.04***	0.86***	1.17***	1.23***
Externalizing behaviors (W1) ^a	3.10***	1.45***	1.48***	4.20***
Externalizing behaviors (W2)	3.65***	1.37***	1.91***	5.89***
Externalizing behaviors (W4)	2.71***	1.24*	1.95***	4.06***
Interpersonal skills (W1) ^b	2.79***	1.25**	1.16*	4.09***
Interpersonal skills (W2)	4.98***	1.68***	1.67***	6.91***
Interpersonal skills (W4)	2.33***	1.18*	1.62***	2.78***
Social interaction (W1) ^b	0.95	0.95	0.98	0.92
Social interaction (W2)	0.89	0.88	1.01	0.88
Social interaction (W4)	0.89	0.90	0.97	1.16
Approaches to learning (W1) ^b	0.98	0.83*	1.02	0.94
Approaches to learning (W2)	0.98	0.77**	0.87	0.95
Approaches to learning (W4)	0.89	0.62***	1.11	1.12
Approaches to learning (W1) ^a	1.50***	1.21**	1.05	1.61***
Approaches to learning (W2)	1.45***	1.41***	1.04	1.61***
Approaches to learning (W4)	1.06	1.04	1.04	1.05
Cognitive skills (W1)	0.99	1.00	0.99***	0.99***
Cognitive skills (W2)	1.00	1.00	0.99*	0.99
Neighborhood resources (W2) ^b	0.99	1.04	0.95**	0.90***
Overall model $\chi^2 = 7726.20, p < .0001$				
Pseudo $R^2 = .294$				

NOTE: Reference group = class two (low impairment-teacher report).

^aTeacher report.

^bParental report.

* $p < .05$. ** $p < .01$. *** $p < .001$.

the results comparing the *severely impaired* subgroup (Class 5 to the reference class). As revealed in Table 4, the overall model was significant ($\chi^2 = 7,726.20, p < .0001$) and several variables were predictive using Relative Risk Ratios (RRR) of class membership. Examination of predictors of Class 5 (*severely impaired* self-regulation) showed physical punishment (RRR = 1.48, $p < .001$), parental stress (RRR = 1.23, $p < .001$), and gross motor skills (RRR = 1.07, $p < .001$) increased the likelihood of class membership. Across all three waves, externalizing problems as reported by teachers were potent predictors (W1 RRR = 4.20, $p < .001$; W2 RRR = 5.89, $p < .001$; W4 RRR = 4.06, $p < .001$). Interpersonal skills, as reported by teachers also significantly increased the likelihood of class membership across all three waves (W1 RRR = 4.09, $p < .001$; W2 RRR = 6.90, $p < .001$; W4 RRR = 2.78, $p < .001$). Teacher ratings of approaches to learning were significant at Waves 1 and 2

only (W1 RRR = 1.61, $p < .001$; W2 RRR = 1.61, $p < .001$). Race and gender were not predictive of membership in Class 5.

Discussion

We identified five latent classes that comprised a large (Class 2) and moderate size (Class 3) subgroup of children with high self-control and low impairment that were characterized by lower levels of externalizing problems, higher performance on motor and cognitive skills tests, less problems in social interactions and interpersonal skills, greater readiness in terms of approaches to learning, and whose membership was more likely female (57.5 and 55.8%, respectively). In other words, children in Classes 2 and 3 exercised self-control across a variety of domains. Two classes, one large (Class 1, $n = 5,267$) and one moderate in size (Class 4, $n = 2,415$) were reported as having more moderate levels of impairment yet diverged from each other in terms of gender composition (Class 1 comprised 59.0% males versus 48.8% for Class 4) and externalizing behaviors and interpersonal skills, whereby Class 1 was reported by teachers as exhibiting more difficulties across all three waves. Importantly, this divergence can be attributed to a rater effect where there was substantial crossover in ratings with teachers rating Class 1 lower in self-control and Class 4 higher in self-control. On the other hand, parents rated children in Class 4 lower on self-control and Class 1 higher on self-control. In other words, parents and teachers rated children in Classes 1 and 4 differently.

Parents and teachers were unequivocal about Class 5, as both agreed across all three waves that this subgroup of children was most deficient in terms of self-regulation. Moreover, external covariates validated the finite mixture class results demonstrating that these children relative to other children possessed lower functioning in gross and fine motor skills, lower functioning in cognitive skills, worse interpersonal skills, poorer social interactions, and had weaker approaches to learning. Furthermore, these children were high in externalizing behaviors, were more likely to be physically punished, received somewhat less affection and involvement from their parents, and resided in stressed family units. Demographically, these children were more likely to be male and non-White. These univariate differences were evaluated further by entering these covariates into polytomous logistic regression models and assessing from these variables those that would be significant in predicting membership in this impaired self-control class. Findings from the multivariate procedure revealed that parental stress, externalizing behaviors, interpersonal skills and approaches to learning at Waves 1 and 2 were associated with increased risk across all classes. In particular, externalizing behaviors and interpersonal skills relative risk ratios were quite high (range = 2.78 to 6.91) for Class 5 and to a lesser extent for Class 1 in comparison to Class 2. These findings strongly suggest that self-control is intertwined with conduct problems and interpersonal deficits relatively early in life and that this nexus is fairly stable.

Our findings have several important implications for self-control theory and the broader study of youth violence. First, the psychopathological profile of the *severely impaired* group (Class 5) comports with the impulsive, cognitively deficient, externalizing adolescent delinquent found in most studies of self-control theory. The relative stability of impulsivity and

low self-control among Class 5 is also suggestive of the stability hypothesized by Gottfredson and Hirschi (1990) and which has been supported empirically (Beaver & Wright, 2007; Beaver, Wright, DeLisi, & Vaughn, in press; Hay & Forrest, 2006; see Burt, Simons, & Simons, 2006). This begs the question: Are the negative traits exemplified by adolescent delinquents and adult offenders in the self-control theory literature already present among children in kindergarten? Based on the consensus of parent and teacher reports and the current analyses, it is certainly possible and perhaps even probable. To move beyond speculation and help answer this question, future research needs to pay greater attention to the development of self-control during childhood to explore ways that childhood psychopathology unfolds into adolescent delinquency, violence, and other maladaptive behaviors. Because the overwhelming preponderance of investigations of self-control theory has focused on adolescents and adults, an emphasis on childhood psychopathology is an important next step.

Second, recent research has called into question one of the central tenets of Gottfredson and Hirschi's (1990) theory, namely that parental monitoring of children's behavior, recognition of children's misbehavior, and appropriate correcting or disciplining of that misbehavior inculcate self-control. Behavioral genetics research by Wright and his colleagues (Wright & Beaver, 2005; Wright, Beaver, DeLisi, & Vaughn, 2008; also see Beaver, 2008) has shown that genetic factors mediate the effects of parenting on self-control. The current study lacked genotypic data, so we could not evaluate whether the psychopathology demonstrated by Class 5 was biological in origin. There was, however, evidence that negative aspects of parenting influenced membership in Class 5. These children had the least parental involvement, incurred the most physical punishment, and lived in homes with the greatest parental stress. As shown in Table 4, physical punishment ($RRR = 1.48, p < .001$) and parental stress ($RRR = 1.23, p < .001$) predicted Class 5 membership. Another important avenue for future research is to explore the biosocial predictors of psychopathology and low self-control in kindergarteners and first graders.

Third, the current findings are consonant with Moffitt's (1993) seminal theory that conceptualizes a life-course-persistent offender whose etiology involves early deficits in neuropsychological functioning that leaves a small subset of children vulnerable to poor academic achievement, involvement with deviant peers, rejection from prosocial avenues, risk taking, and aggression (Farrington & Coid, 2003; Lahey, Moffitt, & Caspi, 2003; Moffitt, 1993). Furthermore, the small subgroup of children in Class 5 were just 9.3% of the total sample that closely mirrors findings that 5% to 10% of persons in a population are pathological and account for the majority of antisocial behavior (DeLisi, 2005; DeLisi & Vaughn, 2008; Lahey et al., 2003; Moffitt, 1993; Vaughn & DeLisi, 2008). To the degree that the children in Class 5 indeed constitute those who will become pathological offenders—and their childhood psychopathology is certainly suggestive of this—they should clearly be targeted for prevention and treatment efforts. Based on the polytomous regression models, externalizing behaviors and interpersonal skills are critical treatment needs based on their powerful statistical effects at predicting Class 5 membership.

Fourth, the weight of the current scientific evidence on addiction demonstrates that substance dependence is a brain disease that specifically involves the hijacking of the ancient reward system in conjunction with lowered capacity to inhibit this overriding compulsion

for a particular psychoactive intoxicant. The key to these problems and many others, such as interpersonal relationships, academic achievement, job performance, and successful adaptation in life involve self-control to a considerable degree. Early identification and description of children who manifest self-control impairment is a necessary ingredient for early intervention. Because self-control has shown to be relatively stable, it is important to develop early interventions that can mitigate some of the harmful effects that impaired self-regulation has on the life chances of such children. It may be that substantial numbers of youth in Class 5 possess lesions in the prefrontal cortex or other unidentified pathogens. In terms of prevention and intervention, one intriguing possibility is the design of training programs that exercise self-control as if it were a muscle (Muraven & Baumeister, 2000). Over time, the strength of self-control mechanisms can be perhaps trained to inhibit some of the harmful consequences of poor self-regulation.

Fifth, in addition to implications for theory and youth violence, the current study also bears on juvenile justice. Self-control is a stable construct with protean negative consequences. In the current study, children with low self-control had deficits in their cognitive skills, their approaches to learning, their social interaction and interpersonal skills, and evinced externalizing behaviors. Over time, this repertoire of deficits makes compliance with the demands imposed by the justice system difficult. DeLisi and his colleagues (DeLisi & Berg, 2006; DeLisi, Hochstetler, Higgins, Beaver, & Graeve, 2008) have shown that multiple forms of noncompliance with criminal justice sentences result from offender deficiencies in self-control and their findings are logically applicable to delinquents in the juvenile justice system as well. Future research can empirically assess the longitudinal effects of self-control on juvenile justice system success and failure. Given everything that has been demonstrated about individuals with severe deficits in self-control, offending and attendant legal consequences are sure to follow.

Finally, classes of self-control in a nationally representative sample of children in kindergarten and first grade were explored. These classes represented a continuum of self-control ranging from high levels to severe impairment. Findings demonstrate that early manifestations of self-control are identifiable and that self-control is associated with externalizing behaviors, neurocognitive skills, and interpersonal skills such that lower levels correspond to deficits in these critical areas. To forestall life-course problem behaviors for impaired children appropriate screening and intervention is warranted.

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