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Childhood self-control and adult outcomes: Results from 30-year longitudinal study

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Abstract

Objective: A study by Moffitt et al [1] reported pervasive associations between childhood self-control and adult outcomes. This study attempts to replicate the findings reported by Moffitt et al, adjusting these results for the confounding influence of childhood conduct problems.

Method: Data were gathered from the Christchurch Health and Development Study, a longitudinal birth cohort studied to age 30. Self-control during ages 6-12 years was measured analogously to Moffitt et al. using parent-, teacher-, and self-report methods. Outcome measures to age 30 included: criminal offending; substance use; education/employment; sexual behavior; and mental health. Associations between self-control and outcomes were adjusted for possible confounding by gender, SES, IQ, and childhood conduct problems (ages 6-10).

Results: In confirmation of the findings of Moffitt et al, all outcomes except major depression were significantly (p < .05) associated with childhood self-control. Adjustment for gender, SES, and IQ reduced to some extent the magnitude of the associations. However, adjustment for childhood conduct disorder further reduced the magnitude of many of these associations, with only four of the 14 outcomes remaining statistically significantly (p < .05) associated with self-control. After adjustment for gender, SES, IQ and conduct problems, those higher in self-control had lower odds of violent offending, welfare dependence, were more likely to have obtained a university degree, and had higher income levels.

Conclusions: The findings of the study suggested that observed linkages between a measure of childhood self-control and outcomes in adulthood were largely explained by the correlated effects of childhood conduct problems, SES, IQ and gender.

In a recent paper Moffitt and her colleagues used data from the Dunedin Multidisciplinary Health and Development Study to examine the associations between self-control in early/middle childhood and later outcomes at the age of 32 years [1]. This study produced clear evidence of a gradient in which declining self-control was associated with increased risks of later crime, poor health, educational and occupational underachievement. Moffit et al concluded that self-control is an important dimension of childhood behavior that is related to many later outcomes. The findings linking early self-control to later crime are also consistent with Gottfredson and Hirschi's theorising that a lack of self-control is a major driver in the development of crime [2].

While Moffitt et al's [1] paper has attracted considerable attention in the developmental literature [3-7], a number of important issues relating to the associations between self-control and developmental outcomes need to be addressed. These issues centre around the fact that many of the test items that Moffitt et al used to define self-control came from the Rutter behavior scale [8]. While Moffitt et al show that these items fitted a single factor, it is also the case that the items selected related to more general behavioral domains of externalizing behaviors including conduct problems and inattention/hyperactivity. These items include those relating to: impulsive aggression; hyperactivity; lack of persistence; and impulsivity. The overlap between the content of the measures of self-control defined by Moffitt et al and the more general dimensions of externalizing behavior raises the possibility that the apparent associations between early self-control and later outcomes were in fact due to the facts that: a) early self-control was correlated with early externalizing behavior; and b) early externalizing behaviors were predictive of future outcomes.

In particular, it may be proposed that many of the associations between self-control and life outcomes may be explained by the correlated effects of childhood conduct problems, which are well-known to be predictive of adverse life outcomes [9-17]. To test this hypothesis requires extending the analyses reported by Moffitt et al to include measures of childhood conduct problems as a further covariate in the model.

In this paper we address this issue by using data from a study (the Christchurch Health and Development Study) that has considerable similarity to the study reported by Moffit et al [1]. The Christchurch Health and Development Study is a longitudinal study of a birth cohort of 1265 Christchurch-born children that has been studied on 22 occasions from birth to the age of 30. The aims of the present study were to:

1) Construct a measure of early self-control using an item set similar to that used by Moffit et al.

2) Estimate the associations between early self-control and later developmental outcomes using a set of outcome measures that were similar to those used by Moffit et al; and

3) Adjust the associations between early self-control and later outcomes for the correlated effects of childhood conduct problems. It was hypothesised that when due allowance was made for the correlated effects of early conduct problems, early self-control would be no longer related to subsequent developmental outcomes.

Method

The data were gathered during the course of the Christchurch Health and Development Study (CHDS). In this study a birth cohort of 1265 children (635 males, 630 females) born in the Christchurch (New Zealand) urban region in mid-1977 has been studied at birth, 4 months, 1 year and annually to age 16 years, and again at ages 18, 21, 25 and 30 years [18,19]. All study information was collected on the basis of signed consent from study participants and all information is fully confidential. All aspects of the study have been approved by the Canterbury (NZ) Ethics Committee.

Self-control (ages 6-12)

At ages 6, 7, 8, 9 and 10 years parent- and teacher-report data were obtained from the Rutter Behavior questionnaires [8]. In addition, at 12 years, children completed a self-report questionnaire

that included a number of items derived from the Rutter Behavior questionnaire. From these questionnaire responses a series of items corresponding to the items used by Moffitt et al [1] in the construction of their measure of self-control were obtained. These items are summarized in Table 1.

INSERT TABLE 1 HERE

To test the dimensionality of the item set specified in Table 1, the following procedure was used:

1) For each item domain a domain score was constructed by summing items over sources and years.

2) The resulting domain scores were then entered into a confirmatory factor model to test the fit of the item set to a single factor model. This analysis showed that a single factor model provided an adequate fit to the data (LR X^2= 33.9; df = 11; CFI = .99; RMSEA = .045; SRMR = .015).

3) To estimate self-control scores for each study participant, the participant's observed item domain scores were standardised, weighted by the least squares estimate of the factor score coefficient and then summed. In cases where data were missing on one or more (but not all) points of observation, the factor scored was imputed from the available items using the procedure PROC IMPUTE in SAS v. 9.2 [20].

The resulting self-control measure had very good internal consistency on the basis of Cronbach's alpha (α = 0.88). For the purposes of the present study, the scale was standardized to a mean of zero and a standard deviation of one.

Outcome measures

Criminal offending. Three dichotomous measures of criminal offending were obtained from the CHDS database. These were:

Ten or more property offenses/violent offenses (ages 17-30). At ages 18, 21, 25 and 30, respondents were questioned about their criminal behaviors since the previous assessment using

the Self-Report Delinquency Inventory SRDI: [21] supplemented by additional custom-written survey items. This information was used to derive count measures of the number of self-reported property offenses and violent offenses committed in the twelve months prior to each assessment over the period from age 17 to age 30 years. Property offenses were defined to include theft, burglary, breaking and entering, vandalism, fire setting, and related offenses; violent offenses included assault, fighting, use of a weapon, or threats of violence against a person. This information was used to construct two dichotomous measures of: a) property offending (ten or more offenses); b) violent offending (ten or more offenses); during the period 17-30 years.

Arrest/conviction (ages 16-30). At ages 18, 21, 25 and 30, cohort members were questioned about whether they had been arrested for any reason during each year since the previous assessment, and, if so, they were asked to provide details of the circumstances leading to the arrest and the consequences of the arrest, including court convictions. Those cohort members who reported having been arrested or convicted during the period 16-30 years were classified using a dichotomous measure as having been arrested/convicted.

Substance use

Nicotine dependence (ages 18-30). At ages 18, 21, 25 and 30, participants were questioned as to their frequency of cigarette smoking and their experience of symptoms related to DSM-IV [22] symptom criteria for nicotine dependence. Participants who met criteria for nicotine dependence at any assessment were classified using a dichotomous measure as having been nicotine dependent during the period 18-30 years.

Alcohol abuse dependence (ages 17-30). At ages 18, 21, 25 and 30, study participants were interviewed via components of the Composite International Diagnostic Interview (CIDI)[23] that were used to assess DSM-IV symptom criteria for alcohol dependence. Participants were questioned about alcohol abuse/dependence symptoms occurring in the past 12 months, and during each 12 month period following the previous assessment. Participants who met criteria for alcohol

abuse/dependence during any assessment period were classified using a dichotomous measure as having had alcohol abuse/dependence during the period 17-30 years.

Illicit drug dependence (ages 16-30). At ages 18, 21, 25 and 30, cohort members were questioned as to their use of a range of illicit drugs, including cannabis, as well as symptoms of dependence on illicit drugs using items of the CIDI relevant to DSM-IV symptom criteria for dependence upon cannabis and other illicit drugs. Participants who met criteria for illicit drug dependence during any assessment period were classified using a dichotomous measure as having been illicit drug dependent during the period 16-30 years.

Education/employment outcomes.

Welfare dependence (ages 21-30). At ages 25, and 30, participants were asked about their receipt of social welfare benefits during each year since the previous assessment. Participants who indicated having been in receipt of a social welfare benefit for at least three months continuously at any point from age 21 were classified using a dichotomous measure as having been welfare dependent during the period 21-30 years.

Attained university degree or equivalent (by age 30). At age 25 and age 30, sample members were questioned as to whether they had ever attained a Bachelor's level or higher degree from a university or tertiary institution. Those who reported having attained this level of qualification were classified using a dichotomous measure as having obtained a university degree by age 30.

Below median income (age 30). At age 30 sample members were asked to estimate their personal gross income from all sources over the previous 12 months. This estimate served as the measure of personal income (in New Zealand dollars) at age 30. Those individuals who were below the median income for the sample (median = NZD$ 43,000) were classified using a dichotomous measure as having an income below the median for the sample at age 30.

Sexual behavior and consequences.

Becoming a parent (by age 21). At each assessment to age 21 cohort members were questioned regarding their relationship and sexual history. As part of this questioning respondents were asked whether they had given birth to (for females) or fathered (for males) a live baby at any point in their lives. Cohort members who reported having become a natural parent at any point prior to the age 21 assessment were classified using a dichotomous measure as having become a parent by age 21.

Ten or more sexual partners (ages 16-30). Also as part of the questioning regarding relationship and sexual history at ages 18, 21, 25, and 30, cohort members were questioned as to the number of opposite-sex and same-sex sexual partners they had had since the previous assessment. The responses to these questions were summed over the assessment periods to create a measure of the total number of sexual partners reported by each cohort member to age 30. Cohort members who reported having had at least ten sexual partners were classified using a dichotomous measure as having had ten or more sexual partners during the period 16-30 years.

Mental health outcomes.

Major depression/anxiety disorder (ages 16-30). At ages 18, 21, 25, and 30 years participants were questioned regarding symptoms of major depression and a range of anxiety disorders (including generalized anxiety disorder, panic disorder, agoraphobia, social phobia, and specific phobia) using CIDI [23] items and DSM-IV [22] diagnostic criteria. Sample members who met DSM diagnostic criteria for a major depressive episode or one or more anxiety disorders at any time during any assessment period (16-18 years; 18-21 years; 21-25 years; 25-30 years) were classified using a pair of dichotomous measures as having major depression or anxiety disorder during the period 16-30 years.

Suicidal ideation (ages 16-30). Suicidal behavior during each assessment period was assessed via self-report by asking sample members whether they had ever thought about killing themselves or had attempted suicide during the assessment period. Participants were classified using a dichotomous measure as having suicidal ideation during the period 16-30 years if they had

reported at least one instance of thinking about killing themselves at any assessment (ages 18, 21, 25, and 30 years).

Covariates

Family socioeconomic status (at birth). This was assessed at the time of the participant's birth using the Elley-Irving [24] scale of socioeconomic status for New Zealand. This scale classifies SES into levels on the basis of paternal occupation ranging from 1 = professional occupations to 6 = unskilled occupations.

Child cognitive ability (IQ). Cognitive ability was assessed at ages 8 and 9 using the Revised Wechsler Intelligence Scale for Children WISC-R: [25]. Total IQ scores were computed on the basis of results on four verbal and four performance subscales. The split half reliabilities of these scores were .93 at age 8 and .95 at age 9. For the purposes of the present analysis the observed WISC-R total IQ scores at age 8 and 9 were combined by averaging over the two administrations.

Childhood conduct problems (ages 6-10). A measure of childhood conduct problems was constructed using parent and teacher reports obtained at each year from ages 6 to 10. Parental reports were obtained from an interview with the child's mother using a behavior questionnaire that combined items from the Rutter, Tizard, and Whitmore [8] and Conners [26] parental questionnaires. Parallel to the maternal report, the child's class teacher was asked to complete a combined version of the Rutter et al. [8] and Conners [27] teacher questionnaires. The items used to assess conduct problems included items pertaining to aggressive, oppositional, and antisocial behavior (see Table 1 in [28]). Previous analyses of these scales [28,29] have shown that when method factors were taken into account both parent and teacher reports loaded on a single factor representing childhood conduct problems. To estimate this factor, parent and teacher ratings over the period from 6-10 years were summed to measure the child's propensity to conduct problems in middle childhood. Items that had

been used in the construction of the self-control scale described above were omitted. The reliability of this scale was very good ($\alpha = .97$). For the purposes of the present study, the scale was standardized to a mean of zero and a standard deviation of one.

Statistical analyses

To examine the associations between the continuous measure of self-control in childhood and outcomes in late adolescence/early adulthood described above, a series of logistic regression models were fitted to the data for each outcome (criminal offending; substance use; education/welfare; sexual behavior/consequences; mental health), using the continuous measure of self-control as the predictor. From the fitted models estimates of the odds ratio (OR) and 95% confidence interval (CI) were obtained. These estimates represented the odds of each outcome given a one standard deviation change in the predictor.

The associations between self-control and outcomes were adjusted in three steps.

1) In the first step, In order to adjust the associations between self-control and outcomes for gender, social background (SES at birth) and IQ as in the analyses by Moffitt et al, the models above were extended to include terms representing gender, SES and IQ (entered simultaneously).

2) In the second step, the associations between self-control and outcomes were adjusted for the correlated effects of childhood conduct problems by extending the bivariate models described above to include the measure of conduct problems during the period 6-10 years.

3) In the final step, the model for each outcome was refined by adding all covariates (gender, SES, IQ, conduct problems)and removing predictors that were above the level of marginal statistical significance ($p > .10$), leaving only the measure of self-control, along with the statistically significant ($p < .05$) or marginally significant ($p < .10$) predictors in each of the final models.

A more detailed description of the statistical analyses is available in Supplement 1. Estimates of the

associations between conduct problems (ages 6-10) and outcomes are provided in Table S1.

Sample sizes

Also as noted previously, because of missing data on the original behavior items during the period 6-

12 years, imputed scores for missing data were obtained through PROC IMPUTE using SAS v. 9.2 [20],

resulting in an available sample size of 1142 for the self-control measure. Missing data on outcome

measures during the period 16-30 years resulted in analyses with sample sizes ranging from 1054 to

964, with the samples representing 85.6% to 78.3% of the cohort surviving to age 30 (N = 1231).

Results

Associations between Self-control (ages 6-12) and Developmental Outcomes Assessed to age 30.

Table 2 shows the associations between self-control at ages 6-12 years (classified into quintiles for

the purposes of data display) and a series of 14 measures describing a range of life outcomes to the

age of 30, including measures of: crime; substance abuse; educational and occupational

achievement; sexual risk taking; and mental health. The associations were tested for statistical

significance by fitting logistic regression models of the bivariate association between self-control and

each outcome. The resulting parameter estimates were used to compute estimates of the OR and

95% CI.

The Table shows that increasing self-control was associated with: a) declining rates of criminal

offending (p < .0001); b) declining rates of substance use disorder (p < .0001); c) declining rates of

welfare dependence (p < .0001); d) increasing rates of educational attainment and higher income (p

< .0001); e) declining rates of sexual risk taking/consequences (p < .0001); and f) declining rates of

anxiety disorder (p < .01) and suicidal ideation (p < .0001). However, self-control was not

significantly associated with later depression (p > .20).

INSERT TABLE 2 HERE

Covariate Adjustment

As explained in Methods the bivariate associations between self-control and the outcome measures

in Table 2 were progressively adjusted for covariates. These adjustments were:

1) adjustment for gender, social background (SES at birth) and IQ as in the analyses by Moffitt et al

    [1] (the absolute value of the correlations between the measure of self-control and these

    covariates ranged from .25 to .45);

2) adjustment for conduct problems (ages 6-10; the correlation between self-control and the

    measure of conduct problems was -.76 (p < .0001)).

3) development of a final fitted model including self-control and all significant and marginally

    significant (p < .10) covariates.

Table 3 reports the results of these analyses. The Table shows for each analysis the covariate-

adjusted OR, 95% CI and associated significance levels. For the final fitted model the table also

identifies the significant and marginally significant (p < .10) covariates. Table 3 shows that:

1) the associations between self-control and the outcome measures were largely unaffected by

    control for gender, IQ, and SES, and in all cases remain statistically significant (p < .05).

2) adjustment for conduct problems had substantial effects on the associations between self-

    control and: property offending; arrest/conviction; substance use; sexual risk-taking and

    consequences; and mental health. Of the 13 statistically significant associations in Table 2, eight

    remained statistically significant (p < .05) after control for the corrected effects of childhood

    conduct disorder.

3) The final fitted model shows that with four exceptions, self-control was not significantly ($p < .05$) related to later outcomes. The exceptions were: violent offending ($p < .05$); welfare dependence ($p < .001$); gaining university degree ($p < .0001$); and income ($p < .05$). In nine of the equations conduct problems were a significant covariate ($p < .05$).

In general the findings in Table 3 suggest that most of the associations between early self-control and later adjustment were explained by factors that were correlated with self-control. These factors included: gender; IQ; SES; and childhood conduct problems.

INSERT TABLE 3 HERE

Discussion

In this paper we have used data from the Christchurch Health and Development study to replicate and extend Moffit et al's [1] analysis of the relationship between childhood self-control and later developmental outcomes using a research design that is similar to that used by Moffitt et al in terms of: location (the South Island of New Zealand); the measurement of self-control ; and assessment of outcomes. The findings of this analysis are summarised below.

The findings of this study provided strong confirmation of Moffit et al's [1] finding that self-control in middle childhood was strongly prognostic of a wide range of adult outcomes including: crime; substance use; sexual risk-taking; welfare dependence, poorer educational attainment and lower income; and mental health problems. In all cases declining self-control was associated with significant increases in adverse outcomes for these measures. In addition, in agreement with the findings of Moffit et al most of these associations persisted after control for gender, socioeconomic status and childhood IQ. The fact that two studies using a general similar methodology were able to find pervasive associations between early self-control and later adult comes demonstrates the robust nature of these general associations.

However, further investigation revealed that the measure of self-control used in this study was highly correlated (r= -.76) with a more general measure of childhood conduct problems assessed over a similar time period. The measure of childhood conduct problems was constructed using parent and teacher reports of the extent to which the child exhibited aggressive, oppositional and antisocial behaviours at home and at school. Statistical control for childhood conduct problems reduced many of the associations between self-control and the outcome measures (property crime and convictions; substance use; sexual risk-taking; mental health) to the point of statistical non-significance. However, even following control for childhood conduct problems, significant associations remained between childhood self-control and later violent offending, welfare dependence, and education/employment outcomes.

These findings suggest that the associations between childhood self-control and later outcomes are likely to be more complicated than suggested by Moffitt et al [1]. While measures of self-control prove to be robust predictors of later outcomes, the effects of self-control on later outcomes were largely accounted for by a number of factors that were correlated with self-control. These factors included: gender; SES; IQ; and most importantly childhood conduct problems. When these factors were taken into account most of the associations between childhood self-control and later outcomes were explained. The exceptions to this were for: violent offending, and education/employment outcomes (welfare dependence; gaining university degree; income). For these outcomes declining self-control adds increasing risk even when allowance is made for gender, SES, IQ, and childhood conduct problems.

These conclusions raise important issues about the relationship between self-control and conduct problems in childhood. At least two explanations of this association are possible. First it may be suggested that childhood self-control is a developmental precursor of childhood conduct problems. If this were the case childhood conduct problems may act as an intervening variable that mediates

the association between self-control and later outcomes. Alternatively, it may be suggested that low self-control is symptomatic of children with early externalizing problems. If this were the case the associations between self-control and later outcomes largely arise because self-control is a correlate of more general tendencies to childhood conduct problems.

While the issue of the developmental relationships between self-control and conduct problems in middle childhood remains to be resolved, the findings of this study clearly suggest that in terms of early intervention the major focus should be on the identification and treatment of conduct problems in middle childhood rather than on self-control specifically. As recent reviews have shown there are now effective methods for addressing these issues through parent and teacher behaviour management programs [30,31]. These programs use social learning methods to address childhood behavior problems with one feature of these methods being to encourage childhood self-control [30-33].

A possible exception to this conclusion is for violent offending, and for educational and economic outcomes, where control for childhood conduct problems did not explain the association between self-control and later outcomes. These findings suggest that addressing early self-control problems independently of childhood conduct problems may have beneficial consequences for later offending, educational and occupational outcomes.

At a more general theoretical level the findings of this study provide only mixed support for Gottfredson and Hirschi's [2] theoretical claims that self-control is the primary childhood factor that contributes to later crime. What our findings suggest is that a key childhood driver of crime and other adverse outcomes in adulthood is the extent to which a child engages in aggressive, oppositional, and antisocial behaviors. This view is consistent with more general findings that adult crime is strongly predicted by patterns of antisocial behavior during childhood and adolescence [34-36].

In summary the findings of this 30-year longitudinal study replicate and confirm Moffit et al's [1] findings that self-control in middle childhood is strongly prognostic of a wide range of outcomes in adulthood. However, further analysis shows that these associations are mediated by the strong association between self-control and childhood conduct problems. While the associations between self-control and childhood conduct problems are poorly understood the weight of the evidence suggests the best approach to addressing associations between childhood self-control and later outcomes may be through programmes directed at the prevention, treatment and management of conduct problems in childhood. A possible exception to these conclusions is for the association between self-control and violent offending, and between self-control and educational/occupational outcomes which were not explained by the associations between self-control and childhood conduct problems.

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Table 1. Item domains for self-control scale.

Domain	Age Assessed	Source	Item Content
Impulsive aggression	6-10 years	Parent/teacher report	Fights; quick to fly off handle
Hyperactivity	6-10 years	Parent/teacher report	Short attention span; can't settle; runs around; restless/hardly still; overactive/can't sit still; driven by motor
Lack of persistence	6-10 years	Parent/teacher report	Slow to finish work; easily distracted; difficulty staying with activity
Impulsivity	6-10 years	Parent/teacher report	Acts without thought; changes activities; impatient awaiting turn
Hyperactivity	12 years	Self-report	Restless; fidgets
Inattention	12 years	Self-report	Easily distracted; doesn't finish jobs
Impulsivity	12 years	Self-report	Difficulty awaiting turn; calls out in class

Table 2. Associations between childhood self-control (ages 6-12) and later life outcomes (to age 30).

	Self-control measure quintile (ages 6-12)						
	1-20% (Lowest)	21-40%	41-60%	61-80%	81-100% (Highest)	p[a]	OR (95% CI)[b]
Criminal offending							
% Ten or more property offenses (ages 17-30)	17.1	11.9	7.0	7.0	4.2	<.0001	0.62 (0.52-0.75)
% Ten or more violent offenses (ages 17-30)	18.6	11.0	9.3	2.8	1.9	<.0001	0.49 (0.41-0.59)
% Arrested/ convicted (ages 16-30)	46.2	25.7	23.3	11.3	8.1	<.0001	0.49 (0.42-0.57)
Substance use							
% Alcohol abuse/dependence (ages 17-30)	54.7	49.3	48.4	43.9	35.1	<.0001	0.76 (0.67-0.87)
% Nicotine dependence (ages 18-30)	50.3	43.3	32.1	29.9	17.8	<.0001	0.60 (0.52-0.68)
% Illicit drug dependence (ages 16-30)	24.2	22.1	16.1	9.8	8.4	<.0001	0.66 (0.57-0.78)
Education/employment							
% Welfare dependent (ages 21-30)	51.3	46.0	32.2	32.0	29.8	<.0001	0.69 (0.61-0.80)
% Gained university degree (by age 30)	7.3	16.0	25.3	40.0	54.3	<.0001	3.54 (2.72-4.59)
% Below median income (at age 30)	56.0	51.7	48.5	39.7	37.6	<.0001	0.75 (0.65-0.86)
Sexual behavior and consequences							
% Parent by age 21	20.2	23.8	14.3	10.6	4.7	<.0001	0.66 (0.56-0.77)
% Ten or more sexual partners (ages 16-30)	36.9	31.2	28.0	26.2	16.8	<.0001	0.75 (0.65-0.86)
Mental health							
% Major depression (ages 16-30)	50.0	53.8	41.2	48.6	47.2	>.20	0.93 (0.81-1.05)
% Anxiety disorder (ages 16-30)	47.0	43.7	35.1	34.6	35.5	<.01	0.81 (0.71-0.92)
% Suicidal ideation (ages 16-30)	41.7	40.8	28.8	31.1	23.4	<.0001	0.75 (0.66-0.86)

[a] Wald chi-square from logistic regression using continuous self-control scale score
[b] Denotes odds given a one standard deviation change on continuous measure of self-control

Table 3. Odds ratios for the associations between self-control (ages 6-12) and life outcomes (to age 30): a) adjusted for gender, IQ and social background (SES); b) adjusted for conduct problems (ages 6-10); and c) the final fitted models

Outcome	Adjusted for gender, IQ and SES		Adjusted for conduct problems (ages 6-10)		Final fitted model		
	OR (95% CI)[a]	p[b]	OR (95% CI)[a]	p[b]	OR (95% CI)[a]	p[b]	Significant (p < .05) or marginal (p < .10) covariates
Criminal offending							
10 or more property offenses	0.68 (0.54-0.85)	<.001	0.82 (0.61-1.17)	>.20	0.95 (0.69-1.31)	>.70	gender; conduct problems
10 or more violent offenses	0.61 (0.49-0.77)	<.0001	0.59 (0.44-0.80)	<.001	0.69 (0.51-0.96)	<.05	gender; SES
Arrest/conviction	0.61 (0.51-0.74)	<.0001	0.65 (0.52-0.82)	<.001	0.80 (0.62-1.01)	<.10	gender; conduct problems
Substance use							
Alcohol abuse/dependence	0.76 (0.64-0.88)	<.001	0.87 (0.71-1.06)	>.10	0.82 (0.66-1.03)	<.10	gender; IQ; conduct problems
Nicotine dependence	0.64 (0.55-0.76)	<.0001	0.74 (0.60-0.91)	<.01	0.80 (0.64-1.01)	<.10	IQ; SES; conduct problems
Illicit drug dependence	0.69 (0.57-0.83)	<.0001	0.78 (0.62-1.03)	<.10	0.89 (0.69-1.16)	>.30	gender; conduct problems
Education/employment							
Welfare dependence	0.71 (0.60-0.84)	<.0001	0.71 (0.57-0.87)	<.01	0.69 (0.59-0.86)	<.001	gender; SES
Gaining university degree	2.23 (1.66-3.01)	<.0001	3.01 (2.18-4.17)	<.0001	2.03 (1.42-2.89)	<.0001	IQ; SES
Below median income age 30	0.84 (0.71-0.99)	<.05	0.77 (0.63-0.96)	<.05	0.83 (0.70-0.99)	<.05	gender; SES; IQ
Sexual behavior and consequences							
Parent by age 21	0.70 (0.57-0.85)	<.001	0.85 (0.66-1.11)	<.001	0.91 (0.67-1.22)	>.50	gender; SES, IQ; conduct problems

10 or more sex partners	0.75 (0.64-0.89)	<.001	0.87 (0.71-1.08)	<.001	0.88 (0.69-1.12)	>.30	gender; IQ; conduct problems
Mental health							
Anxiety disorder	0.72 (0.61-0.85)	<.0001	1.10 (0.89-1.35)	>.70	1.00 (0.79-1.27)	>.90	gender; IQ; conduct problems
Suicidal ideation	0.64 (0.55-0.76)	<.0001	0.84 (0.65-1.08)	>.10	0.81 (0.65-1.03)	<.10	gender; IQ; conduct problems

[a] Derived from parameter estimates from logistic regression using continuous self-control scale score
[b] Wald chi-square from logistic regression