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EMPIRICAL RESEARCH

# Self-Control Assessments and Implications for Predicting Adolescent Offending

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**Abstract** Although low self-control is consistently related to adolescent offending, it is unknown whether self-report measures or laboratory behavior tasks yield better predictive utility, or if a combination yields incremental predictive power. This is particularly important because developmental theory indicates that self-control is related to adolescent offending and, consequently, risk assessments rely on self-control measures. The present study (a) examines relationships between self-reported self-control on the Weinberger Adjustment Inventory with Go/No-Go response inhibition, and (b) compares the predictive utility of both assessment strategies for short- and long-term adolescent reoffending. It uses longitudinal data from the Crossroads Study of male, first-time adolescent offenders ages 13–17 (N = 930; 46 % Hispanic/Latino, 37 % Black/African-American, 15 % non-Hispanic White, 2 % other race). The results of the study indicate that the measures are largely unrelated, and that the self-report measure is a better indicator of both short- and long-term reoffending. The laboratory task measure does not add value to what is already predicted by the self-report measure. Implications for assessing self-control during adolescence and consequences of assessment strategy are discussed.

**Keywords** Self-control · Impulsivity · Adolescent delinquency

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## Introduction

Self-control, or the ability to exercise control over one's behaviors (Casey and Caudle 2013; Diamond 2013), increases during adolescence (Harden and Tucker-Drob 2011; Hay and Forrest 2006; Monahan et al. 2009) on both behavioral (Steinberg et al. 2008) and neurobiological levels (Dahl 2004). Although self-control fully matures by the mid-20s (Strang et al. 2013), adolescents with less self-control may be at a developmental disadvantage because they are less able to inhibit inappropriate desires, emotions, and actions (Casey 2015). Adolescents with low self-control are particularly at risk for involvement in crime (Gottfredson and Hirschi 1990). Indeed, dozens of studies have established the relationship between low self-control and adolescent crime (e.g., Cauffman et al. 2005; Meldrum et al. 2015; Moffitt et al. 2011; Pratt and Cullen 2000; Steinberg et al. 2008; Turner and Piquero 2002). It is unsurprising, therefore, that self-control measures are used in current juvenile offender risk assessments (e.g., SAVRY; Borum et al. 2006; Mulvey and Iselin 2008) and

federal guidelines recommend their inclusion in the development of future risk assessments (Office of Juvenile Justice and Delinquency Prevention 2014). However, there is substantial debate on whether to assess self-control using self-report scales or laboratory behavior tasks (de Ridder et al. 2012; Duckworth and Kern 2011; Tittle et al. 2003). This question is particularly salient considering that a growing literature finds that these assessment strategies detect distinct behaviors (Cyders and Coskunpinar 2011, 2012; Reynolds et al. 2006; Sharma et al. 2014). Considering the general lack of relation among self-control measures and the implications of self-control assessments for use in both current and future risk assessments, it is essential to ask whether we can better predict adolescent reoffending by using multiple measurement strategies simultaneously.

## Assessment of Self-Control

Self-reported assessments of self-control require individuals to report on their general behavioral tendencies over a particular recall period. For example, the self-control subscale of the Weinberger Adjustment Inventory (WAI) asks participants to rate how frequently they exhibited particular impulsive behaviors in the last 6 months (e.g., "I say the first thing that comes into my mind without thinking enough about it")(Weinberger and Schwartz 1990). This self-report measure is widely used in the study of juvenile offending. Previous research suggests that adolescent offenders report lower self-control on the WAI subscale than non-offenders (Cauffman et al. 2005), and low WAI self-reported self-control is related to delinquency (Meldrum et al. 2015), reoffending (Bechtold et al. 2013), violent offending (Parker et al. 2005), and arrests (Steiner et al. 1999).

However, there are two limitations of the self-report approach. First, self-report measures require that the participant is able to report on his behavioral tendencies. This is potentially problematic if the individual does not recognize that his behavior was impulsive. Indeed rather than assess actual behavior, self-report scales may indicate one's perceptions of one's behavior (Grieger et al. 2012). Second, assuming that the individual is able to recognize his impulsive behavior, self-report methods require a willingness to report one's behavioral tendencies. Indeed, face validity is one of the main weaknesses of the self-report approach in general (Benda 2005). The susceptibility of self-report methods to self-presentation concerns (Doherty and Schlenker 1991) and social desirability (Fazio and Olson 2003) may be particularly salient if justice system officials use self-reported scales in risk assessments. This has led to the dominant view that individuals may be unable or unwilling to provide accurate information about themselves. However, an increasing literature on self-report methods in risk assessments suggests that individuals may be better able to predict their behavior than psychological tests (Skeem et al. 2013). Because individuals have more information about their own feelings, thoughts, and behaviors across contexts than any external source of information (Shrauger et al. 1996), individuals may, in fact, be the best source of information about themselves. Even when there is incentive to deceive or when information may be used against them in sentencing decisions or risk assessments, individuals do provide valid, socially undesirable information about themselves (see Loza et al. 2007; Peterson et al. 2011; Skeem et al. 2013). Therefore, self-reported assessments of self-control may be useful for predicting juvenile reoffending despite self-presentation concerns.

## Laboratory Task Measures of Self-Control

In contrast to self-report assessments, performance on laboratory tasks is less sensitive to biases, self-perceptions, and false-reporting (Enticott et al. 2006; Williams and Kaufmann 2012). Laboratory tasks assess behavioral snapshots of how the individual responds to a particular stimulus, and not just how the individual *thinks* she would behave or knows she has behaved in the past. These tasks are intended to be performance measures that assess behavior indicative of self-control under standardized conditions.

However, laboratory tasks typically measure only one specific dimension of impulsive behavior, such as the ability to delay gratification, the ability to sustain concentration, or the ability to inhibit a prepotent response (see Reynolds et al. 2006). As a result, performance on a single task may not be representative of the overall self-control construct. Prepotent response inhibition is one such behavior assessed by laboratory tasks of self-control. Prepotent response inhibition refers to the ability to suppress a strong tendency to respond to cued stimuli. Generally assessed with the Go/No-Go task (GNG; Nosek and Banaji 2001), response inhibition activates areas of the prefrontal cortex involved in self-regulation and executive functioning (Aron 2011; Casey et al. 1997; Cyders and Coskunpinar 2011), particularly the anterior cingulate cortex (Aharoni et al. 2013). Of the various behaviors assessed by laboratory tasks of self-control, prepotent response inhibition is therefore a promising proxy for assessing the broader self-control construct because it taps into a general tendency towards self-control (see Cyders and Coskunpinar 2011).

GNG response inhibition is related to functional deficits across multiple disorders and antisocial behaviors, including borderline personality disorder (Rentrop et al. 2008),

conduct problems (Berlin and Bohlin 2002), and substance use (Sharma et al. 2014). Performance on the measure is related to both adult and adolescent offending. For example, adult offenders perform more poorly than non-offenders (Munro et al. 2007), adult repeat-offenders perform more poorly than first-time offenders (Ross and Hoaken 2011), and juvenile delinquents perform more poorly on the GNG task than non-delinquents (Yechiam et al. 2006). GNG response inhibition may thus appear to be a more useful predictor of adolescent reoffending than self-report measures, particularly because it is not limited by self-presentation concerns. However, it is unclear how useful this task would be for predicting future adolescent offending for two reasons. First, studies have used this task primarily to distinguish *between* adolescent populations (e.g., offenders vs. non-offenders) rather than *within* adolescent populations (e.g., offenders who continue offending vs. offenders who cease offending). Though it may be useful for distinguishing between pre-defined groups of those who have or have not offended, it is unknown whether it can distinguish repeat offenders within populations of adolescent offenders. Such data would be critical for determining whether performance on the task could be an important part of a comprehensive risk assessment. Second, because the brain regions assessed by the task undergo significant developmental changes during adolescence (Kelly et al. 2009), a snapshot of cognitive functioning at a particular point may not be useful beyond a short period of time. It may be the case that youth who start at the same point may develop functional connectivity in these regions at different rates. Alternatively, despite developmental gains in the cognitive control system, adolescents may disproportionately recruit other regions when processing decisions in the real world. In essence, there may be an imbalance in the recruitment of regions responsible for cognitive versus emotional control. Accordingly, using a measure of GNG impulsivity and a measure of a self-reported measure of self-control simultaneously would likely yield incremental predictive power over the use of either measure alone because each measure taps into different modalities (Sharma et al. 2014).

## Present Study

Despite a growing literature on the relationships between self-control measurements (Cyders and Coskunpinar 2011, 2012; Duckworth and Kern 2011; Meldrum et al. 2013; Sharma et al. 2014) and their implications for predicting risk of offending, studies have not yet examined whether a particular measurement strategy is a better predictor of recidivism among a sample of adjudicated, first-time offenders. Studying the predictive utility of these measurement strategies using first-time offenders is of critical practical importance because adolescents who come into contact with the juvenile justice system are at a greater risk of reoffending, of getting rearrested, and of returning to court (Holman and Zeidenberg 2006; Liberman et al. 2014; Snyder and Sickmund 2006). Further, the study of first-time offenders is also empirically advantageous because this limits the variability in reoffending attributable to one's offending history. Accordingly, we employ a sample of first-time offenders to address three aims. First, we examine the relationship between self-reported self-control (measured by the Weinberger Adjustment Inventory) and response inhibition (measured by the Go/No-Go Task). Second, we test whether response inhibition is sufficiently sensitive to predict adolescent reoffending in the short term (6 months) and the longer term (6–12 months later). Finally, we examine whether using both measurement strategies simultaneously better predicts reoffending 6 and 12 months later than either measure alone. We expect that using both measures simultaneously should offer greater prediction of reoffending.

## Methods

### Participants

The sample consists of 1181 male juvenile offenders, ages 13–17 ($M = 15.3$, $SD = 1.3$), from the Crossroads Study. The Crossroads Study examines the developmental trajectories male adolescent offenders after their first official contact with the juvenile justice system. The youths had each been arrested for a range of non-felony offenses, and the most frequent charges included vandalism (17.5 %), theft (16.7 %), possession of marijuana for personal use (14.8 %), and assault and battery (12.5 %). Youths were sampled from three sites: Philadelphia, Pennsylvania ($N = 514$); Jefferson Parish, Louisiana ($N = 149$); and Orange County, California ($N = 518$). The sample was ethnically diverse: Hispanic/Latino (46 %), Black/African American (37 %), non-Hispanic White (15 %), and other (2 %). Approximately 98 % of the sample was retained for the first follow-up interview, and approximately 95 % for the second follow-up wave. Youth who did not complete both self-control measures were not included in analyses, thus the total sample size for this analysis is 930. Reasons for why youth did not complete both measures include computer malfunctions, interviews conducted over the phone, or interviews conducted at detention facilities. The present sample did not differ from the entire Crossroads sample on any key descriptive, predictor, or outcome variables.

Signed parental consent and youth assent were obtained for all participants before interviews were conducted. Upon

obtaining consent, youth completed an interview a maximum of 6 weeks after the disposition hearing for their first arrest, and two follow-up interviews approximately 6 months apart. Face-to-face interviews with the youth ranged from 2 to 3 h and were recorded using a secure computer-based program. Participants were informed of the nature of the study and were told that there was no penalty for not participating. The Institutional Review Board (IRB) of the University of California, Irvine approved all study procedures. All interview responses are protected by a Certificate of Confidentiality issued by the Department of Justice. This permanently protects participants' privacy by exempting their responses and identity from subpoenas, court orders, or other types of involuntary disclosures. Participants were given a detailed explanation of the Certificate of Confidentiality before beginning the interview, and were reminded again before sensitive questions, such as those about reoffending, were asked.

## Measures

### *Demographic Information*

Youth were each asked to report on general demographic information, including age, race/ethnicity (Table 1).

### *Self-Report of Self-Control*

The Weinberger Adjustment Inventory (WAI; Weinberger and Schwartz 1990) is a self-report assessment of an individual's social-emotional adjustment that has been well-validated in both clinical and nonclinical samples of adolescents (Weinberger 1997). This study uses the 8-item self-control subscale, which measures the extent to which an adolescent moderates his impulses before acting (sample item "*I do things without giving them enough thought*"). The self-control scores are averaged on a 5-point scale, with higher scores indicative of *less* self-control ($M = 2.65$, $SD = .88$; $\alpha = .759$). The variable was not significantly skewed ($p = .30$). The mean self-control score was similar to that found in other male adolescent offender samples (Cauffman et al. 2005). Self-reported self-control is assessed using a z-score, such that higher values indicate *poorer* self-control.

**Table 1** Descriptive statistics for study variables

| | *M* | *SD* | Range |
|---|---|---|---|
| *Demographics* | | | |
| Age of youth at baseline in years | 15.3 | 1.3 | |
| % non-Hispanic White | 15.2 | | |
| % Black/African American | 36.6 | | |
| % Hispanic/Latino | 45.9 | | |
| % Other | 2.3 | | |
| IQ | 88.49 | 11.51 | 55–124 |
| *Self-control assessments* | | | |
| Self-report | 2.65 | .86 | 1–5 |
| GNG performance | 17.06 | 8.74 | 0–49 |
| *Youth self-reported offending variety* | | | |
| 6 months preceding study | 1.33 | 2.18 | 0–18 |
| Short term | 1.17 | 2.19 | 0–14 |
| Long term | .98 | 1.96 | 0–17 |

### *Laboratory Task*

Participants completed a computerized version of a Go/No-Go task (GNG; Casey et al. 2001). Procedures for adolescents are similar to those used with adult samples (Casey et al. 1997, 2001; Yechiam et al. 2006), though the task has been altered to be more developmentally appropriate for young children (see Durston et al. 2002). For this task, participants viewed a series of 256 letters presented one-by-one on a computer screen. Each letter was presented for 500 ms, with a 2000-ms interstimulus interval. Participants were asked to press the space bar in response to every letter, but to withhold the response if presented with an *X*. The fact that the non-*X*s are frequent, occurring 75 % of the time, sets up a prepotent tendency to respond on all trials. This prepotent response must be inhibited when the *X* randomly appears, and failing to inhibit the response is referred to as a commission error. A high number of commission errors indicates poor response inhibition ($M = 17.05$, $SD = 8.75$, range 0–49). The variable was significantly skewed ($p < .01$). The percentage of commission errors is comparable to those found in samples of adolescents who had been diagnosed with ADHD as children (Schulz et al. 2014). GNG response inhibition is assessed using a z-score of the number of commission errors, such that higher values indicate *poorer* response inhibition.

### *IQ*

The Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler 1999) was administered at baseline to assess each participant's IQ. The WASI offers a brief and reliable measure of general intelligence that was normed across the life span (Ryan et al. 2013). A full-scale IQ estimate was created by combining scores from the verbal ability scale (Vocabulary) and the performance ability scale (Matrix Reasoning). Studies have illustrated that the WASI yields strong psychometric properties. Convergent validity of the scale has been demonstrated using a sample of adolescents (Canivez et al. 2009). Because intelligence is related to both delinquency and self-control (Loeber et al. 2012;

White et al. 1994), the full-scale IQ estimate was used as a covariate in all analyses (Table 1). The mean IQ (Brandt et al. 1997) and the range (Hampton et al. 2014) were similar to that of other adolescent offenders samples.

*Self-Reported Offending*

Delinquent behavior was assessed for the 6 months period preceding the initial interview, for the 6 months period following the initial interview, and in the 6-to-12 months following the initial interview using the Self-Report of Offending scale (SRO; Huizinga et al. 1991). This self-report scale assesses 24 various criminal acts ranging from selling drugs to homicide. The number of different types of offenses the person had committed since the previous assessment was summed to create an overall offending variety score, which provides a consistent and valid estimate of involvement in illegal activity over a given recall period (Osgood et al. 2002). The variety score approach, which was first introduced by Porterfield (1943), has several advantages over summing how frequently the youth offended. First, it reduces the inherently skewed distribution caused by the fact that the modal response for each offending behavior is zero, and a small number of respondents may engage in particular behaviors repeatedly. Further, the variety score enhances the contribution of serious offenses because high scores only result if respondents have engaged in a wider variety of serious behaviors. For instance, a youth who engages in vandalism frequently but does not engage in any other type of crime would receive a "1", whereas a youth who engages in vandalism and burglary would receive a score of "2." These variety scores are the preferred method for summarizing individual criminality because they assess heterogeneity in crime types versus frequency of a particular type of offending, and give more weight to more serious behaviors that maybe discounted if they occur less frequently than less serious behaviors that occur more frequently (Sweeten 2012). On average, youth engaged in 1.33 ($SD = 2.18$) types of offenses prior to baseline (Table 1). Approximately 44 % of the sample reoffended within the 6 months follow-up period, engaging in an average of 1.17 ($SD = 2.19$) types of offenses. Approximately 42 % reoffended in the 6–12 months follow-up period, engaging in an average of .98 ($SD = 1.96$) types of offenses.

### Plan of Analysis

Stata 14 was used for the analyses in the present study. A bivariate correlation was used to assess the relationship between self-reported self-control and GNG impulsivity. To address the second and third research questions, a series of negative binomial regressions were conducted. Negative binomial regression models are used to predict count outcomes because of their restricted distribution and over-dispersion. Models were first run using robust standard errors to account for the clustered nature of the sampling method. To account for the fact that subjects within each data collection site may be more similar to each other than to subjects at other sites, models were re-analyzed using cluster-robust standard errors. However, because results were unaltered, results of the robust standard errors are presented and site is used as a covariate. Incidence-rate ratios are presented for negative binomial regression models. Regression models were also run using continuous and dichotomous scorings of self-reported offending, but findings did not change. Considering the dependent variables' restricted distributions and over-dispersion, negative binomial regressions were used for clarity of presentation.

When two self-reported measures are obtained from the same participant at the same assessment point, the relationship between them may be influenced by common method variance (CMV). CMV is the variance attributable to the measurement method rather than the constructs, and such variance introduces potential spurious correlations between the variables of interest. Thus, the correlation between self-reported self-control and short-term offending may be inflated by common method variance. Numerous methods account for CMV (see Williams et al. 2010; Podsakoff et al. 2012), but researchers commonly utilize the marker variable technique (Lindell and Whitney 2001) to partial out the effect of the common method variance. This can be done post hoc without identifying the marker variable a priori (Lindell and Brandt 2000). The second-smallest positive correlation between key variables of the same assessment methodology is used as a conservative estimate of the effect of CMV (Lindell and Whitney 2001). This effect is then partialled out of the correlation between the variables of interest to ensure that findings are not attributable to common method variance.

## Results

As depicted in Table 2, correlations were conducted to examine the relationships between WAI self-reported self-control, GNG impulsivity, age, and both short- and long-term reoffending. Interestingly, self-reported self-control was not correlated with GNG self-control ($r = .04$, $p = .261$) or age ($r = .04$, $p = .228$). Both self-reported self-control ($r = .17$, $p < .001$) and GNG response inhibition ($r = .07$, $p = .030$) were correlated with short-term self-reported offending. However, self-reported self-control ($r = .18$, $p < .001$), but not GNG response inhibition ($r = .03$, $p = .419$), was correlated with long-term self-

**Table 2** Bivariate correlations between primary variables in the analytic sample

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. Age (years) | – | | | | |
| 2. IQ | .077* | – | | | |
| 3. WAI[a] low self-control | .040 | −.012 | – | | |
| 4. GNG[b] low self-control | −.177** | .067* | .045 | – | |
| 5. SRO[c] 6 months | −.015 | .010 | .165*** | .071* | – |
| 6. SRO 6–12 months | −.032 | .003 | .179*** | .027 | .577*** |

[a] Weinberger Adjustment Inventory

[b] Go/No-Go

[c] Self-reported offending

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

reported offending. As expected, the correlation between short- and long-term self-reported offending was significant ($r = .577$, $p < .001$).

To test whether GNG response inhibition was related to youth reoffending in the short term (6 months) or whether adding this laboratory task provides incremental prediction over the self-report method, a series of negative binomial regressions were conducted (Table 3). All models controlled for age, race/ethnicity, IQ, and prior self-reported offending variety. Incidence-rate ratios (IRR) are presented and can be interpreted as the effect of a 1 unit change in the independent variable on the odds of self-reported offending variety. Because IRRs are centered on 1, estimates larger than 1 indicate that the variable is associated with a larger variety of self-reported offending. IRRs smaller than 1 indicate that the variable is related to the odds of a *smaller* variety of self-reported offending. For example, the IRR coefficient of 1.36 for prior self-reported offending in model 1 indicates that every one unit increase in prior offending variety was associated with a 36 % increase in short-term self-reported offending variety.

In the first model, WAI self-control was used to predict short-term self-reported offending (Table 3). The results of the likelihood ratio test indicated that the negative binomial model was more appropriate than the Poisson model, ($\chi^2(1) = 442.70$, $p < .001$). The results of the first model indicate that prior self-reported offending and self-reported self-control are both associated with a larger variety of short-term self-reported offending. In the second model, self-reported self-control was replaced by GNG response inhibition. The negative binomial model fit the data significantly better than the Poisson model, ($\chi^2(1) = 442.20$, $p < .001$). The results of the second model indicate that prior self-reported offending and GNG response inhibition are both associated with increased variety of self-reported offending in the short term. In the third model, self-reported self-control and GNG response inhibition were included simultaneously. The negative binomial model fit

**Table 3** Negative binomial regression for self-control variables predicting self-reported offending 6 months later with robust standard errors

| | Model 1 | | | | | Model 2 | | | | | Model 3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | b | SE | 95 % CI (b) | | IRR[a] | b | SE | 95 % CI (b) | | IRR | b | SE | 95 % CI (b) | | IRR |
| SRO[b] | .308*** | .021 | .268 | .349 | 1.361 | .343*** | .023 | .297 | .388 | 1.409 | .330*** | .024 | .283 | .376 | 1.391 |
| WAI[c] low self-control | .166** | .054 | .061 | .272 | 1.181 | – | – | – | – | – | .126* | .058 | .012 | .239 | 1.134 |
| GNG[d] low self-control | – | – | – | – | – | .155** | .052 | .053 | .258 | 1.168 | .153** | .051 | .052 | .253 | 1.165 |
| *Wald* $\chi^2$ | 325.17*** | | | | | 248.19*** | | | | | 256.96*** | | | | |
| *df* | 9 | | | | | 9 | | | | | 10 | | | | |
| $R^2_{Pseudo}$ | .096 | | | | | .097 | | | | | .099 | | | | |

Controls are age, race/ethnicity, IQ, and site (omitted from the table)

[a] *IRR* incidence-rate ratios

[b] Self-reported offending

[c] Weinberger Adjustment Inventory

[d] Go/No-Go

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

the data significantly better than the Poisson model, ($\chi^2(1) = 446.70$, $p < .001$). The results of the third model indicate that when both self-reported self-control and GNG response inhibition are included simultaneously, both measures are both significantly associated with self-reported offending variety in the short term. The results of a Wald test indicate that the self-report and GNG response inhibition are equivalently associated with self-reported offending in the short term, ($Wald\ \chi^2(1) = .14$, $p = .706$).

To test whether GNG response inhibition is related to youth self-reported reoffending in the long term (6–12 months) or whether adding this laboratory task provides incremental prediction over the self-report method, a series of negative binomial regressions were conducted (Table 4). All models controlled for age, race/ethnicity, IQ, and baseline self-reported offending variety. The negative binomial model fit the data significantly better than the Poisson model, ($\chi^2(1) = 245.19$, $p < .001$). The results of the first model indicate that prior self-reported offending and self-reported self-control are associated with a larger variety of long-term self-reported offending. In the second model, self-reported self-control was replaced by GNG response inhibition. The negative binomial model fit the data significantly better than the Poisson model, ($\chi^2(1) = 272.74$, $p < .001$). The results of the second model indicate that prior self-reported offending variety, but not GNG response inhibition, is associated with long-term self-reported offending variety. In the third model, both the self-report and GNG response inhibition were included simultaneously. The negative binomial model fit the data significantly better than the Poisson model, ($\chi^2(1) = 243.50$, $p < .001$). The results of the third model indicate that when both self-reported self-control and GNG response inhibition are included simultaneously, only self-reported self-control is associated with long-term self-reported offending variety. The results of a Wald test confirm that the relationship between the self-reported self-control and long-term self-reported offending variety is stronger than the relationship between GNG response inhibition and long-term self-reported offending variety, ($Wald\ \chi^2(1) = 6.52$, $p = .010$).

Finally, the marker variable technique was utilized to examine whether the results are due to common method variance. In this study, the second smallest correlation was between the WAI item "I am the kind of person who would try anything once" and self-reported offending in the short term ($r = .066$, $p < .001$). The CMV-adjusted correlation between the self-reported self-control scale and short-term self-reported offending was computed by partialling out the correlation between that WAI item and short-term self-reported offending. Results indicate that the spurious correlation caused by CMV is minimal, amounting to .041. The adjusted correlation between self-reported

**Table 4** Negative binomial regression for self-control variables predicting self-reported offending 12 months later with robust standard errors

| | Model 1 | | | | | Model 2 | | | | Model 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | b | SE | 95 % CI (b) | | IRR[a] | b | SE | 95 % CI (b) | IRR | b | SE | 95 % CI (b) | IRR |
| SRO[b] | .281*** | .020 | .243 | .320 | 1.325 | .299*** | .024 | .252 | .345 | 1.348 | .279*** | .022 | .235 | .322 | 1.322 |
| WAI[c] low self-control | .238** | .066 | .109 | .367 | 1.269 | – | – | – | – | – | .248** | .075 | .102 | .395 | 1.282 |
| GNG[d] low self-control | – | – | – | – | – | −.025 | .055 | −.133 | .083 | .975 | −.017 | .056 | −.127 | .093 | .983 |
| *Wald* $\chi^2$ | 268.72*** | | | | | 187.64*** | | | | | 206.29*** | | | | |
| *df* | 9 | | | | | 9 | | | | | 10 | | | | |
| $R^2_{Pseudo}$ | .098 | | | | | .084 | | | | | .093 | | | | |

Controls are age, race/ethnicity, IQ, and site (omitted from the table)

[a] *IRR* incidence-rate ratios

[b] Self-reported offending

[c] Weinberger Adjustment Inventory

[d] Go/No-Go

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

self-control and self-reported short-term offending is still significant ($r = .147$, $p < .001$). This suggests that the results are not likely due to common method variance, though replication using a multi-informant approach is necessary.

## Discussion

Although dozens of developmental studies suggest a connection between low self-control and adolescent offending, researchers have not examined whether self-report or laboratory behavior tasks are better indicators of likelihood of juvenile reoffending. Because risk assessments rely in large part on measures of self-control, it is particularly important to know if a combination of measurement strategies yields incremental predictive power over the use of either independently, or if either a laboratory task or a self-report measure alone is sufficiently sensitive to be used independently. Either finding would have important implications for resource allocation, and would have significant consequences for improving both best practices in risk assessments and positive outcomes for youth offenders. The results of the present study indicate that, although both self-reported and laboratory behavioral measures of self-control predict short-term reoffending independently, the increase in predictive value from adding a laboratory task is minimal with respect to the prediction of short-term or long-term reoffending. Indeed, on its own, performance on the laboratory measure of self-control is *unrelated* to long-term offending.

Self-reported measures of self-control may better predict reoffending than laboratory tasks because they assess self-control behaviors across multiple contexts. For instance, items on the WAI include "I should try harder to control myself when I'm having fun" or "I stop and think things through before I act." These items likely assess adolescent behavior within multiple contexts. In contrast, the GNG in this study assesses a specific aspect of self-control: response inhibition in a testing situation. Considering that contexts, particularly those involving peers and emotional arousal, affect adolescent risk taking (see Blakemore and Mills 2014; Cauffman et al. 2015; Smith et al. 2013), assessments that measure self-control more broadly should be more predictive of adolescent risk taking than assessments that measure self-control more narrowly.

A growing body of research suggests that, although both measurement strategies assess the same overall construct, self-report and behavioral measures detect distinct aspects of self-control. This study employs two widely used measures, one in each assessment style, and demonstrates that WAI self-control and GNG response inhibition are not correlated. One possibility is that the GNG assesses a single aspect of the construct whereas the WAI assesses multiple aspects of impulsivity. The GNG measures the ability to inhibit a prepotent response, a single aspect of self-control. Response inhibition may not be the aspect of self-control that differentiates adolescent reoffenders, thus the GNG task may be unhelpful for this purpose. Self-report questions, particularly those on the WAI, assess various behaviors indicative of low self-control (e.g., acting without thinking, acting without planning). Through providing a more general measure of the self-control construct, self-report assessments may either capture the aspect of self-control that is more related to offending or provide a more complete picture for how self-control is related to offending. Future research with a variety of self-control measures may identify whether a particular aspect of self-control best relates to reoffending.

Among the strengths of this study were the sample choice. Studying the predictive utility of such measurement strategies using first-time offenders is of critical practical importance. Previous studies using the Go/No-Go task have focused on distinguishing *between* adolescent offenders and non-offenders. Studies have not examined whether the assessment strategy predicts the re-offending *within* a sample of adolescent offenders. This novel contribution is important considering that adolescents who come into contact with the juvenile justice system are at a greater risk of reoffending, of getting rearrested, and of returning to court (Holman and Zeidenberg 2006; Liberman et al. 2014; Ramchand et al. 2009; Snyder and Sickmund 2006). Further, the fact that these are first-time offenders inherently limits the variability in reoffending that could be attributable to the individual's offending history. Both of these methodological factors make our results particularly relevant for evaluating the two methods of assessing self-control for their utility in risk assessments for juvenile offenders. Finally, the use of three sites and an ethnically heterogeneous sample gives us greater confidence that our sample closely resembles the broader populations of youth involved in the U.S. juvenile justice system.

Despite these strengths, this study is limited in its use of just one self-report and one laboratory task measure of self-control. Although we followed prior procedures for programming the Go/No-Go task (Casey et al. 1997, 2001; Yechiam et al. 2006), altering the task presentation, for example, making it more emotionally salient (see Durston et al. 2002), may alter results. It would be wise for replications to use additional response inhibition tasks, behavioral measures of other components of impulse control, and combinations of assessment strategies (e.g., planning, delay of gratification) (see Wright et al. 2014; Sharma et al. 2014) to confirm the study results and help to determine if the different results across measures were due to

differences in measurement format or due to the assessment of different types of response inhibition. Second, this study only follows youth for 12 months; "long-term" in this study is not very long. It may be the case that youth who did not reoffend during this period may have been likely to reoffend in the following months. Future studies examining the predictive utility of measurement strategies would benefit from tracking youth for longer periods of time to examine whether a particular strategy is more useful for predicting behavior in the long-term. Further, considering that this study sampled first-time, non-felony, male offenders, results may not be generalizable to felony-level male offenders or to female offenders. Although there are some differences in the developmental trajectories of self-control among males and females (Shulman et al. 2015), self-reported self-control deficits are related to low-level offending among females (Vazsonyi et al. 2001) and felony-level offending in general (Cauffman et al. 2005). Less is known, however, about task-based measures of self-control. Replications of these analyses using a female offender population, as well as male felony offenders, are necessary. Finally, it is important to note that these are small to moderate effect sizes. These effect sizes suggest that relying solely on any single construct, even one with robust associations with reoffending like self-control, is not likely to be sufficient for risk assessment in a clinical or juvenile justice setting.

## Conclusions

Although our findings are based on a sample of juvenile offenders, largely to ensure adequate variability in delinquency, there are several important implications for research on adolescent development on a broader level. Adolescents with less self-control may be at a developmental disadvantage because they are less able to inhibit inappropriate desires, emotions, and actions (Casey 2015). These inabilities may lead to a greater propensity to engage in delinquency. Indeed, a large body of research links low self-control during adolescence with delinquency involvement (e.g., Cauffman et al. 2005; Moffitt et al. 2011; Pratt and Cullen 2000; Steinberg et al. 2008; Turner and Piquero 2002). This study contributes to that developmental literature through indicating that adjudicated adolescent offenders with comparably lower self-control may also be at increased risk of *re*-engaging in delinquency. Considering the substantial debate about proper assessment strategy (de Ridder et al. 2012; Duckworth and Kern 2011; Meldrum et al. 2013) and the growing developmental literature that finds that assessment strategies detect distinct aspects of the self-control construct (Cyders and Coskunpinar 2012; Sharma et al. 2014), this study (a) contributes to our understanding of interrelations between self-control constructs during adolescence, and (b) indicates the importance of carefully selecting the proper self-control assessment strategy. Perhaps the most important finding from this study is that, although these two widely used self-control assessment strategies detect distinct components of the self-control construct, they do not predict youth reoffending equally. While using multiple self-control assessments should theoretically increase explanatory power, using the self-report measure better predicts who may be more at risk of reoffending in both the short and long term. It was not clear from our results that the time and expense required to administer a laboratory task, such as the Go–No Go task, provides enough incremental benefit to be included in risk assessments of justice-involved adolescents.

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**Conflict of interest** The authors report no conflict of interests.

**Ethical Standard** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

## References

Aharoni, E., Vincent, G. M., Harenski, C. L., Calhoun, V. D., Sinnott-Armstrong, W., Gazzaniga, M. S., & Kiehl, K. A. (2013). Neuroprediction of future rearrest. *Proceedings of the National Academy of Sciences of the United States of America, 110*(15), 6223–6228. doi:10.1073/pnas.1219302110.

Aron, A. R. (2011). From reactive to proactive and selective control: Developing a richer model for stopping inappropriate responses. *Biological Psychiatry, 69*(12), e55–e68. doi:10.1016/j.biopsych.2010.07.024.

Bechtold, J., Cavanagh, C., Shulman, E., & Cauffman, E. (2013). Does mother know best? Adolescent and mother reports of impulsivity and subsequent delinquency. *Journal of Youth and Adolescence*. doi:10.1007/s10964-013-0080-9.

Benda, B. B. (2005). The robustness of self-control in relation to form of delinquency. *Youth & Society, 36*(4), 418–444. doi:10.1177/0044118X04268071.

Berlin, L., & Bohlin, G. (2002). Response inhibition, hyperactivity, and conduct problems among preschool children among preschool children. *Journal of Clinical Child & Adolescent Psychology, 31*(2), 242–251.

Blakemore, S.-J., & Mills, K. L. (2014). Is adolescence a sensitive period for sociocultural processing? *Annual Review of Psychology, 65*, 187–207. doi:10.1146/annurev-psych-010213-115202.

Borum, R., Bartel, P., & Forth, A. (2006). *Structured assessment of violence risk in youth (SAVRY)*. Lutz, FL: Psychological Assessment Resources.

Brandt, J. R., Kennedy, W. A., Patrick, C. J., & Curtin, J. J. (1997). Assessment of psychopathy in a population of incarcerated adolescent offenders. *Psychological Assessment, 9*(4), 429.

Canivez, G. L., Konold, T. R., Collins, J. M., & Wilson, G. (2009). Construct validity of the Wechsler Abbreviated Scale of intelligence and wide range intelligence test: Convergent and structural validity. *School Psychology Quarterly, 24*(4), 252–265.

Casey, B. J. (2015). Beyond simple models of self-control to circuit-based accounts of adolescent behavior. *Annual Review of Psychology*. doi:10.1146/annurev-psych-010814-015156.

Casey, B. J., & Caudle, K. (2013). The teenage brain: Self control. *Current Directions in Psychological Science, 22*(2), 82–87. doi:10.1177/0963721413480170.

Casey, B. J., Forman, S. D., Franzen, P., Berkowitz, A., Braver, T. S., Nystrom, L. E., et al. (2001). Sensitivity of prefrontal cortex to changes in target probability: A functional MRI study. *Human Brain Mapping*, *13*(1), 26–33. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11284044.

Casey, B. J., Trainor, R. J., Orendi, J. L., Schubert, A. B., Nystrom, L. E., Giedd, J. N., & Rapoport, J. L. (1997). A developmental functional MRI study of prefrontal activation during performance of a Go–No-Go task. *Journal of Cognitive Neuroscience, 9*(6), 835–847. doi:10.1162/jocn.1997.9.6.835.

Cauffman, E., Cavanagh, C., Donley, S., & Thomas, A. G. (2015). A developmental perspective on adolescent risk-taking and criminal behavior. In A. R. Piquero (Ed.), *The handbook of criminological theory* (pp. 100–120). New York, NY: John Wiley & Sons, Inc.

Cauffman, E., Steinberg, L., & Piquero, A. (2005). Psychological, neuropsychological, and physicological correlates of serious antisocial behavior in adolescence: The role of self-control. *Criminology*, *43*(133), 175. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.0011-1348.2005.00005.x/abstract.

Cyders, M. A., & Coskunpinar, A. (2011). Measurement of constructs using self-report and behavioral lab tasks: Is there overlap in nomothetic span and construct representation for impulsivity? *Clinical Psychology Review, 31*(6), 965–982. doi:10.1016/j.cpr.2011.06.001.

Cyders, M. A., & Coskunpinar, A. (2012). The relationship between self-report and lab task conceptualizations of impulsivity. *Journal of Research in Personality, 46*(1), 121–124. doi:10.1016/j.jrp.2011.11.005.

Dahl, R. (2004). Adolescent brain development: A period of vulnerabilities and opportunities. Keynote address. *Annals of the New York Academy of Sciences*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1196/annals.1308.001/full.

De Ridder, D. T. D., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: a meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review: An Official Journal of the Society for Personality and Social Psychology, Inc, 16*(1), 76–99. doi:10.1177/1088868311418749.

Diamond, A. (2013). Executive functions. *Annual Review of Psychology, 64*, 135–168. doi:10.1146/annurev-psych-113011-143750.

Doherty, K., & Schlenker, B. R. (1991). Self-consciousness and strategic self-presentation. *Journal of Personality, 59*(1), 1–18. doi:10.1111/j.1467-6494.1991.tb00765.x.

Duckworth, A. L., & Kern, M. L. (2011). A meta-analysis of the convergent validity of self-control measures. *Journal of Research in Personality, 45*(3), 259–268. doi:10.1016/j.jrp.2011.02.004.

Durston, S., Thomas, K. M., Yang, Y., Ulu, A. M., Zimmerman, R. D., & Casey, B. J. (2002). A neural basis for the development of inhibitory control. *Developmental Science, 4*, 9–16.

Enticott, P. G., Ogloff, J. R. P., & Bradshaw, J. L. (2006). Associations between laboratory measures of executive inhibitory control and self-reported impulsivity. *Personality and Individual Differences, 41*(2), 285–294. doi:10.1016/j.paid.2006.01.011.

Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition. Research: Their meaning and use. *Annual Review of Psychology, 54*, 297–327. doi:10.1146/annurev.psych.54.101601.145225.

Gottfredson, Michael. R., & Hirschi, Travis. (1990). *A general theory of crime*. Stanford, CA: Stanford University Press.

Grieger, L., Hosser, D., & Schmidt, A. F. (2012). Predictive validity of self-reported self-control for different forms of recidivism. *Journal of Criminal Psychology, 2*(2), 80–95. doi:10.1108/20093821211264405.

Hampton, A. S., Drabick, D. A. G., & Steinberg, L. (2014). Does IQ moderate the relation between psychopathy and juvenile offending? *Law and Human Behavior, 38*(1), 23–33. doi:10.1037/lhb0000036.

Harden, K. P., & Tucker-Drob, E. M. (2011). Individual differences in the development of sensation seeking and impulsivity during adolescence: Further evidence for a dual systems model. *Developmental Psychology, 47*(3), 739–746. doi:10.1037/a0023279.

Hay, C., & Forrest, W. (2006). The development of self-control: Examining self-control theory's stability thesis. *Criminology, 44*(4), 739–774. doi:10.1111/j.1745-9125.2006.00062.x.

Holman, B., & Zeidenberg, J. (2006). *The dangers of detention*. Washington, DC: Justice Policy Institute.

Huizinga, D., Esbensen, F.-A., & Weiher, A. W. (1991). Are there multiple paths to delinquency? *The Journal of Criminal Law and Criminology, 82*(1), 83–118. doi:10.2307/1143790.

Kelly, A. M. C., Di Martino, A., Uddin, L. Q., Shehzad, Z., Gee, D. G., Reiss, P. T., et al. (2009). Development of anterior cingulate functional connectivity from late childhood to early adulthood. *Cerebral Cortex, 19*(3), 640–657. doi:10.1093/cercor/bhn117.

Liberman, A. M., Kirk, D. S., & Kideuk, K. (2014). Labeling effects of first juvenile arrests: Secondary deviance and secondary sanctioning. *Criminology,*. doi:10.1111/1745-9125.12039.

Lindell, M. K., & Brandt, C. J. (2000). Climate quality and climate consensus as mediators of the relationship between organizational antecedents and outcomes. *Journal of Applied Psychology*, *85*, 331–348.

Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional designs. *Journal of Applied Psychology, 86*(1), 114–121.

Loeber, R., Menting, B., Lynam, D. R., Moffitt, T., Stouthamer-Loeber, M., Stallings, R., & Pardini, D. (2012). Findings from the Pittsburgh Youth Study: Cognitive impulsivity and intelligence as predictors of the age-crime curve. *Journal of the American Academy of Child and Adolescent Psychiatry, 51*(11), 1136–1149. doi:10.1016/j.jaac.2012.08.019.

Loza, W., Loza-Fanous, A., & Heseltine, K. (2007). The myth of offenders' deception on self-report measure predicting recidivism: Example from the Self-Appraisal Questionnaire (SAQ).

*Journal of Interpersonal Violence, 22*(6), 671–683. doi:10.1177/0886260507300208.

Meldrum, R. C., Barnes, J. C., & Hay, C. (2015). Sleep deprivation, low self-control, and delinquency: A test of the strength model of self-control. *Journal of Youth and Adolescence, 44*(2), 465–477.

Meldrum, R. C., Young, J. T., Burt, C. H., & Piquero, A. R. (2013). Maternal versus adolescent reports of self-control: Implications for testing the general theory of crime. *Journal of Criminal Justice, 41*(1), 24–32.

Moffitt, T., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences of the United States of America, 108*(7), 2693–2698. doi:10.1073/pnas.1010076108.

Monahan, K., Steinberg, L., Cauffman, E., & Mulvey, E. (2009). Trajectories of antisocial behavior and psychosocial maturity from adolescence to young adulthood. *Developmental Psychology, 45*(6), 1654–1668. doi:10.1037/a0015862.Trajectories.

Mulvey, E. P., & Iselin, A. M. R. (2008). Improving professional judgments of risk and amenability in juvenile justice. *The Future of Children/Center for the Future of Children, the David and Lucile Packard Foundation, 18*, 35–57.

Munro, G. E. S., Dywan, J., Harris, G. T., McKee, S., Unsal, A., & Segalowitz, S. J. (2007). Response inhibition in psychopathy: The frontal N2 and P3. *Neuroscience Letters, 418*(2), 149–153. doi:10.1016/j.neulet.2007.03.017.

Nosek, B., & Banaji, M. (2001). The go/no-go association task. *Social Cognition*, *19*(6), 625–664. Retrieved from http://guilfordjournals.com/doi/abs/10.1521/soco.19.6.625.20886.

Office of Juvenile Justice and Delinquency Prevention. (2014). *Predicon and risk/needs assessment*. Washington, DC: Office of Juvenile Justice and Delinquency Prevention.

Osgood, D. W., McMorris, B. J., & Potenza, M. T. (2002). Analyzing multiple-item measures of crime and deviance I: Item response theory scaling. *Journal of Quantitative Criminology, 18*(3), 267–296.

Parker, J. S., Morton, T. L., Lingefelt, M. E., & Johnson, K. S. (2005). Predictors of serious and violent offending by adjudicated male adolescents. *North American Journal of Psychology, 7*(3), 407–418.

Peterson, J., Skeem, J., & Manchak, S. (2011). If you want to know, consider asking: How likely is it that patients will hurt themselves in the future? *Psychological Assessment, 23*(3), 626–634. doi:10.1037/a0022971.

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology, 63*, 539–569.

Porterfield, A. (1943). Delinquency and its outcome in court and college. *American Journal of Sociology, 49*, 199–208.

Pratt, T., & Cullen, F. (2000). The empirical status of Gottfredson and Hirschi's general theory of crime: A meta-analysis. *Criminology*, *38*(3), 931–964. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1745-9125.2000.tb00911.x/abstract.

Ramchand, R., Morral, A. R., & Becker, K. (2009). Seven-year life outcomes of adolescent offenders in Los Angeles. *American Journal of Public Health, 99*(5), 863–870. doi:10.2105/AJPH.2008.142281.

Rentrop, M., Backenstrass, M., Jaentsch, B., Kaiser, S., Roth, A., Unger, J., & Renneberg, B. (2008). Response inhibition in borderline personality disorder: Performance in a Go/Nogo task. *Psychopathology, 41*(1), 50–57. doi:10.1159/000110626.

Reynolds, B., Ortengren, A., Richards, J. B., & de Wit, H. (2006). Dimensions of impulsive behavior: Personality and behavioral measures. *Personality and Individual Differences, 40*(2), 305–315. doi:10.1016/j.paid.2005.03.024.

Ross, E. H., & Hoaken, P. N. S. (2011). Executive cognitive functioning abilities of male first time and return Canadian federal inmates. *Canadian Journal of Criminology and Criminal Justice, 53*(4), 377–403. doi:10.3138/cjccj.53.4.377.

Ryan, J. J., Carruthers, C. A., Miller, L. J., Souheaver, G. T., Gontkovsky, S. T., Zehr, M. D. (2003). Exploratory factor analysis of the Wechsler Abbreviated Scale of Intelligence (WASI) in adult standardization and clinical samples. *Applied Neuropsychology*, *10*(4), 252–256.

Schulz, K. P., Fan, J., Tang, C. Y., Newcorn, J. H., Buchsbaum, M. S., Cheung, A. M., et al. (2014). Response inhibition in adolescents diagnosed with attention deficit hyperactivity disorder during childhood: An event-related FMRI study. *American Journal of Psychiatry*, *161*(9), 1650–1657.

Sharma, L., Markon, K. E., & Clark, L. A. (2014). Toward a theory of distinct types of "impulsive" behaviors: A meta-analysis of self-report and behavioral measures. *Psychological Bulletin*, *140*(2), 374.

Shrauger, J. S., Ram, D., Greniger, S., & Mariano, E. (1996). Accuracy of self-predictions versus judgments by knowledgeable others. *Personality & Social Psychology Bulletin*, *33*(10), 928–940. doi: 10.1177/01461672962212004.

Shulman, E. P., Harden, K. P., Chein, J. M., & Steinberg, L. (2015). Sex differences in the developmental trajectories of impulse control and sensation-seeking from early adolescence to early adulthood. *Journal of Youth and Adolescence, 44*(1), 1–17.

Skeem, J., Manchak, S., Lidz, C., & Mulvey, E. (2013). The utility of patients' self-perceptions of violence risk: Consider asking the person who may know best. *Psychiatric Services, 64*(5), 410–415. doi:10.1176/appi.ps.001312012.

Smith, A., Chein, J., & Steinberg, L. (2013). Impact of socio-emotional context, brain development, and pubertal maturation on adolescent risk-taking. *Hormones and Behavior, 64*(2), 323–332. doi:10.1016/j.biotechadv.2011.08.021.Secreted.

Snyder, H., & Sickmund, M. (2006). Juvenile offenders and victims: 2006 national report. *Office of Juvenile Justice and Delinquency Prevention,*. doi:10.1007/BF00275231.

Steinberg, L., Albert, D., Cauffman, E., Banich, M., Graham, S., & Woolard, J. (2008). Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: Evidence for a dual systems model. *Developmental Psychology, 44*(6), 1764–1778. doi:10.1037/a0012955.

Steiner, H., Cauffman, E., & Duxbury, E. (1999). Personality traits in juvenile delinquents: Relation to criminal behavior and recidivism. *Journal of the American Academy of Child and Adolescent Psychiatry, 38*(3), 256–262. doi:10.1097/00004583-199903000-00011.

Strang, N. M., Chein, J. M., & Steinberg, L. (2013). The value of the dual systems model of adolescent risk-taking. *Frontiers in Human Neuroscience, 7*(May), 223. doi:10.3389/fnhum.2013.00223.

Sweeten, G. (2012). Scaling criminal offending. *Journal of Quantitative Criminology, 28*(3), 533–557.

Tittle, C. R., Ward, D. A., & Grasmick, H. G. (2003). Self-control and crime/deviance: Cognitive vs. behavioral measures. *Journal of Quantitative Criminology, 19*(4), 333–365.

Turner, M. G., & Piquero, A. R. (2002). The stability of self-control. *Journal of Criminal Justice, 30*(6), 457–471. doi:10.1016/S0047-2352(02)00169-1.

Vazsonyi, A. T., Pickering, L. E., Junger, M., & Hessing, D. (2001). An empirical test of a general theory of crime: A four-nation comparative study of self-control and the prediction of deviance. *Journal of Research in Crime and Delinquency, 38*(2), 91–131.

Wechsler, D. (1999). *Wechsler Abbreviated Scale of intelligence*. San Antonio, TX: Psychological Corporation.

Weinberger, D. (1997). Distress and self-restraint as measures of adjustment across the life span: Confirmatory factor analyses in clinical and nonclinical samples. *Psychological Assessment, 9*(2), 132–135.

Weinberger, D., & Schwartz, G. (1990). Distress and restraint as superordinate dimensions of self-reported adjustment: A typological perspective. *Journal of Personality*, *58*(2), 381–417. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/2213473.

White, J., Moffitt, T., Caspi, A., Bartusch, D., Needles, D., & Stouthamer-Loeber, M. (1994). Measuring impulsivity and examining its relationship to delinquency. *Journal of Abnormal Psychology, 103*(2), 192–205.

Williams, L. J., Hartman, N., & Cavazotte, F. (2010). Method variance and marker variables: A review and comprehensive CFA marker technique. *Organizational Research Methods,*. doi:10.1177/1094428110366036.

Williams, B. J., & Kaufmann, L. M. (2012). Reliability of the Go/No Go association task. *Journal of Experimental Social Psychology, 48*(4), 879–891. doi:10.1016/j.jesp.2012.03.001.

Wright, L., Lipszyc, J., Dupuis, A., Thayapararajah, S. W., & Schachar, R. (2014). Response inhibition and psychopathology: A meta-analysis of go/no-go task performance. *Journal of Abnormal Psychology, 123*(2), 429.

Yechiam, E., Goodnight, J., Bates, J. E., Busemeyer, J. R., Dodge, K. A., Pettit, G. S., & Newman, J. P. (2006). A formal cognitive model of the go/no-go discrimination task: Evaluation and implications. *Psychological Assessment, 18*(3), 239–249. doi:10.1037/1040-3590.18.3.239.A.

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