

# Non-Cognitive Skills and Crime

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# 1 Introduction

Research on the economics of criminal activity focuses on price theory models of crime whereby human capital enters the criminal's decision through opportunity costs - individuals with higher human capital earn higher wages and thus are less likely to commit crime (Grogger (1998), Lochner (2004)). In most empirical research human capital is proxied by IQ, academic achievement tests, or education. However, emerging research in economics has shown the effects of traits other than cognitive ability on outcomes such as labor market participation, test scores, health, and migration (see for example Borghans et al. (2008), Heckman et al. (2005), Cobb-Clark and Tan (2010), Dohmen and Falk (2010), Chiteji (2010), and Jaeger et al. (2010)), suggesting a likely role for these traits in predicting criminal activity as well. Hill et al. (2011) show that several interventions that focus on personality rather than cognitive skills were effective at reducing delinquency and traits related to delinquency. Understanding which childhood traits predict outcomes can help us build optimal interventions for fighting crime before it begins.

Though the literature in economics on the effects of non-cognitive skills on crime is limited, there is a larger literature in psychology and criminology estimating correlations between IQ, measures of personality, and crime which finds correlations between personality measures such as self-control, constraint, negative emotionality and crime/delinquency (including Caspi et al. (1994), Agnew et al. (2002), and Pratt and Cullen (2000)). Others have explored correlations between measures of IQ and crime as well and found positive correlations (Fergusson et al. (2005), Lynam et al. (1993)).<sup>1</sup> This literature tends to focus on cross-sectional analysis which can lead to problems of reverse causality.

To enhance our understanding of the effect of childhood skills and personality on criminal outcomes I explore evidence from longitudinal data. The main source of data is the National Longitudinal Study of Youth-Children and Young Adults Survey (CNLSY) which follows children of the women in the National Longitudinal Survey of Youth 1979 (NLSY79) and

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<sup>1</sup>For more on the literature from criminology and psychology see Agan (2010)

includes measures of behavior, risk, impulsivity, and academic achievement (cognitive skills) during childhood as well self-reports of adult criminal behavior. I find that non-cognitive skills measured by externalizing and internalizing behavior as well as impulsivity and risk preference have important effects on criminal participation even after controlling for family background and high school graduation. These effects are generally larger than those of cognitive skills.

This research bolsters the evidence in [Hill et al. \(2011\)](#) that interventions that effect non-cognitive skills can have effects on delinquency. It also may help explain why the Perry Preschool Program was so successful at reducing criminal activity ([Heckman et al. \(2010\)](#), [Heckman et al. \(2010\)](#)). The Perry Preschool program had no long-run effect on IQ scores but had a significant effect on the children’s “externalizing” and “internalizing” behavior for both genders ([Heckman et al. \(2010\)](#)).

Recent work by Heckman and coauthors ([Heckman et al. \(2005\)](#), [Cunha et al. \(2010\)](#)) focuses on the technology of skill formation. Both offer some evidence that criminal outcomes are can be explained more by noncognitive factors than cognitive factors, using data from the NLSY79 and the CNLSY, though the focus of these papers is not on criminal outcomes. I add to the understanding they provided by focusing the analysis criminal outcomes other than probation, adding in measures of risk and impulsivity, considering two subscales from the Behavior Problem Index that represent externalizing and internalizing behavior to understand their differential effects, and comparing the results with those from early childhood interventions.

## **2 Enhancing the Price Theory Approach to Criminal Participation**

The idea underlying the price theory approach to modeling criminal participation is that the individual will choose to commit a crime if their expected utility from committing the crime

is greater than the expected utility from their outside option. This outside option is most easily represented by labor market opportunities, but could also include childrearing, additional school/training, etc... Empirically, human capital has been proxied with education, IQ, and scores and achievement tests. This opportunity cost framework implies individuals with higher IQs/more education should be less likely to commit crimes. This is an empirically promising approach, the IQ-crime and education-crime links are well established in the literature ([Hirschi and Hindelang \(1977\)](#), [Lochner and Moretti \(2004\)](#)). This approach can also help explain the age-crime profile ([Leung \(1994\)](#)).

What is the role for non-cognitive skills? Recent research shows that non-cognitive skills affect education and wages ([Heckman et al. \(2005\)](#), [Piatek and Pinger \(2010\)](#)), thus they are likely to enter indirectly through opportunity costs. Non-cognitive skills could also have direct impacts on criminal participation. Some traits, such as aggression, are likely to be more valued in criminal activity versus formal legal employment and thus lead some individuals to have a comparative advantage in crime. Other traits, such as impulsivity and time preference, will cause individuals to act on immediate desires without considerations for long-term consequences and thus likely lead to increased criminal activity. Utility from crime is likely to be affected by traits such as conscientiousness - more conscientiousness individuals may get enough displeasure from committing crime so as to deter them even with no threat of consequences.

For the most part this analysis revolves around contemporaneous measures of criminality and skills/preferences. Our traits and skills are shaped during childhood. Evidence from [Cunha and Heckman \(2007\)](#) and [Cunha et al. \(2010\)](#) amongst others points to critical and sensitive periods for the formation of skills in children. Though the critical periods for non-cognitive traits are later than those for cognitive skills, they still happen before adulthood and imply that if remediation is to occur it should occur before the individual reaches adulthood. Thus understanding which measured traits in childhood predict adult criminal activity is important to building interventions to remediate these traits.

## 3 Evidence from the CNLSY

### 3.1 Data

The CNLSY is a survey following the children born to the participant females of the NLSY79, women who were between the ages of 14 and 22 in 1979. Starting in 1986, any child age 0-14 of the participant females was eligible for the survey and the participants have been interviewed every 2 years since then, with the latest year of data available for 2008. The data contains extensive information on both mother and child. Since many participants are followed from birth, the CNLSY also offers measures of skills participants from relatively early ages. The average age of the CNLSY participants in 2008 is 22, with 50% of the current sample being between 18-27 at the time of the 2008 survey. While this is relatively young for studying labor market outcomes, it is good timing for exploring criminal activity. The literature on the life-cycle of criminal activity has reached a general consensus that there is eventually a drop off in criminal activity with age, with peak crime happening sometimes around the late teens or early twenties - although the determinants and exact timing of the drop off are still in dispute.<sup>2</sup>

#### 3.1.1 Cognitive and Noncognitive skill measures

One measure of non-cognitive skills I use is the Behavior Problems Index (BPI), a 28 item questionnaire administered to administered to parents about their children when their children were between the ages of 5 and 13. It is adapted from the Achenbach Child Behaviour Checklist ([Achenbach and Edelbrock \(1983\)](#)). Parents are given a description such as “child cheats or tells lies” and asked to respond whether this behavior is often true, sometimes true,

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<sup>2</sup>Work by [Sampson and Laub \(2003\)](#) shows that in a sample of boys who were identified delinquent as adolescents, 84% were arrested between the ages of 17-24... and this percentage drops with each increasing age bracket. [Steffensmeier et al. \(1989\)](#) show using data from the Uniform Crime Reports that arrests for property crimes like burglary and vandalism tend to peak in the late-teens/early twenties with 50% of those crimes being done by 15-24 year olds. However, crimes against other people such as murder, assault, or sex offenses tend to peak later, around age 27, with 50% of the crimes being committed by people those from 20-mid-thirties. So using data from the CNLSY we will likely not capture offenses against other people (violent offenses) very well but we should get a good snap shot of property crime offending.

or never true for their child. Starting in 1994, The Center for Human Resource Research at The Ohio State University summarized the responses to the BPI with two scores: one for externalizing behavior and one for internalizing behavior ([Center for Human Resource Research \(2009\)](#)). Externalizing behaviors can be described by aggression, noncompliance, impulsivity, and high activity levels. Internalizing behaviors include being withdrawn, anxious, and depressed. Table 1 recreates information from [Center for Human Resource Research \(2009\)](#)

Table 1: Composition of Externalizing and Internalizing Scales

Externalizing	Internalizing
Sudden Changes in Mood/Feeling	Feels no one loves him/her
High Strung	Difficulty Concentrating
Cheats or Tells Lies	Feels worthless/inferior
Argues too much	Is Withdrawn
Bullies or is cruel	Clings to Adults
Disobedient	Cries too much
Trouble getting along with others	Demands a lot of attention
Is impulsive	Too Dependent on Others
Not Liked by other children	
Obsessive	
Restless	
Stubborn	
Strong Tempered	
Breaks things deliberately	
Both Externalizing/Internlizing	
Too fearful or anxious	
Easily Confused	
Unhappy, sad or Depressed	

about which questions were used to create each scale.<sup>3</sup> A taxonomy often used in psychology to describe personality, the Big Five and it's traits of Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism, may be more familiar to economists

<sup>3</sup>Note the CNLSY also summarizes the BPI more finely into six subscales measuring: antisocial behavior, anxiousness/depressions, headstrongness, hyperactivity, dependency, and peer conflict/social withdrawal. I choose to use the externalizing and internalizing behaviors as my measures for several reasons: the previous psychology literature cited externalizing behaviors as a possibly important factor in predicting criminal behavior, and to ease comparison with the [Heckman et al. \(2010\)](#) study of the Perry Preschool program which uses measures of externalizing and internalizing behavior to describe non-cognitive skills.

due to its recent use in economic research ([Almlund et al. \(2010\)](#), [Gensowski et al. \(2011\)](#)). Research by [Ehrler et al. \(1999\)](#) looks at correlations between behavior problems in children and these traits. They find that conscientiousness, agreeableness, and openness to experience are negatively associated with externalizing behaviors and neuroticism is positively correlated with internalizing behaviors such as anxiety and depression.

The CNLSY also offers 6 questions that were asked of the children themselves when they were over the age of 10 starting in 1994 (and every 2 years after that) that measure some aspects of risk preference and impulsivity.<sup>4</sup> The 6 questions are answered on a scale of

Table 2: Attitudes Towards Risk Questions

Question	Subscale
I often get in a jam because I do things without thinking	Impulsivity
I think planning takes the fun out of things	Impulsivity
I have to use a lot of self-control to keep out of trouble	Impulsivity
I enjoy taking risks	Risk Preference
I enjoy new/exciting experiences even if they are frightening	Risk Preference
Life with no danger in it would be too dull for me	Risk Preference

Strongly Disagree, Disagree, Agree, or Strongly agree and are shown in [Table 2](#).

[Center for Human Resource Research \(2009\)](#) describes these questions as “a series of questions about the child’s attitude towards risky behavior and planning for the future”. Several papers have used these questions and given the responses different definitions including: “self-control”, “risk-proneness”, and “impulsivity” ([Meldrum \(2008\)](#), [Crockett et al. \(2006\)](#), and [Lundberg et al. \(2009\)](#) respectively). Using data from children ages 11-12 and 13-14 (the same ages for which BPI data is also available), factor analysis indicated that the questions can be summarized by *two* factors, with the first three questions from [Table 2](#) loading more heavily on the first factor and the second three questions loading more heavily on a different factor. I call these subscales “impulsivity” and “risk preference”.

<sup>4</sup>Unfortunately there no direct measure of time preference, however [Lowenstein et al. \(2001\)](#) argue that impulsivity may be a subdimension of time preference, so we may be getting at parts of time preference. Interestingly, [Whiteside and Lynam \(2001\)](#) argue that impulsivity itself can be broken down into four sub-factors that each correlate with different traits of the five factor model

For cognitive skills I use measures from the Peabody Individual Achievement Test (PIAT), which gives subscores for reading comprehension, reading recognition, and math and were administered every 2 years between the ages of 5 and 14.

### 3.1.2 Criminal Participation in the CNLSY Data

The CNLSY asks questions of those 14 and older about self-reported criminal activity. These questions include whether the individual was ever convicted, ever convicted of certain crime categories (such as assault or robbery), and whether the individual was ever sentenced to a correctional facility.

## 3.2 Results

From above we see that we have several measurements for several types of skills, both within years and across years. This is a common phenomenon in large, longitudinal datasets. If many of these measures are meant to uncover the same underlying skill, and we have a very large number of them, then we may want to combine the measures to get a better sense of the underlying skill we are trying to proxy. I use factor analysis to proxy these latent skills. I have several questions over several ages that are meant to measure the five traits that I consider: academic achievement/cognitive ability, externalizing behavior, internalizing behavior, impulsivity, and risk preference. We can write the measurement system as:

$$M_{ij} = \mu_{ij} + \alpha_{ij}\theta_j + \epsilon_{ij} \tag{1}$$

where  $M_{ij}$  represents the  $i \in \mathcal{I}$  measurement of trait  $j \in \{\text{academic achievement, externalizing behavior, internalizing behavior, impulsivity, and risk preference}\}$ .  $\theta_j$  is the trait we are interested in,  $\alpha_{ij}$  is the factor loading, and  $\epsilon_{ij}$  is measurement error independent of each factor. For now, each measurement is “single loading”, i.e. it is affected by only one factor. Because of the arbitrariness of the scale of the factors, a normalization must be made. In this

Table 3: Percent Ever Convicted

Overall	Male	Female	Black	Hispanic	NBNH
0.19	0.27	0.13	0.18	0.20	0.20

case  $\alpha_{1j}$  is set to 1 for each trait. The measures are then used to estimate the parameters of this model (for intuition on identification see [Carneiro et al. \(2003\)](#) and [Hansen et al. \(2004\)](#)). Factors scores are then predicated via the method proposed by [Bartlett \(1937\)](#) and widely used in the literature ([Gensowski et al. \(2011\)](#), [Heckman et al. \(2010\)](#)). I then use these factor scores in probit regressions:

$$Y_i = \Phi(\beta_1 \hat{\theta}_i^C + \beta_2 \hat{\theta}_i^E + \beta_3 \hat{\theta}_i^I + \beta_4 \hat{\theta}_i^R + \beta_5 \hat{\theta}_i^I + \delta X_i) \quad (2)$$

I restrict my sample to individuals who have were no more than 5 years old at the date of their first survey, and at least 19 years old by the time of the 2008 survey for whom it is known whether they graduated from high school, so that I have measurements of skills from a relatively early age and the child is old enough to have been convicted of crimes. Due to the nature of the survey this means I am looking at individuals who were born to younger mothers than the sample as a whole and is not representative; since the representativeness is already compromised by this restrictions, I choose to leave in the oversample.<sup>5</sup> This restriction leaves 3,803 individuals for analysis. I further restrict to individuals who have at most one years worth of questions missing for each measure, which brings my sample to 2,419 individuals.<sup>6</sup>

<sup>5</sup>Note that interviews with the oversample of underprivileged white mothers were discontinued in 1990, and female military members in 1985 and thus no information about their children is available after that, thus they are dropped.

<sup>6</sup>Allowing one missing year greatly increases sample size. This is particularly true due to that fact that in 2000 40% of the black and hispanic oversample were randomly not interviewed. To allow for these individuals to be included in the factor analysis I exploit the longitudinal nature of the study and impute average responses to missing questions - i.e. if BPI questions are missing for age 7-8 but non-missing for age 5-6 and 9-10 (required since I only allow maximum of one missing age of data) then the floor of the average responses to each item from age 5-6 and 9-10 are imputed to age 7-8

Table 3 shows the percent of the sample convicted overall, by gender, and by race. About 19% of the sample reports ever having been convicted - with the percentage much higher for males (27%) than for females (13%). By race conviction rates are very similar. This is likely due to the fact that the children in the sample were born to relatively young mothers and thus represent a more high-risk population than the overall population.

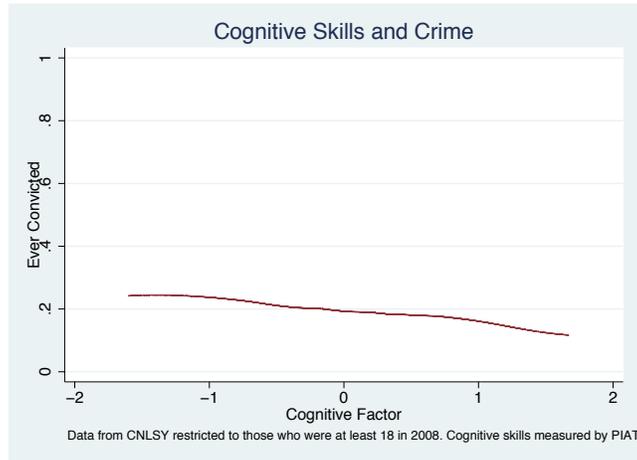


Figure 1: Cognitive Skills and Crime

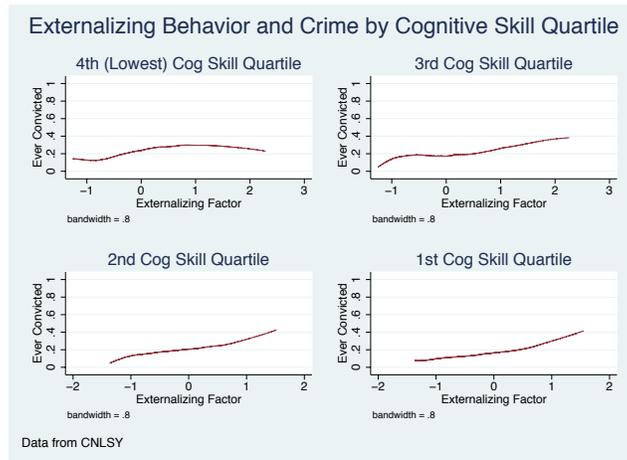


Figure 2: Externalizing Behavior and Crime by Cognitive Skill Quartile

In Figure 1 I show the familiar negative correlation between the cognitive factor and the probability an individual had ever been convicted. Figure 2 breaks individuals down into four quartiles of cognitive skills and shows that even *conditional* on cognitive skills, externalizing behavior in

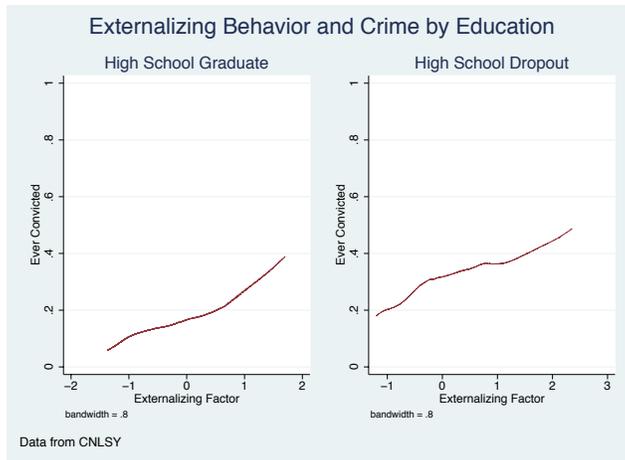


Figure 3: Externalizing Behavior and Crime by Education

adolescence is positively correlated with the probability of conviction across *all* quartiles. Figure 3 shows the same pattern conditional on high school graduate versus high school dropout. These figures imply a role for non-cognitive skills beyond that of cognitive skills and education.

Table 4 shows the results of a probit regression of whether an individual was ever convicted by the time of the 2008 survey on the overall cognitive and noncognitive factor scores for the overall sample. In column 1 I show the two effect of cognitive ability on crime, reflecting the negative relationship from Figure 1. It shows that an increase in one standard deviation in the cognitive factor leads to a 4% decrease in the probability of ever being convicted. In column 2 is the total effect of the four non-cognitive factors. Externalizing behavior has a large, significant effect on the criminal participation, with a one standard deviation increase in externalizing behavior leading to about an 7% increase in the probability of being convicted. The other non-cognitive skills affect criminal participation in similar magnitudes to crime - and internalizing behavior has a *negative* affect on crime. In columns 3 and 4 high school graduation status is added to columns 1 and 2 to show the effect of these skills individually on criminal participation conditional on education. In column 5 non-cognitive skills are added to column 1, and we see that these non-cognitive skills reduce the coefficient on cognitive skills by a similar magnitude as high school graduation. The  $r^2$ s imply that the non-cognitive skills explain more of the variation in criminal participation than cognitive skills.

In Table 5 I control for family fixed effect to determine if family background characteristics

not controlled for in Table 4 are affecting the results. Approximately 61% of my sample has a sibling *also in my sample* which is where the variation will come from. We see that results hardly change at all, giving us more confidence in the previously reported results. A child from the same family who exhibits more externalizing behavior than their sibling(s) as an adolescent is more likely to be convicted as an adult, same for risk preference and impulsivity. A child from the same family with higher cognitive ability or who exhibits more internalizing behaviors is less likely to be convicted as an adult. Coefficients are all of a similar magnitude to the results without fixed effects.

Table 4: Ever Convicted Probit Regressions

VARIABLES	(1) All	(2) All	(3) All	(4) All	(5) All	(6) All
Cognitive	-0.041*** (0.008)		-0.022*** (0.009)		-0.027*** (0.009)	-0.014* (0.009)
Externalizing		0.072*** (0.013)		0.064*** (0.013)	0.070*** (0.013)	0.064*** (0.013)
Internalizing		-0.029** (0.013)		-0.030** (0.013)	-0.034*** (0.013)	-0.033** (0.013)
Risk Preference		0.016** (0.008)		0.021*** (0.008)	0.019** (0.008)	0.022*** (0.008)
Impulsivity		0.045*** (0.008)		0.039*** (0.008)	0.043*** (0.008)	0.038*** (0.008)
High School			-0.150*** (0.025)	-0.129*** (0.024)		-0.119*** (0.024)
Observations	2,419	2,419	2,419	2,419	2,419	2,419
R2	0.0637	0.103	0.0823	0.118	0.107	0.119

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

All variables are standardized. Marginal effects displayed.

Controls Include race, gender, cohort and family background characteristics.

Table 6 displays results by race: black, Hispanic, and non-black non-Hispanic. Recall from Table 3 that conviction rates were very similar across races. We see some interesting patterns across the races. Controlling for non-cognitive skills, cognitive skills appear to have no effect on black criminal participation. The coefficient on cognitive ability falls for all races (and actually turns positive for blacks) once high school graduation is controlled for. Externalizing behavior is

Table 5: Ever Convicted Probit Regressions with Family Fixed Effects

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	All	All	All	All	All	All
Cognitive	-0.041*** (0.008)		-0.023*** (0.009)		-0.027*** (0.009)	-0.015* (0.009)
Externalizing		0.071*** (0.013)		0.064*** (0.013)	0.070*** (0.013)	0.064*** (0.013)
Internalizing		-0.029** (0.013)		-0.030** (0.013)	-0.034*** (0.013)	-0.033** (0.013)
Risk Preference		0.016** (0.008)		0.021*** (0.008)	0.019** (0.008)	0.022*** (0.008)
Impulsivity		0.045*** (0.008)		0.039*** (0.007)	0.043*** (0.008)	0.038*** (0.008)
High School			-0.149*** (0.025)	-0.129*** (0.023)		-0.119*** (0.024)
Observations	2,419	2,419	2,419	2,419	2,419	2,419
R2	0.0645	0.103	0.0829	0.118	0.107	0.119

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

All variables are standardized. Marginal effects displayed.

Controls Include race, gender, and family background characteristics.

a significant and important predictor of criminal participation across all races, as is impulsivity although of a smaller magnitude. Risk preference also has very small, insignificant coefficients for blacks with larger coefficients for hispanics and non-black non-Hispanics.

Table 7 displays results by gender. Cognitive ability appears to have little effect on the probability of ever being convicted for females, with the coefficient being close to zero and statistically insignificant. Externalizing behavior, internalizing behavior, and impulsivity have similar effects as seen before. Risk preference is also close to zero for females but important for males.

The suggestive evidence from this analysis appears points to the idea that noncognitive skills in adolescence as measured by externalizing and internalizing behaviors from the BPI and risk preference and impulsivity are important in determining criminal participation above and beyond the effect of schooling. The magnitudes of the coefficients are larger than for cognitive skills and non-cognitive skills appear to explain more of the variation in criminal participation than cognitive skills.

Table 6: Ever Convicted by Race

VARIABLES	(1) Black	(2) Black	(3) Hispanic	(4) Hispanic	(5) NBNH	(6) NBNH
Cognitive	-0.008 (0.015)	0.007 (0.016)	-0.043** (0.019)	-0.026 (0.020)	-0.029** (0.012)	-0.020 (0.013)
Externalizing	0.094*** (0.023)	0.084*** (0.023)	0.078** (0.031)	0.071** (0.031)	0.076*** (0.019)	0.072*** (0.019)
Internalizing	-0.036 (0.022)	-0.029 (0.022)	-0.052 (0.032)	-0.049 (0.031)	-0.035* (0.020)	-0.036* (0.020)
Risk Preference	-0.008 (0.012)	-0.005 (0.012)	0.032* (0.018)	0.036* (0.019)	0.040*** (0.012)	0.041*** (0.012)
Impulsivity	0.033*** (0.012)	0.028** (0.012)	0.035** (0.018)	0.032* (0.018)	0.058*** (0.012)	0.054*** (0.012)
High School		-0.124*** (0.041)		-0.145*** (0.047)		-0.092** (0.039)
Observations	772	772	515	515	1,132	1,132

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

All variables are standardized. Marginal effects displayed.  
 Controls for family background, cohort, and gender included.  
 NBNH stands for non-black non-Hispanic.

## 4 Evidence from Childhood Interventions

### 4.1 Background

The evidence from the CNLSY shows us that noncognitive skills are important in explaining criminal participation above and beyond their effects on schooling. The policy implication is that for childhood interventions to be a successful long-term crime reduction strategy they should focus on enhancing the non-cognitive skills of children.

In a recent review, [Hill et al. \(2011\)](#) showed that several interventions focusing on non-cognitive skills were successful at reducing delinquency or traits associated with delinquency (such as anti-social behavior). The sorts of interventions they review include Multisystemic Therapy (intensive therapy targeted at adolescents who are severely antisocial), *Scared Straight*, job skills training programs, and the Seattle Social Development a Project (a project to promote prosocial behavior in

Table 7: Ever Convicted by Gender

VARIABLES	(1) Male	(2) Male	(3) Female	(4) Female
Cognitive	-0.038*** (0.013)	-0.022 (0.014)	-0.002 (0.009)	0.005 (0.009)
Externalizing	0.089*** (0.021)	0.085*** (0.021)	0.063*** (0.016)	0.058*** (0.016)
Internalizing	-0.042* (0.022)	-0.041* (0.022)	-0.028* (0.015)	-0.026* (0.015)
Risk Preference	0.029** (0.013)	0.033** (0.013)	0.005 (0.009)	0.005 (0.009)
Impulsivity	0.048*** (0.012)	0.044*** (0.012)	0.039*** (0.008)	0.036*** (0.008)
High School		-0.139*** (0.035)		-0.075** (0.030)
Observations	1,189	1,189	1,230	1,230

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

All variables are standardized. Marginal effects displayed.

Controls for family background, cohort, and race included.

children starting with the actions of their teachers). They review both programs that “worked” and those that had little or negative impacts. They note that the interventions that had positive effects tended employ rigorous and consistent implementation. While the exact mechanism that made some programs succeed where others failed still needs to be explored, that the failed programs did actually change the non-cognitive skills they purported to affect seems like a plausible explanation.

Research by Heckman et al. (2010) and Heckman et al. (2010) shows that the Perry Preschool program had effects on adult criminal participation.<sup>7</sup> Heckman et al. (2010) attribute much of this treatment effect on the programs effect on non-cognitive skills, particularly externalizing behavior. This mirrors the results from the CNLSY analysis above and implies that interventions that actually change these non-cognitive skills can have effects on crime, even in the absence of effects on IQ.

<sup>7</sup> The Perry Preschool Program was an intervention that took place in Ypsilanti, MI in the mid-1960s that focused on low-IQ, disadvantaged African American children. That treatment was a preschool program based on intensive teacher interaction and active learning. The school program was also supplemented with weekly home visits. For more on the Perry Program see Heckman et al. (2010), Heckman et al. (2010), and Schweinhart et al. (1993).

## 4.2 Abecedarian

The Abecedarian Project (ABC) was an early childhood intervention based in North Carolina in the 1970s focused on at-risk children. This program offers another opportunity to explore the effects of interventions on crime and cognitive/non-cognitive skills. Below I present some *preliminary* analysis of this program.

The intervention focused on school-readiness and consisted of intensive schooling with low teacher-student ratios. The intervention itself consisted of a two-stages: the first stage began with the child as an infant and took them up through until kindergarten, the second stage consisted of an intensive school-age intervention that lasted until the end of the second grade. Randomization happened twice, the first time happened before the pre-school intervention and families were either randomized into treatment or control. The second randomization happened after pre-school but before the school-age intervention and again families were randomized into treatment or control. The children were followed up with surveys and evaluations throughout the preschool and school age treatment, and then again at ages 12, 15, 21, and 30. I will focus the analysis below on comparisons between the pre-school treatment and control.

I have several measures of skills during the school age period (the period concurring with the analysis from the CNLSY). Measures of non-cognitive skills I use come from the and the Achenbach Child Behavior Checklist (CBC) filled out by parents about their children<sup>8</sup> which consists of 113 questions that can be summarized by the broad scales of internalizing and externalizing behavior. It was administered at the end of the school age treatment (at the end of 2nd grade, approximately age 8), at the age 12 follow-up and the age 15 follow-up. Additional measures of externalizing behavior come from subscales of the EASI (emotionality, activity, sociability, impulsivity). Cognitive measures I use come from the Wechsler Preschool and Primary Scale of Intelligence, administered at age 5, and the revised Wechsler Intelligence Scale for Children (WISC-R) administered at ages 6, 7.5, and 12. Again, factor scores from these measures are predicted uses the Bartlett method for analysis.

Administrative crime records from North Carolina from the North Carolina Department of

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<sup>8</sup>The CBC is also available filled out by teachers, however, the teacher scales are missing for close to half the participants so I focus on the parent scales

Corrections (NCDOC) as of September 2010 which gives us data for the participants up to 36-40 years of age. This crime data contains records on all criminal convictions that happen in North Carolina. We have information on the charge, the sentence, and the actual served sentence as well as various other information such as infractions while in jail. The data, however, does not contain information on arrests or charges that did not lead to a conviction. 32 of the 102 participant have any conviction in the NCDOC data. Out of state records were also searched for individuals not living in North Carolina at the age 30 follow-up. Those searches did yield any hits and thus these individuals are considered to not have been convicted of any crimes.

Table 8 shows treatment effects for the criminal outcomes of “ever convicted”, “number of convictions”, and “number of convictions conditional on ever being convicted”. We see that the program had no overall effect on criminal participation (the percent of each group ever convicted is very similar and statistically significantly different) but that it appeared to have effects on the *number* of crime committed. When we break down by male and female we see that this effect is coming most from the females. The program appears to affect the intensive margin of crime for females.

Table 9 shows effects on cognitive skills, externalizing behavior, and internalizing behavior during the school age period. We see that the program, contrary to Perry, had effects on cognitive skills even at these later ages, for both genders. Externalizing behavior was affected much more for females. Internalizing behavior was not statistically significant for either gender.

These suggestive results support the idea that interventions that effect non-cognitive skills, particularly externalizing behavior, can have effects on crime.

## 5 Conclusion

Non-cognitive skills of children are an important consideration when predicting adult criminal activity. Externalizing behavior in adolescents has a larger effect on adult criminal participation than cognitive skills. Non-cognitive skills in general can explain more of the variation in adult criminal participation than cognitive skills. Several interventions that have changed or enhanced non-cognitive skills, even just for certain subsets of the target population, have been successful

Table 8: **Significance Tests for Criminal Activity of ABC participants**

	Measure	Control	Experimental	T Test	Perm Test
	Ever Convicted	0.34	0.29	0.29	0.37
	Num Convictions	2.04	1.12	0.07	0.07
	Num Convictions (Cond)	6.00	3.87	0.05	0.06
Male:	Ever Convicted	0.45	0.41	0.37	0.48
Male:	Num Convictions	2.45	1.81	0.24	0.25
Male:	Num Convictions (Cond)	5.40	4.45	0.25	0.26
Female:	Ever Convicted	0.25	0.16	0.21	0.32
Female:	Num Convictions	1.71	0.36	0.05	0.07
Female:	Num Convictions (Cond)	6.86	2.25	0.07	0.10

Notes:

Table 9: **Significance Tests for Traits of ABC Participants**

	Measure	Control	Experimental	T Test	Perm Test
	Cognitive	-0.29	0.26	0.01	0.01
	Externalizing	0.15	-0.14	0.14	0.14
	Internalizing	0.13	-0.13	0.16	0.16
Male:	Cognitive	-0.34	0.29	0.03	0.03
Male:	Externalizing	0.07	-0.04	0.68	0.68
Male:	Internalizing	0.30	0.01	0.28	0.28
Female:	Cognitive	-0.25	0.24	0.10	0.11
Female:	Externalizing	0.22	-0.25	0.12	0.12
Female:	Internalizing	-0.02	-0.29	0.30	0.29

Notes:

at reducing crime/delinquency. If interventions are to have an effect on crime, focusing on non-cognitive skills seems like the most promising avenue for doing so.

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