The Association of Externalizing and Internalizing Problems with Indicators of Intelligence in a Sample of At-Risk Children

Brian B. Boutwell[a*]

Jesse Helton[b]

Michael G. Vaughn[c]

Nicholas Kavish[d]

a* *Corresponding author.* Criminology and Criminal Justice and Department of Epidemiology (secondary appointment), College for Public Health and Social Justice, Saint Louis University, St. Louis, MO 63103, email: boutwellb@slu.edu
b School of Social Work, College for Public Health and Social Justice, Saint Louis University, St. Louis, MO 63103 email: heltonjj@slu.edu
c School of Social Work and Department of Epidemiology, College for Public Health and Social Justice, Saint Louis University, St. Louis, MO 63103 email: mvaughn9@slu.edu
d Department of Psychology and Philosophy, Sam Houston State University, 1901 Avenue I, Suite 390, Huntsville, TX 77340, email: nak012@shsu.edu

Abstract

A substantial body of research suggests that various psychopathological constructs fall into two hierarchical clusters: externalizing and internalizing problems. Researchers, moreover, have also highlighted the high rate of comorbidity between externalizing and internalizing psychopathology. Numerous risk factors for psychopathology and behavioral problems have been found, including low intelligence. However, much of this research has focused on externalizing problems, thus it remains less clear how (and if) intelligence relates differently to internalizing problems. The current study seeks to contribute to this knowledge base by examining the associations between two indicators of intelligence and internalizing, externalizing, and total scores on the Child Behavioral Checklist in a sample of approximately 2,500 at-risk children. While the two measures of intelligence performed differently, there emerged a consistent relationship between overall lower IQ and higher behavioral problem total scores. There was some evidence that low IQ also predicted higher internalizing scores, but this relationship varied greatly by measure and model. Results, limitations, and implications of the current study are discussed.

Introduction

General intelligence has emerged in the last century as one of the most intensively studied and psychometrically scrutinized variables in the psychological and behavioral sciences (Kline, 2013; Ritchie, 2015). What has become clear is that general intelligence can not only be reliably and validly measured via a variety of instruments, but that variation in general intelligence predicts a host of important life outcomes (Gottfredson, 2004; Plomin & Deary, 2015; Ritchie, 2015). For example, using a sample of respondents tracked from birth until the third decade of life, Moffitt and colleagues (2011) uncovered evidence that along with self-control, intelligence was consistently associated with indicators of health and economic success across the lifespan.

Other studies have uncovered very similar patterns of effects, revealing positive associations between intelligence and educational attainment, accrual of wealth, increased self-regulation, upward social mobility, selection of friends and romantic partners, and even longer life expectancy, across a range of independent samples (Arden et al., 2015; Beaver et al., 2016; Gottfredson, 2004; Boutwell et al., 2017; Meldrum et al., 2017; Plomin and Deary, 2015). Meldrum and colleagues (2017), for instance, examined a national sample of approximately 1,000 children and found intelligence to be positively related to self-control across time and multiple raters even after adjusting for key covariates (prior self-control, maternal IQ, etc.). Not only have higher levels of intelligence been linked to positive social outcomes, the inverse also seems to be true, in that lower levels of intelligence predict various adverse life events. Boutwell and colleagues (2017) recently reported evidence that lower intelligence predicts an increased risk of criminal victimization, even after correcting for possible genetic confounds. Beaver et al (2016) reported a similar result using a nationally representative sample of over 15,000

participants, finding that those in the bottom 25% of IQ scores were almost twice as likely to be victimized as those in the top 25%. Additionally, lower levels of intelligence are also associated with an increased risk of self-reported criminal justice processing (being arrested and incarcerated) in adulthood (Beaver et al., 2013).

Intelligence, Adverse Behavior, & At-Risk Populations

The evidence outlined above suggests that variation in measures of intelligence could represent a robust correlate, and perhaps even a causal factor, in the prediction of various deleterious outcomes (see also Aarons, James, Monn, Raghavan, Wells, & Leslie, 2010; Vaughn, Shook, & McMillen, 2008). Yet, despite this pattern of findings, there remains several interesting gaps in the literature that need to be examined. For example, in highly at-risk samples of children —children who are members of families that have been actively investigated by Child Protective Services (CPS) for alleged abuse or neglect—do measures of intelligence perform in a similar manner to predict adverse behavioral outcomes? There is at least some evidence that they may not. Using a sample of socioeconomically advantaged families in the United Kingdom, Flouri, Midouhas, & Joshi (2015) found that general intelligence measured between ages 3 and 7 did not moderate the relationship between a host of environmental threats (socioeconomic disadvantage, adverse life events, and neighborhood poverty) and changes in child behavioral problems over time.

Another important issue to keep in mind, as we've mentioned, is that psychopathology can be broadly measured in two main categories: externalizing and internalizing (Caspi et al., 2014; Kotov et al., 2017), with a smaller third category sometimes reported for thought disorder or psychotic experiences (Wright et al., 2013). These hierarchical clusters (internalizing and externalizing) have been replicated cross-culturally (Kessler et al., 2011) and been found in both

children/adolescents (Achenbach, 1966; Lahey et al, 2011) and adults (Krueger & Markon, 2006). Generally speaking, externalizing problems encompass overt displays of aggression and impulsivity (del Giudice, 2016). Internalizing problems, on the other hand, involve problems with anxiety, depression, and other less overt forms of psychopathology. Researchers examining the origins and nature of psychopathology have long recognized the tendency for externalizing and internalizing problems to be comorbid with one another (Caspi et al., 2014; Lilienfeld, 2003).

Additional research has examined the possible risk factors, both phenotypic and genetic, which might account for the co-occurrence of internalizing and externalizing problems (Del Giudice, 2016). To date, intelligence seems to play a clear role in the prediction of overt externalizing problems (Guay, Ouimet, & Proulx, 2005; Hinshaw, 1992; Menting, Hirschi & Hindelang, 1977; Menting, Van Lier & Koot, 2011). In a review of the longitudinal research on IQ, school achievement, and externalizing behavior problems, Hinshaw (1992) concluded that low IQ was a strong predictor of both low school performance and increased behavioral problems. Subsequent research has since extended these findings to demonstrate that poor language skills (a correlate of lower IQ) predicted peer rejection and externalizing difficulties in 615 children followed from Kindergarten to 4th grade (Menting, Van Lier, & Koot, 2011).

Yet, it is less clear to what extent intelligence predicts internalizing behaviors in general, or what role it might play in predicting variation for internalizing problems early in the life course specifically (especially for heavily disadvantaged populations). One exception is a US study using a longitudinal sample of maltreated children and their families (Harpur, Polek, & Harmelen, 2015). The authors found that both higher spatial and verbal intelligence measured at age 6 was associated with lower levels of anxiety and depression at age 14. Thus, while it may

be the case that general intelligence is inversely related to externalizing behaviors across childhood, such as impulsivity or aggression, it remains less certain if the association between intelligence and internalizing behavior is as consistent or as robust. And as we mentioned above, newer evidence seems to suggest that intelligence may not have as strong of an effect on internalizing problems as externalizing behaviors (Flouri, Midouhas, & Joshi, 2015).

The Current Study

To further examine the association between indicators of intelligence and problem behaviors, the current study makes use of a unique dataset of highly at-risk American children. In particular, we analyze a sample that is nationally representative of children who have been investigated by CPS based on allegations of abuse and neglect on the part of their caregivers within the United States. The sample represents children who may be considered the most-imperiled members of the population in that they are predominately minority respondents residing in lower socioeconomic strata. To date, it remains less clear whether variation in measures of general intelligence function to predict behavioral problems in this segment of the population. Although this population may have on average more externalizing and internalizing behavioral problems, we hypothesize an inverse relationship between intelligence and both externalizing and internalizing behaviors: as intelligence scores increase, problem behaviors and symptoms decrease.

METHODS

Sample

Data were derived from the second cohort of the National Survey of Child and Adolescent Well-Being (NSCAW II). NSCAW II, has been discussed in detail in a variety of other studies and as a result, we restrict our description to an abbreviated discussion. The study

designers utilized a two-stage stratified sampling design. The first step was to select nine sampling strata consisting of the eight states with the largest child welfare caseloads and the remainder of the US (see Dolan, Smith, Casanueva, & Ringeisen, 2011). The primary sampling units (PSUs), which for the study were defined as geographic areas that encompassed the population served by a CPS agency, were then selected within each of the nine strata. The same numbers of families were then sampled within each of the 83 selected PSUs. NSCAW II study sampled cases from CPS investigations that were closed between February 2008 and April 2009 nationwide (n = 5873). The final sample of children was representative of the national population of children birth to 17 years of age in families being investigated for allegations of maltreatment (Dowd et al., 2011).

It is important to note that the cohort included both substantiated and unsubstantiated investigations. Moreover, the sample also included cases that received family preservation services following an investigation as well as those who did not receive services, along with families who had their children removed to foster care. Face-to-face interviews with children and current caregiver by trained NSCAW practitioners were completed on average 4 months after the close of the investigation, and again approximately 12 months following the baseline interview (Waves 1 and 2 of NSCAW). Due to age restrictions on our standardized measures, we restricted the data to children over the age of 3 at baseline interview (n=2591).

Measures

Child behavior. The caregiver reported Child Behavioral Checklist (CBCL; Achenbach & Ruffle, 2000) was used to assess child social competence and behavioral problems. The CBCL measures domains of both internal, such as somatic complaints, anxiety, and depression, and externalizing behavior problems, such as delinquent and aggressive behaviors and external

presentations of behavioral problems. A total score was also derived combining internal, external, and an additional 33 items. The CBCL gives a standardized score with a mean of 50 and standard deviation of 10, with higher scores indicating greater behavioral problems.

Insert Table 1 about Here

Indicators of Intelligence. The Kaufman Brief Intelligence Test (KBIT; Kaufman & Kaufman, 1990) tests both verbal intelligence, by way of word knowledge and verbal concept formation, and nonverbal intelligence, by way of ability to perceive relationships and complete analogies. A normalized sum of standard scores for vocabulary and matrices scores was also used. The KBIT was administered to children directly by an NSCAW interviewer. Scores ranged from 40 to 142, with a mean of 100, a standard deviation of 15, and high scores indicating greater intelligence. We also examined scores on the Woodcock Johnson III Tests of Cognitive Abilities. Each scale -- Letter Identification, Passage Comprehension and Applied Problems -- has national norms for each age and an average score of 100 and standard deviation of 15, and higher scores indicating greater academic achievement. Children over the age of 10 were not administered the Passage Comprehension tests.

*Child demographics***.** A child's age, race/ethnicity, and sex were assessed by structured interview with primary caregiver at time of NSCAW interview.

Family Poverty. Poverty was measured by calculating the family's income-to-needs ratio, which was estimated by dividing family income by its corresponding poverty threshold in 2009. The poverty threshold varies by family size and is based on the money necessary for the minimally accepted amounts of food, with 1.00 representing the overall poverty threshold (Bishaw & Iceland, 2003). Caregivers reported both family income and household size. This measure was divided into four categories: at or below 50% of the poverty line, between 51% and

100% of the poverty line, between 101% of the poverty line and 200%, and above 200% of the poverty line.

Analytic Approach

All analyses were performed using STATA Statistical Software Release 13 (Stata, 2013). Due to NSCAW's complex sampling design, special STATA survey commands were applied to obtain unbiased estimates of population parameters (NSCAW Research Group, 2002). All percentages were weighted for sample probabilities; therefore, percentages reported in tables represent national estimates. To account for the complex survey design, χ^2 statistics were converted to *F*-statistics with noninteger degrees of freedom using a second-order Rao and Scott correction (StataCorp, 2003). All intelligence and behavioral measures were normally distributed, making ordinary least squares (OLS) regression appropriate. Three separate regressions were used to examine the relationship between intelligence and future behavior. The first regression modeled only behavior at wave 2 by intelligence at wave 1 and the second added important covariates. In the third regression, we added behavior scores at wave 1 as a type of lag variable, where we were able to test change in behavioral scores from wave 1 to wave 2 as a function of intelligence (Cohen, Cohen, West, Aiken, 2003). Missing data were limited to 40 cases, or 1.5%, and did not require ad-hoc adjustments.

Results

The average behavioral scores were slightly higher than the general population of children, which indicated greater behavioral problems (Table 1). Likewise, average intelligence was lower than the general population of children, with verbal scores in the K-BIT and applied and passage comprehension scores close to one standard deviation below the population mean. Average child age was 10 years, gender was equally distributed, and less than half of the sample

was non-Hispanic white. Over half (54.7%) of children were living in families that were under the federal poverty line.

Insert Table 1 about Here

In Table 2, beginning with the K-BIT, an interesting pattern of results emerged (in order to simplify the presentation of results, covariates are excluded from the tables. However, full tables are available in supplementary files). Both the matrices and total scores were related to externalizing problems in Model 1 - as scores on these items increased, scores on the externalizing scale declined—however, none of the K-BIT scores (intelligence: matrices, verbal, or total) predicted externalizing problems in Model 2 after correcting for demographic and socioeconomic factors. Interestingly, Model 3 revealed that all K-BIT measures predicted changes in externalizing behavior scores over time.

Insert Table 2 about Here

Next, we examined the WJ-III. Model 1 revealed that the applied problems, word ID, and total scale scores were significantly associated with externalizing problems. No such effect emerged for the passage compression subscale. Similar to the results using the K-BIT, none of the intelligence items predicted externalizing problems in Model 2 for the WJ-III. However, for Model 3, all of the WJ-III measures (except passage comp) predicted changes in externalizing problems measured at Wave 2. Our final set of analyses for the externalizing measure examined a summed score of intelligence across both the K-BIT and the WJ-III. In this case, the intelligence item was significant in all three models, predicting behavioral problems in the bivariate and multivariate models, as well as predicting change in model 3.

Insert Table 3 about Here

Table 3 presents the analyses using the internalizing behavioral problems scale as the dependent variable. The modeling of results unfolded identically to those contained in Table 2. Perhaps not surprisingly, the K-BIT appeared to be unrelated to the internalizing problems in either Models 1 or 2. In Model 3, however, each of the K-BIT items were significantly related to changes in internalizing problem scores: as scores on these items increased, scores on the internalizing scale declined. Moving next to the WJ-III measures, both the word ID and total scale score items were significantly (and inversely) related to internalizing problems. These effects remained in Model 3, suggesting that the word ID and total scores were associated with changes in internalizing scores. Finally, we examined the global intelligence score and found evidence of a significant effect, only in model 3 for internalizing scores.

Insert Table 4 about Here

Insert Figure 1 about Here

Finally, Table 4 presents the model using the total CBCL scores as the dependent variable. The K-BIT did not emerge in Model 1 or Model 2 as a significant correlate of behavioral problems. Model 3, alternatively, suggested that each K-BIT was associated with changes in total behavioral problems. Moving next to the WJ-III, the applied problems, word ID, and total scores were significantly associated with behavioral problems in Model 1. Model 3 revealed an identical pattern of findings for these three measures (a pattern that was absent in Model 2). The final set of Models in Table 4 examined the relationship between the total intelligence measure and the total behavioral problems scale. Similar to prior results, the total intelligence scale was related to behavioral problems in all three models. The results in this last phase of the analysis are presented visually in Figure 1.

Discussion

The association between internalizing and externalizing problems has been well known to, and widely discussed by psychopathology researchers for some time (Caspi et al., 2014; Del Giudice, 2016). Increasingly, scholars have attempted to understand the source of the co-morbidity in order to better gauge whether certain risk factors are common across both types of disorders. At the same time, intelligence researchers have reported well-replicated associations between indicators of general intelligence and various deleterious outcomes including overt antisocial behavior, violence, aggression, low impulse control, as well as a host of economic, educational, and other social outcomes (see citations above). In other words, there exists evidence for a clear link between intelligence and externalizing behaviors. Our study was intended to examine whether measures of intelligence might also predict internalizing problems in addition to externalizing problems.

Intelligence, as measured by both the K-BIT and WJ-III, in the present study was more consistently associated with externalizing and total behavioral problems rather than internalizing problems. Interestingly, the K-BIT did not seem to predict externalizing problems as robustly as the WJ-III, which it should be noted, is more accurately conceived of as a measure of crystalized intelligence (see Ritchie, 2015 for details on the distinction). A less consistent association emerged for internalizing problems and the indicators of intelligence, though the WJ-III did evince some evidence of correlation with the internalizing items of the CBCL. Finally, the total CBCL was associated with lower scores on the composite intelligence measure in the sample. Thus, while the results did deviate from expectation in some instances, the general picture that emerged was a rather consistent association between intelligence and externalizing problems, a less consistent relationship for internalizing problems, and an overall relationship for behavioral problems (broadly defined) and intelligence. The smaller effect of intelligence on internalizing

compared to externalizing behaviors (seen in Figure 1), it should also be mentioned, is consistent with previous associations found in more advantaged populations (Flouri, Midouhas, & Joshi, 2015).

Findings pertaining to the WJ-III suggest a role for crystalized intelligence in general, and reading performance in particular, in externalizing problem behavior. This observation is in line with prior research finding an association between verbal ability and delinquency (Bellair, McNulty, and Piquero, 2016; Moffitt, Lynam, and Silva, 1994). However, relatively little research has been conducted examining reading and externalizing per se. From a more pragmatic perspective, however, this finding also suggests the possibility that intensive reading intervention for struggling readers in this at-risk population *may* represent one avenue for reducing externalizing behavior, and that the improvements in behavior may emerge as crystalized intelligence levels improve across the life-course (Vacca, 2008). The inclusion of externalizing spectrum assessment in experimental evaluations of reading interventions with at-risk adolescents would enable directly testing this possibility.

Prior to concluding, there are a number of limitations and considerations that are important to mention. First, the sample represents an at-risk portion of American children, and thus the findings will not generalize to the broader population. Nonetheless, there has been relatively little effort to examine the phenotypic association between indicators of intelligence and behavioral outcomes in this population (compared to general population samples). Second, the assessment of externalizing and internalizing problem behaviors is based solely on caregiver reports and is therefore subject to the usual threats of social desirability bias and over and under reporting. An interesting consideration involves the tendency in some cases for the effect of intelligence to dissipate in Model 2 when other key control variables were introduced. While we

do not have an immediate explanation for this, it is perhaps worth noting that the coefficient for the variable often remained relatively unchanged across models.

Finally, the primary independent and dependent variables in the study are moderately to highly heritable constructs (Plomin & Deary, 2015), however, the nature of our data did not permit us to model the effects of heritability directly. This is an important issue, because as prior research has noted (Barnes, Boutwell, Gibson, Beaver & Wright, 2014), even a moderate genetic correlation left unaccounted for may fully confound a phenotypic correlation. Thus, it remains to be seen whether the phenotypic association between intelligence and externalizing/internalizing behaviors observed herein can withstand correction for genetic confounding. Ultimately, our paper offers initial evidence that variation in intelligence may be associated with variation in problem behaviors and symptoms in general. To the extent that our findings replicate in other samples, using other measures of intelligence and psychopathological outcomes remains an open and important question for future researchers to address.

References

Aarons, G. A., James, S., Monn, A. R., Raghavan, R., Wells, R. S., & Leslie, L. K. (2010). Behavior problems and placement change in a national child welfare sample: A prospective study. *Journal of the American Academy of Child & Adolescent Psychiatry*, *49*(1), 70-80.

Achenbach, T. M. (1966). The classification of children's psychiatric symptoms: A factor-analytic study. *Psychological Monographs: General and Applied*, *80*(7), 1-37.

Achenbach, T. M. (1991). *Manual for the child behavior checklist/4–18 and 1991 profile*. Burlington, VT: University of Vermont, Department of Psychiatry.

Arden, R., Luciano, M., Deary, I. J., Reynolds, C. A., Pedersen, N. L., Plassman, B. L., ... & Visscher, P. M. (2015). The association between intelligence and lifespan is mostly genetic. *International Journal of Epidemiology*, *45*(1), 178-185.

Barnes, J. C., Boutwell, B. B., Beaver, K. M., Gibson, C. L., & Wright, J. P. (2014). On the consequences of ignoring genetic influences in criminological research. *Journal of Criminal Justice*, *42*, 471-482.

Beaver, K. M., Nedelec, J. L., Barnes, J. C., Boutwell, B. B., & Boccio, C. (2016). The association between intelligence and personal victimization in adolescence and adulthood. *Personality and Individual Differences*, *98*, 355-360.

Beaver, K. M., Schwartz, J. A., Nedelec, J. L., Connolly, E. J., Boutwell, B. B., & Barnes, J. C. (2013). Intelligence is associated with criminal justice processing: Arrest through incarceration. *Intelligence*, *41*(5), 277-288.

Bellair, P. E., McNulty, T. L., & Piquero, A. R. (2016). Verbal ability and persistent offending: A race-specific test of Moffitt's theory. *Justice Quarterly*, *33*(3), 455-480.

Boutwell, B. B., Connolly, E. J., Barbaro, N., Shackelford, T. K., Petkovsek, M., & Beaver, K. M. (2017). On the genetic and environmental reasons why intelligence correlates with criminal victimization. *Intelligence, 62,* 155-166.

Caspi, A., Houts, R. M., Belsky, D. W., Goldman-Mellor, S. J., Harrington, H., Israel, S., ... & Moffitt, T. E. (2014). The p factor: one general psychopathology factor in the structure of psychiatric disorders? *Clinical Psychological Science, 2*(2), 119-137.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Erlbaum.

Flouri, E., Midouhas, E., & Joshi, H. (2015). Family and neighbourhood risk and children's problem behaviour: The moderating role of intelligence. *Intelligence, 53,* 33-42.

Gottfredson, L. S. (1997). Why g matters: The complexity of everyday life. *Intelligence, 24,* 79-132.

Gottfredson, L. S. (2004). Intelligence: is it the epidemiologists' elusive" fundamental cause" of social class inequalities in health? *Journal of Personality and Social Psychology, 86,* 174-199.

Guay, J. P., Ouimet, M., & Proulx, J. (2005). On intelligence and crime: A comparison of incarcerated sex offenders and serious non-sexual violent criminals. *International Journal of Law and Psychiatry, 28*(4), 405-417.

Harpur, L. J., Polek, E., & van Harmelen, A. L. (2015). The role of timing of maltreatment and child intelligence in pathways to low symptoms of depression and anxiety in adolescence. *Child abuse & neglect, 47,* 24-37.

Harris, J. R. (1995). Where is the child's environment? A group socialization theory of development. *Psychological Review, 102,* 458-489.

Harris, J. R. (1998). *The nurture assumption: Why children turn out the way they do*. New York: Free Press.

Hinshaw, S. P. (1992). Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms. *Psychological Bulletin*, *111*(1), 127.

Hirschi, T., & Hindelang, M. J. (1977). Intelligence and delinquency: A revisionnist review. *American Sociological Review, 42*, 571 – 587.

Kessler, R. C., Ormel, J., Petukhova, M., McLaughlin, K. A., Green, J. G., Russo, L. J., ... & Uestuen, T. B. (2011). Development of lifetime comorbidity in the World Health Organization world mental health surveys. Archives of General Psychiatry, 68, 90- 100.

Kline, P. (2013). *Intelligence: The psychometric view*. London: Routledge.

Kotov, R., Krueger, R. F., Watson, D., Achenbach, T. M., Althoff, R. R., Bagby, R. M., ... & Eaton, N. R. (2017). The Hierarchical Taxonomy of Psychopathology (HiTOP): A dimensional alternative to traditional nosologies. *Journal of abnormal psychology*, *126*(4), 454-477.

Krueger, R. F., & Markon, K. E. (2006). Understanding psychopathology: Melding behavior genetics, personality, and quantitative psychology to develop an empirically based model. *Current Directions in Psychological Science*, *15*(3), 113-117.

Lilienfeld, S. O. (2003). Comorbidity between and within childhood externalizing and internalizing disorders: Reflections and directions. *Journal of Abnormal Child Psychology*, *31*(3), 285-291.

Meldrum, R. C., Petkovsek, M. A., Boutwell, B. B., & Young, J. T. (2017). Reassessing the relationship between general intelligence and self-control in childhood. *Intelligence*, *60*, 1-9.

Menting, B., Van Lier, P. A., & Koot, H. M. (2011). Language skills, peer rejection, and the development of externalizing behavior from kindergarten to fourth grade. *Journal of Child Psychology and Psychiatry*, *52*(1), 72-79.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., ... & Sears, M. R. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, *108*, 2693-2698.

Moffitt, T. E., Lynam, D. R., & Silva, P. A. (1994). Neuropsychological tests predicting persistent male delinquency. *Criminology*, *32*(2), 277-300.

Murray, C. (2013). *Coming apart: The state of white America, 1960-2010*. Three Rivers Press.

Plomin, R., & Deary, I. J. (2015). Genetics and intelligence differences: five special findings. *Molecular Psychiatry*, *20*, 98-108.

Polderman, T. J., Benyamin, B., De Leeuw, C. A., Sullivan, P. F., Van Bochoven, A., Visscher, P. M., & Posthuma, D. (2015). Meta-analysis of the heritability of human traits based on fifty years of twin studies. *Nature Genetics*, *47*(7), 702-709.

Ritchie, S. (2015). *Intelligence: All that matters*. Hodder & Stoughton.

Scarr, S. (1992). Developmental theories for the 1990s: Development and individual differences. *Child Development*, *63*(1), 1-19.

Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype→ environment effects. *Child Development*, 424-435.

Vacca, J. S. (2008). Crime can be prevented if schools teach juvenile offenders to read. *Children and Youth Services Review*, *30*(9), 1055-1062.

Vaughn, M. G., Shook, J. E., McMillen, J. C. (2008). Aging out of foster care and legal involvement: Toward a typology of risk. *Social Service Review, 82*, 419-446.

Wright, A. G., Krueger, R. F., Hobbs, M. J., Markon, K. E., Eaton, N. R., & Slade, T. (2013). The structure of psychopathology: Toward an expanded quantitative empirical model. *Journal of abnormal psychology*, *122*(1), 281-294.

Table 1. Sample characteristics (n=2591)

	%	SE	Mean	SE
Behavior at Wave 2				
Externalizing			54.32	0.42
Internalizing			52.21	0.42
Total			53.98	0.45
Behavior at Wave 1 (Baseline)				
Externalizing			54.95	0.52
Internalizing			53.29	0.61
Total			54.99	0.60
K-BIT				
Matrices			92.99	1.02
Verbal			86.83	0.96
Total			89.23	0.97
WJ-III				
Applied			87.05	1.23
Word identification			92.72	1.55
Passage comprehension			87.44	1.23
Composite Intelligence			88.67	1.18
Age			9.84	0.13
Sex				
Male	48.4	1.98		
Female	51.6	1.98		
Race				
Non-Hispanic white	42.9	4.07		
Non-Hispanic black	21.9	2.81		
Hispanic	27.3	3.88		
Other	7.9	1.42		
Family poverty				
<50%	21.7	1.64		
51%-100%	33.0	1.74		
101%-200%	27.4	1.36		
>200%	17.9	1.64		

Table 2: Regression models predicting externalizing CBCL conditions at time 2

	Model 1	Model 2	Model 3

	b	*SE*	*b*	*SE*	*b*	*SE*
K-BIT						
Matrices	-0.06*	0.03	-0.04	0.03	-0.06**	0.02
Externalizing (Baseline)					0.62	0.03
Verbal	-0.04	0.02	-0.04	0.03	-0.04*	0.02
Externalizing (Baseline)					0.56**	0.03
Total	-0.06*	0.03	-0.05	0.03	-0.06**	0.02
Externalizing (Baseline)					0.62**	0.03
WJ-III						
Applied problems	-0.05*	0.02	-0.03	0.02	-0.04**	0.01
Externalizing (Baseline)					0.62**	0.03
Word ID	-0.06**	0.02	-0.05	0.02	-0.03**	0.01
Externalizing (Baseline)					0.61**	0.03
Passage Comp.	-0.07	0.03	-0.05	0.03	-0.01	0.02
Externalizing (Baseline)					0.58**	0.04
Total score	-0.07**	0.02	-0.05	0.02	-0.04**	0.01
Externalizing (Baseline)					0.62**	0.03
Sum score						
Composite Intelligence	-0.08**	0.02	-0.06*	0.02	-0.05**	0.01
Externalizing (Baseline)					0.62**	0.03

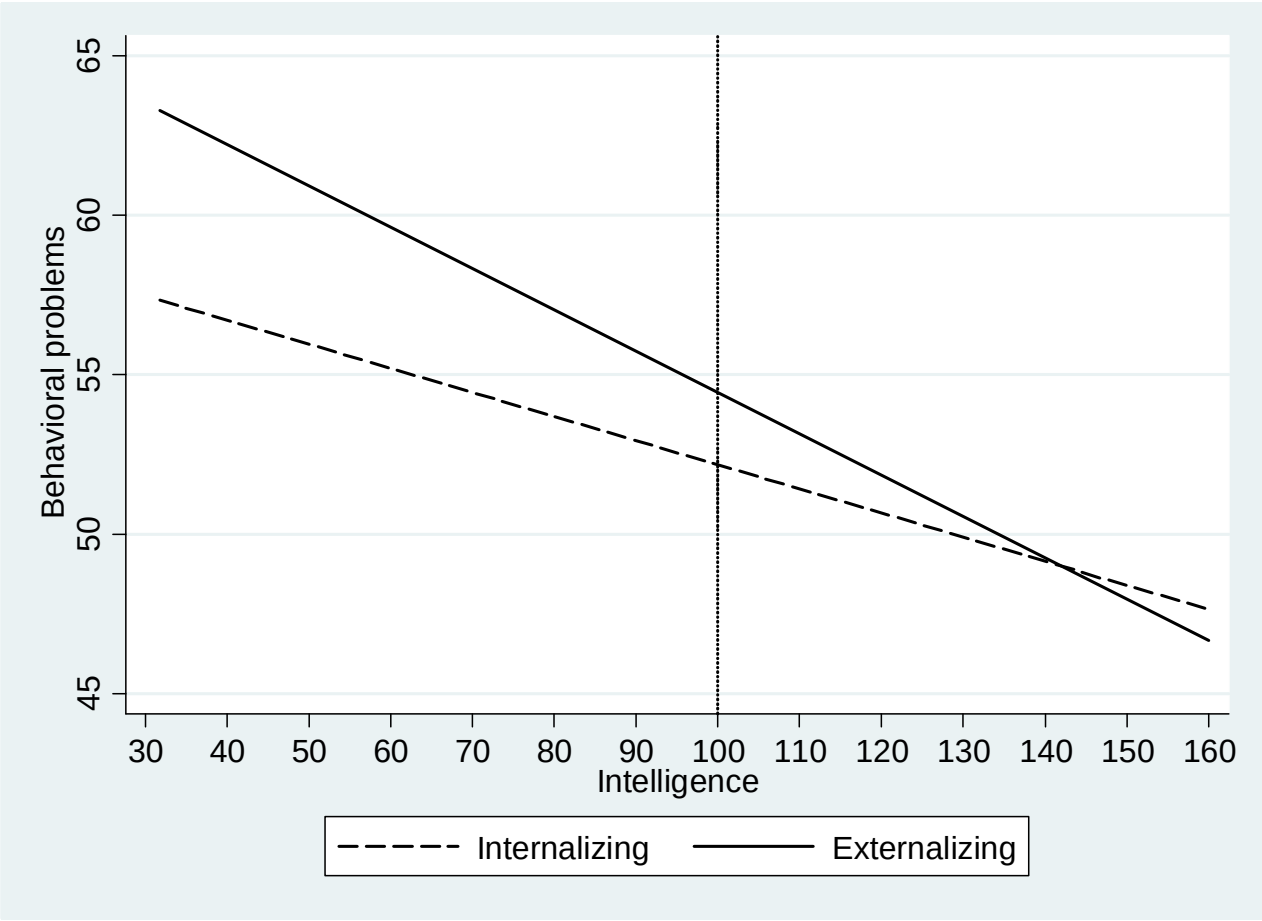
Table 3: Regression models predicting internalizing CBCL conditions at time 2

	Model 1		Model 2		Model 3	
	b	*SE*	*B*	*SE*	*b*	*SE*
K-BIT						
Matrices	-0.02	0.02	-0.01	0.02	-0.04*	0.02
Internalizing (Baseline)					0.61**	0.03
Verbal	-0.02	0.02	-0.02	0.02	-0.04*	0.01
Internalizing (Baseline)					0.60	0.03
Total	-0.02	0.02	-0.02	0.02	-0.05*	0.02
Internalizing (Baseline)					0.60**	0.03
WJ-III						
Applied problems	-0.03	0.02	-0.01	0.02	-0.02	0.01
Internalizing (Baseline)					0.59	0.03
Word ID	-0.04*	0.02	-0.02	0.02	-0.03*	0.01
Internalizing (Baseline)					0.59**	0.03
Passage Comp.	-0.06	0.03	-0.06	0.03	-0.02	0.02
Internalizing (Baseline)					0.54**	0.04
Total	-0.04*	0.02	-0.02	0.02	-0.04*	0.01
Internalizing (Baseline)					0.59**	0.03
Sum score						
Composite Intelligence	-0.04	0.02	-0.03	0.02	-0.05*	0.01
Internalizing (Baseline)					0.60	0.03

Table 4: Regression models predicting total CBCL behavioral conditions at time 2

	Model 1		Model 2		Model 3	
	b	*SE*	*b*	*SE*	*b*	*SE*
K-BIT						
Matrices	-0.05	0.02	-0.04	0.02	-0.06**	0.02
Total Behavior (Baseline)					0.67**	0.03
Verbal	-0.05	0.02	-0.05	0.03	-0.06**	0.02
Total Behavior (Baseline)					0.66**	0.03
Total	-0.05	0.02	-0.06	0.03	-0.08**	0.02
Total Behavior (Baseline)					0.67**	0.03
WJ-III						
Applied problems	-0.06*	0.02	-0.04	0.02	-0.04**	0.01
Total Behavior (Baseline)					0.66**	0.04
Word ID	-0.07**	0.02	-0.05	0.02	-0.04**	0.01
Total Behavior (Baseline)					0.66**	0.04
Passage Comp.	-0.09	0.04	-0.06	0.05	-0.02	0.02
Total Behavior (Baseline)					0.62**	0.04
Total	-0.08**	0.03	-0.06	0.03	-0.05**	0.01
Total Behavior (Baseline)					0.66	0.04
Sum Score						
Composite Intelligence	-0.09**	0.03	-0.07*	0.03	-0.07**	0.01
Total Behavior (Baseline)					0.66**	0.03

Figure 1


Behavioral problems
65
60
55
50
45
30
40
50
60
70
80
90
100
110
120
130
140
150
160
Intelligence
Internalizing
Externalizing