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## The Relation of Violence Exposure and Ethnicity to Intelligence and Verbal-Performance Discrepancies in Incarcerated Male Adolescents

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### Abstract

Incarcerated populations have an estimated incidence of intellectual disabilities (ID) far higher than national norms, ranging as high as ten percent. In the present study, the relation between ID and violence exposure in 115 incarcerated adolescents was examined. Interpersonal violence exposure (IPV-E) predicted an average decrease in full scale IQ of 4.5 points, explaining approximately five percent of the difference in IQ. Child maltreatment increased the odds of having a verbal disability by 3 fold and explained 17% of the variance in verbal disability. Hierarchical regression was used to examine the relative contribution of ethnicity, poverty and violence exposure to intellectual functioning. The literature on racial bias in incarceration and the implications for the present study are discussed.

### Keywords

Child maltreatment; interpersonal violence exposure; adolescent development; intellectual disability; racial bias

### Introduction

It has long been understood that youth who are incarcerated have a higher incidence of violence exposure than non-offending adolescents (Swahn et al., 2006; Widom & White, 1997). Violent victimization is a risk factor for later offending (Lansford et al., 2007). Abuse in the childhood is also a predictor of poor psychological adjustment (Wareham & Dembo, 2007). Further, multiple victimizations are found to increase the rate of later violent offending (Hosser, Raddatz, & Windzio, 2007).

Incarcerated populations, both adult and juvenile, also have higher incidences of intellectual disability than national norms (Hayes, Shackell, Mottram, & Lancaster, 2007; Murphy, 1986; Murphy, Mason, & Bouras, 1999; Quinn, Rutherford, Leone, Osher, & Poirier, 2005). Estimates for prevalence in incarcerated groups range from .05 to 9.7%, depending on the criteria for determining intellectual disability (Fazel, Xenitidis, & Powell, 2008; Quinn et al., 2005), which far exceeds the national estimated prevalence of 0.012% (Murphy, Yeargin-Allsopp, Decoufle, & Drews, 1995). In the present study we explore the relative contribution

of violence exposure, including child maltreatment and exposure to interpersonal violence (IPV-E), to intellectual disability, verbal IQ and non-verbal (performance) IQ for incarcerated adolescents in diverse ethnic groups.

### **Intellectual Disability**

Reasons for higher rates of disabling conditions within prison populations vary. Disability may be related to criminal and delinquent behavior either through an intellectual deficit in understanding the consequences of actions or from discrimination in response to delinquent behavior in youth with disabilities. In addition there may be third variables, such as poverty or other family adversity that may increase rates of both criminal behavior and disabilities (White & Loeber, 2008). People with disability face several challenges within the judicial system (Holland, Clare, & Mukhopadhyay, 2002; Talbot, & Riley, 2007). The under-identification of disability is common in judicial systems worldwide (Wertlieb, 1991). From arrest through trial and during incarceration, people with disabilities are more likely to experience problems understanding the systems. Miranda warnings are often misunderstood, defendants who are ruled incompetent to stand trial are often kept institutionalized until fit to stand trial, which can amount to a life sentence (Holland, Clare, & Mukhopadhyay, 2002; Wertlieb, 1991). During trials, programs to help the defendant to understand the proceedings are often lacking and many states do not provide appropriate incarceration facilities for offenders with disabilities (Wertlieb, 1991). Adjudicated persons with intellectual disabilities are more likely to receive a prison sentence for property offenses or social disruptions like vagrancy or parole violations and are more likely to be given prison sentences without the possibility of parole (Cockram, 2005).

### **Ethnicity and Disability**

There is limited prior work on overrepresentation of disabilities in offender groups and the relation to race or ethnicity. This is one of the limitations of prior studies (Hayes, Shackell, Mottram, & Lancaster, 2007). There is an overrepresentation of minority groups in special education in the general population nationwide, which would suggest that there is also an overrepresentation in incarcerated populations (Colarusso, Keel, & Dangel, 2001; Skiba, Poloni-Staudinger, Gallini, Simmons, & Feggins-Azziz, 2006; Yeargin-Allsopp & Drews, 1995). Explanations for this bias in special education are complex. African American students are both less likely to be referred for special education and to be found eligible (Colarusso, Keel, & Dangel, 2001), and are more likely, once in special education, to spend more time in more restrictive environments, outside of the regular education classroom (Hosp & Reschly, 2002), even controlling for SES, school changes and parental involvement (Achilles, McLaughlin, & Croninger, 2007). African American students are overrepresented in mild and moderate developmentally delayed but underrepresented in speech and language classes (Skiba, Poloni-Staudinger, Gallini, Simmons, & Feggins-Azziz, 2006). In fact, African American youth have twice the likelihood of white youth of having intellectual disabilities (Yeargin-Allsopp & Drews, 1995). Poverty likely confounds this relation. African American toddlers show increased odds of learning related problems at age two but these differences are mostly explained by socioeconomic status (SES) and parental support (Morgan, Farkas, Hillemeier, & Maczuga, 2009).

## Violence Exposure

Higher rates of violence exposure are present in both adult and adolescent offenders. In a large study of incarcerated adolescents documented histories of maltreatment were found in 14 – 19% of the offenders (Jonson-Reid & Way, 2001). In a nationally representative random sample of 3,362 adults, Curtis and colleagues (Curtis, Leung, Sullivan, Eschbach, & Stinson, 2001) found that having been touched sexually prior to puberty resulted in a 7-10% increase in the probability of being incarcerated later in life. In one study of girls court mandated to out-of-home care, 69% had documented sexual abuse, 88% physical abuse and 79% witnessed domestic violence (Smith, Leve & Chamberlain, 2006). In the general population, disabled children are more likely to be abused, children with abuse histories are more likely to have disabilities and disabled children are more likely to exhibit problem behaviors and delinquency, including perpetration of violence (Sullivan & Knutson, 2000a, 2000b), suggesting a bidirectional relation between violence and disability (Perkins, under review).

The goal of the present study is to understand the relation between violence exposure and disability in incarcerated youth. In this study we restrict our analyses to intellectual disabilities (ID), verbal disability and performance impairment (PI). The term intellectual disability refers deficits in intellectual function, as measured by IQ. Verbal disabilities and PI are found when an individual has a large discrepancy between verbal IQ and performance IQ. Normally individuals score high, average or low on both measures. A significant discrepancy is thought to be indicative of a deficit in verbal or non-verbal functioning or capacity for functioning.

We first hypothesize that there will be high rates of ID, verbal disability and PI in the present population, relative to national norms. We further hypothesize that there will be a discrepancy between African American youth and Caucasian youth such that African American youth will have a higher rate of ID. Our secondary hypothesis is that violence exposure will be related to disability status, such that higher exposure to violence will be related to disability conditions in all three areas, ID, verbal disability and PI. There is very little current research on ethnic difference in violence exposure or disability status in incarcerated youth. Previous research would suggest that African American youth have higher rates of violence exposure. Our final hypothesis is that controlling for violence exposure will decrease the relation between ethnicity and disability.

## Method

### Design

The study was conducted at a youth incarceration facility in Michigan and included survey data, individual cognitive and neuropsychological assessment and educational records review. Following IRB approval, consent was obtained for the study from parents or the court (for wards of the state) before asking the minors for assent to participate. Letters were sent to parents with consent documents attached. If there was no response to a second letter and the juveniles were covered under Delinquency Act 150, we asked that the State Department of Human Services give permission for the youth the participate in the study.

Legal adults (those youth over 18 years old) were asked to sign participant consent. After parent/guardian, court or Human Services permission was granted, each youth was contacted individually to obtain assent. Researchers explained that the study was voluntary and that no consequence positive or negative would result from participation or refusal to participate. If necessary, assistance with reading the surveys was provided. Youth were not compensated directly for participation in the study. Instead, a donation was made to the facility for purchase of recreational equipment.

We used a mixed methods design that included experimental, survey and records review. Each participant completed a neuropsychological battery, including five computerized cognitive processing assessments, intelligence and achievement testing and a survey, which included basic demographic information and a number of standardized measures of mental health adjustment.

## Participants

The sample consisted of 115 males who ranged in age from 13 to 20 with a mean age of 17 ( $SD=1.304$ ). Participants last completed grades were between 7<sup>th</sup> and the 1<sup>st</sup> year in college. The sample was 28.3% African American, 44.3% Caucasian and 23.6% self-defined as multi-racial. The majority of multi-racial participants defined themselves as African-American and some other group. Less than four percent of the population defined themselves as Hispanic, Asian, Native American or other race. To simplify further analyses, Caucasian youth were compared to all other youth.

In terms of family composition, 37% of the sample reported that they grew up in a two-parent home. Twenty-seven percent reported growing up with a single mom and 12% reported having grown up with their mother and a partner. Seven percent reported the family of origin as father-headed (either a single father or father and step-mother) and 15% reported growing up with other relatives (see Table 1). Forty percent of the sample reported that their parents have at one time been divorced and 50% reported that their parents were married.

## Measures

**Poverty**—The study has no direct measure of socioeconomic status (SES). We did not receive permission to obtain income information from facility records and did not obtain parental education or occupation from many participants. In the present study we use a measure of family poverty from a thirteen binary item measure of family dysfunction. To avoid collinearity with our measure of violence exposure we used only the two items directly related to poverty; “Lots of moves and/or homelessness” and “Very poor (little money, food, clothes, heat, etc.)” ( $M = .65$ ;  $SD = .07$ ).

**Violence Exposure**—Family violence was measured using an adapted version of the Conflict Tactics Scale (CTS) (Straus, 1990) to assess how conflicts in the family are handled on a 1 to 5 Likert Scale where 1 is equal to “never” and 5 equals “every day.” Internal consistency of the CTS was determined as part of the National Family Violence Survey ( $n = 2,143$ ). This measure has been widely used in incarcerated populations (Haapasalo & Virtanen, 1999; Hosser et al., 2007; Reed et al., 2009). Participants were asked to state how

often they experienced each of 18 conflict tactics during two time frames: from ages 6-12 and from 13-18. The 18 items were repeated within four familial relationship types; parents to participant (child maltreatment), parent to parent (Interpersonal Violence Exposure - IPV-E), sibling to participant and participant to sibling. There existed a high correlation between these subscales.

In the present study we used the child maltreatment (parent to youth violence) and intimate partner violence exposure (IPV-E) (violence witnessed by the youth between parents or mother and significant other) subscales. For both measures a combined score of mean violence exposure from 6-18 was calculated. Mean level of maltreatment ranged from 0.19 to 5.00 ( $\alpha = .940$ ;  $M = 1.76$ ;  $SD = 0.82$ ). Mean IPV ranged from 0.81 to 5.00 ( $\alpha = .942$ ;  $M = 1.58$ ;  $SD = 0.71$ ).

**Disability**—Disability is a complex construct and was measured in a number of ways. Cognitive delays were assessed using the Kaufman Brief Intelligence Test Second Edition (K-BIT-2) (Kaufman & Kaufman, 2004), which provides a quick assessment of verbal and non-verbal ability. Cognitive Impairment (CI) was determined with a standard score of 69 or below on the K-BIT-2, which is equivalent to 2 standard deviations (SD) below to mean. Cognitive delay was determined with a standard score of 77 or below, equivalent to 1.5 standard deviations below the norm. Verbal and nonverbal disabilities were determined using a discrepancy of 1 SD between standard scores.

**Analyses**—Linear regression and logistic regressions were used to predict difference in disability group membership based on age, ethnicity, child maltreatment and interpersonal violence exposure (IPV-E). Ethnicity was simplified into three categories, Caucasian, African American and a combined mixed ethnicity and other group. In multiple regressions, dummy variables were created to compare African American and mixed ethnicity participants with Caucasian participants. If there were multiple predictors of individual disability outcomes, hierarchical regression was performed to determine if violence exposure and family poverty provided significant additional contribution.

## Results

### Descriptive Statistics

**Sample Characteristics**—From the educational records, it was found that 70% had a current Individual Education Plan (IEP) with a lifetime incidence of special education diagnosis of 75.5%. Attention deficit disorder was the most common diagnosis affecting 47% of the population, followed by cognitive impairment (CI) and speech problems (approximately 12%).

**Violence Exposure**—Approximately 25% of the participants reported IPV-E of at least a couple of times a year. Thirty-four percent of the sample reported mean maltreatment by parents at a couple of times a year or more and 46% reported this level of maltreatment by their sibling. Caucasian youth had the highest level of IPV-E ( $M = 1.71$ ,  $SD = .67$ ) and mixed ethnicity youth had the lowest ( $M = 1.42$ ,  $SD = .87$ ) but there was no statistical difference between groups ( $F(2, 102) = 1.593$ ,  $p = 0.230$ ). For child maltreatment,

Caucasian youth reported the highest level ( $M = 1.90, SD = .79$ ) and mixed race youth reported the lowest level ( $M = 1.66, SD = 1.06$ ) with no difference between groups ( $F(1, 102) = 1.037, p = .358$ ).

**Hypothesis testing**—To test our hypothesis that there would be more disability in this population than in national norms, we first defined ID, verbal disability and PI groups and compared rates to national norms from previous studies. To test our hypothesis that African American participants would have lower IQ and higher rates of ID, we first performed regression analyses with Full Scale IQ as an outcome and ethnicity as an independent predictor. To examine whether violence exposure was related to disability status, we performed regression with disability status and Full Scale IQ as separate outcome measures and age, ethnicity and violence exposure as independent predictors. To test for the additive predictive power of violence exposure, we performed hierarchical regression analyses with violence exposure in the second level.

**Intelligence and Disability Status**—KBIT means for verbal, nonverbal and full scale IQ were all within the lower end of the average range (see Table 1). We had complete data for assessing IQ on eighty-eight subjects. Approximately one quarter of the population was more than 1 standard deviation below the mean for full scale IQ, which is higher than is expected in a normal distribution. A total of 21 participants had below average IQs, which constitutes 24% of the population. The Kaufman Brief Intelligence Test is normed such that 16% of the population should score within this range. Of these four participants (4.5%) had a full scale IQ in the lower extreme (standard score < 69) and seventeen (19.3%) scored in the below average range (standard score 70-84). The majority of the sample ( $n = 60, 68.2\%$ ) scored in the average range (standard score 85-115). None of the participants scored in the upper extreme (standard score > 131). Eight percent ( $n = 7$ ) scored above average (standard score between 116 - 130).

Four participants scored in the CI range (4.5%) and four score in the cognitively delayed range as assessed by > 1.5 *SD* below average intelligence. National prevalence of CI (often called mental retardation) is less than 2% (U.S. Department of Education, 2010). Twenty-seven participants (30.6%) qualified for nonverbal disability and nine had a verbal disability (10.2%). Assessment of verbal and nonverbal disabilities was a 1 *SD* difference below full scale IQ. National prevalence of specific learning disabilities in the United States is 5.2% (U.S. Department of Education, 2010).

**Intelligence**—In logistic regression analyses, none of the demographics or violence measures predicted whether a participant had an IQ more than 1.5 *SD* below 100 (see Table 2). There was a trend toward both African American and mixed ethnicity participants having lower IQ (see Table 3). Both groups had a mean IQ approximately one half a standard deviation below the mean for Caucasian participants. IPV-E also predicted lower IQ at a trend level. To examine whether IPVE and family poverty contributed to lower intelligence, beyond the contribution of ethnicity, IPV-E was entered as a predictor of IQ in the second step of a hierarchical regression analysis and family poverty was entered in the final model (see Table 4). In this combined hierarchical model, African American and mixed ethnicity significantly predicted lower IQ when taking into account the independent contribution of

IPV-E, which significantly lowered IQ by ~ 4.5 points on average. This combined model explained over 10% of the variability in the sample on IQ. Family poverty did not significantly contribute to the variance in IQ in the population.

**Verbal and Nonverbal Disabilities**—To test our hypothesis that violence exposure would predict disability status and that African American participants would be more likely to have more disabilities, we performed logistic regression analyses with verbal and nonverbal disabilities as outcomes to determine if age, ethnicity and violence exposure predicted disability. To further test the hypothesis that violence exposure would add predictive power to any ethnic differences in disability status, we performed a hierarchical logistic regression.

Child maltreatment and IPV-E, predicted rates of verbal disability (see Table 2). Child maltreatment increased the odds of having a verbal disability three and a half times and IPV-E increased the odds of verbal disability three times. To investigate whether IPV-E added to the prediction of verbal disability, the stronger predictor, child maltreatment, was entered as the first step in a two-step hierarchical regression analysis (see Table 5). In this model, child maltreatment remained a predictor of verbal disability but IPV-E failed to add significantly to the explanatory power. Child maltreatment alone accounted for 17% of the variance in verbal disability status.

Ethnicity predicted nonverbal disability such that African American and multiethnic youth were ten and five times more likely to have nonverbal disability, respectively. There was a trend toward child maltreatment significantly negatively predicting nonverbal disability (see Table 2), such that greater child maltreatment decreased the odds of having a nonverbal disability by half. Ethnicity, child maltreatment and family poverty were then entered into a three step hierarchical logistic regression (see Table 6). Once child maltreatment was entered into the second model, ethnicity continued to predict a greater likelihood of nonverbal disability but child maltreatment was no longer a significant predictor. This original model predicts 19% of the variability in performance impairment. There was a trend toward family poverty decreasing rates of PI. The addition of family poverty increased the predictive value of the model by over five percent.

## Discussion

It has long been observed that incarcerated youth and adults have more pronounced histories of violence exposure (Curtis et al., 2001; Jonson-Reid, Drake, Chung, & Way, 2003; Jonson-Reid & Way, 2001; Smith et al., 2006) as well as higher prevalence of disabilities (Heide & Solomon, 2006; Maxfield, Weiler, & Widom, 2000; Pithers & Gray, 1998). Incarcerated youth are a particularly appropriate population in which to study these low incidence phenomena and the relation between these constructs. It is not well understood whether violence exposure and disability, which are linked in the general population (Sullivan & Knutson, 2000a, 2000b), are also linked in incarcerated youth. Furthermore, violence exposure and disabilities may be compounding risk factors, that uniquely increase the risk of offending.

## Intelligence

This study supports the findings of a large body of research that has consistently shown high rates of intellectual disabilities among incarcerated populations. Our overall results show a larger prevalence of low intelligence in our incarcerated population. We find that 24% of the population is more than one *SD* below the mean in full-scale IQ and no participant score in the upper extreme, which suggests a skewed distribution of the normal curve such that the population as a whole is below national norms in intelligence. Our result of nine percent of the population with ID mirrors the findings of Quinn and colleagues (2005) that 9.7% of youth in juvenile corrections have ID. The American Association of Intellectual and Developmental Disabilities recommends a combined method of determining ID using both an IQ cut-off of 1.5 to 2 *SD* below the average and a functional assessment of adaptive behavior. Our study did not include an assessment of adaptive behavior. We used a definition of 1.5 *SD* below the mean. Quinn and colleagues used a survey procedure, whereby heads of the state departments of juvenile justice were asked about students served in special education. It is reasonable to assume that because states differ in procedures for determining eligibility, that state-to-state comparisons of criteria for ID would also differ.

In other studies of ID in incarcerated populations (Fazel et al., 2008), using the combined IQ and adaptive behavior assessment, rates of ID in incarcerated populations range from 0.5% to 3%. With a more stringent cut-off of 2 *SD*, we found a rate of 4.5%, which is within the margin of error of other studies. It may be that IQ scores alone slightly over estimate the rates of ID. Fazel and colleagues review studies that included only adult incarcerated samples and our slightly higher rate may indicate higher rates of ID in juvenile justice populations.

## Race and Ethnicity

In the present study, we find that Full Scale IQ is lower in both African American and mixed race participants. This is consistent with other studies that have found African American students are overrepresented in mild and moderate cognitively delayed classifications in the general population (Skiba et al., 2006; Yeargin-Allsopp & Drews, 1995) and within at-risk youth (Cornell & Wilson, 1992). Explanations for this discrepancy include, racial bias in testing, differences in diagnosis at the school level, differences in health care access, differential risk for certain reproductive outcomes and poverty-related difference including exposure to lead and early education experiences (Yeargin-Allsopp & Drews, 1995).

In the present study, ethnicity accounted for only five percent of the variance in intellectual ability. When exposure to IPV was added as an explanatory variable, we accounted for another five percent of variance. This suggested that the overrepresentation of African American students in low intelligence groups might be partially accounted for by exposure to IPV-E.

Because African American and other ethnic minority women report 35% higher rates of IPV-E, which partially disappears when SES is accounted for (Hien & Ruglass, 2009), it is unclear whether higher rates of IPV-E might be a proxy for lower SES or whether higher IPV-E may be directly associated with ID in this group. Children with disabilities are more



vulnerable to maltreatment (Kendall-Tackett, Lyon, Taliaferro, & Little, 2005; Sobsey, 2002) so it would seem plausible that families in which children have ID, there would be a greater risk of IPV-E.

Many studies have examined whether there exists a relation between having a child with disability and risk for marital discord and divorce. Some studies have failed to find greater discord in marriages where children have disabilities but others have found increased divorce rates (Sobsey, 2004). One explanation may be that in families with high marital satisfaction prior to having a child with disabilities, the stress of parenting their child can lead to higher marital satisfaction and the reverse can be true for stressed families (St. John, Pai, Belfer, & Mulliken, 2003). These studies generally do not address marital discord that rises to the level of IPV and may be missing a subsection of the population for whom IPV is greater in families of children with disabilities.

Another explanation may be that disabilities are not randomly distributed in the population; certain disabilities are more likely to occur in high poverty environments (Sobsey, 2004), which are associated with both IPV-E and disabilities. Combining disabilities that are randomly distributed with disabilities that are more likely to be caused by poverty-related variables, such as lead poisoning or lack of prenatal care, may obfuscate the relation between disabilities and marital discord. In a population like the one in our study, with multiple risk factors, it may be that both disability and IPV-E are increased by factors associated with poverty.

Finally other studies have demonstrated an ethnic bias in intelligence testing. Our study used a brief intelligence test rather than a full intelligence test, which would naturally be more susceptible to bias. Our own experience is that certain items seemed to be more difficult for African American students because of cultural inappropriateness. One example is a verbal item in the riddles subsection that asks “what is metal, is different for left handed people and is used by barbers?” Several African American participants discussed this item out loud and came back to it after testing. Although the word “clippers” is a possible correct answer, there was great debate as to whether or not clippers could be left-handed. The same debate did not exist for scissors, another correct answer. The general acceptance of the existence of left-handed scissors facilitates a correct response to this item if the youth has a type of hair that would be cut with scissors.

### **Verbal Disability**

Verbal disabilities and performance impairment are high in the present study. We found a much higher prevalence of PI than verbal disabilities. There has been little recent research into verbal and PI in incarcerated youth. Our findings differ from the most recent work on delinquent populations, which found higher rates of low verbal IQ (Cornell & Wilson, 1992) but are consistent with a much older study of adjudicated youth where the researchers found higher rates of PI (Hubble & Groff, 1981).

We find that child maltreatment is predictive of both verbal disabilities and performance impairment. For verbal disabilities, maltreatment experienced by children explains over 15% of the variance in verbal disabilities. Other studies have found that language difficulties are

related to history of maltreatment (Scarborough & McCrae, 2009). When we included IPV into our model, there was little additional variance accounted for, which would suggest that maltreatment alone is predictive of verbal disability.

### **Performance Impairment**

Our findings indicate that PI is primarily predicted by race and ethnicity. Being African American or mixed ethnicity accounts for over 19% of the variance in PI. Our data cannot be used to determine the direction of effect. Minority youth are more likely to be represented in incarcerated populations, regardless of disability status and are overrepresented in our study. Previous research has shown that being African American or mixed ethnicity predicts learning-related behavior problems by the age of two but that these differences mostly disappear when controlling for low birth weight and low parental support (Morgan et al., 2009). Low birth weight is often considered a proxy for low SES, which suggests that our finding of overrepresentation of African American and mixed ethnicity youth in PI is related to lower SES rather than ethnicity. Child maltreatment did not add significantly to the variance in PI beyond the explanatory power of ethnicity.

Family poverty, as measured by two items, predicted lower rates of PI at a trend level. This finding may be in part due to systematic variance in the way these two questions were answered rather than a true difference in poverty. It may be that participants with PI were less likely to fully understand these items or might have been more reluctant to endorse them. At any rate, these items clearly do not fully capture poverty of SES in our population and must be interpreted cautiously.

### **Sample Demographics**

African Americans are overrepresented in the sample in comparison to the overall representation of African Americans in the general population for the state. According to the 2000 U.S. Census, 14.4% of the population of the State of Michigan is African American. Our sample population is 28% African American and over half non-white including subjects with mixed ethnicity, Hispanic and other minority groups. African American students do not significantly differ from other groups on level of exposure to violence. We do find higher rates of ID and PI among African American students. This might be further evidence for a racial bias in the judicial system, although we do not have appropriate data to answer this question empirically.

Other data would suggest that poverty is a factor in overrepresentation of African American students among special education populations. Our data are not sufficient to draw conclusions on the relation between ethnicity, poverty and disability in this population. It is clear, though, that within our incarcerated group there are high rates of minority students with special needs. There is very little current work that would help to explain this confluence. Future work should examine this relation.

### **Mechanisms**

The mechanisms that explain the confluence between disabilities and exposure to violence are complex (Perkins, under review). Early literacy and communication have been

implicated as possible mediating factors in the development of disability (McGee, Wolfe, & Olson, 2001) and exposure to violence disrupts early learning and communication. Violence exposure can be a cause of learning disabilities in children either through physical damage that can result in changes in the central nervous system (CNS), psychological damage, such as trauma symptoms, that have been shown to alter the CNS or behavioral changes that reach clinical significance. Brain injuries in children are often a direct result of abuse (Sobsey, Randall, & Parrila, 1997). Also IPV-E during pregnancy is related to low birth weight, which in turn has been related to an increase in pre-term births (Rosen, Seng, Tolman, & Mallinger, 2007) a known cause of disability (Sobsey, 2002).

Violence exposure can also be related to the development of intellectual deficits through disruption of the autonomic system, including heart rate variability (Gordis, Feres, Olezeski, Rabkin, & Trickett, 2010; Heim, et al., 2000; Murali & Chen, 2005), galvanic skin response (Gordis, Feres, Olezeski, Rabkin, & Trickett, 2010) and cortisol (Heim, et al., 2000; Murali & Chen, 2005; Murray-Close, Han, Cicchetti, Crick, & Rogosch, 2008; Obradovi , Bush, Stamperdahl, Adler, & Boyce, 2010). These differences in the normative stress response can lead to dysfunctional development in brain volumes (Andersen, Tomada, Vincow, Valente, Polcari, & Teicher, 2008, white matter development (Choi, Jeong, Rohan, Polcari, & Teicher, 2009; Seckfort, et al., 2008) and regional brain function (Miskovic, Schmidt, Georgiades, Boyle, & Macmillan, 2010). Each of these, in turn, could theoretically account for development of intellectual problems in violence-exposed children (Perkins & Graham-Bermann, in press). Future work should examine psychobiological mechanisms that may connect violence exposure with the development of disabilities.

## Implications

Once in correctional facilities, youth have historically had difficulty in receiving adequate special educational services (Leone, 1994). Our study underscores the importance of strong special education in youth incarceration facilities. The overrepresentation of minority youth both with and without ID highlights the need to examine juvenile justice practices for racial bias. Racial bias may exist in both the assessment and identification of youth with disabilities among offenders and the determination to incarcerate versus treat after the commission of a crime.

We find that child maltreatment and IPV-E differentially predict deficits in this population. IPV-E was a determinant of low intelligence, whereas child maltreatment predicted verbal disability. There is little previous work that documents the effects of IPV-E on intelligence in children (Graham-Bermann, Howell, Miller, Kwek & Lilly, 2010). IPV-E, in utero or postnatally may be related to child intelligence through premature birth, low birth weight or developmental delays. Studies of at-risk couples should evaluate the development of intelligence in families with IPV-E. Higher rates of IPV-E may also be related to parenting of children with disabilities. Work on marital discord between parents of children with disabilities does not answer the question of whether the stress of parenting under these circumstances may lead to IPV in families. To answer that question, future work would have to specifically query IPV-E and differentiate between families that are at-risk of violence.

Child maltreatment is clearly related to disability both through greater rates of disability following maltreatment and in higher rates of maltreatment among children with disabilities. The current study suggests that this relation is particularly strong in the verbal realm. It may be that child maltreatment results in removal from educational settings at home and at school. Within our population, it is reasonable to suggest that one mechanism may be an increase in emotional problems following abuse, which results in restrictive school settings, that could have limit verbal development. Future research should examine the development of verbal ability as it relates to emotional development following abuse.

Within incarcerated groups, a focus on treatment for psychological problems following the trauma associated with IPV-E and child maltreatment would be important for intervention with these youth. The interrelation between violence exposure and intelligence in this population suggests that direct treatment of the psychological sequelae of trauma would benefit this population.

## References

- Achilles G, McLaughlin M, Croninger R. Sociocultural correlates of disciplinary exclusion among students with emotional, behavioral, and learning disabilities in the SEELS national dataset. *Journal of Emotional and Behavioral Disorders*. 2007; 15(1):33.
- Andersen S, Tomada A, Vincow E, Valente E, Polcari A, Teicher M. Preliminary evidence for sensitive periods in the effect of childhood sexual abuse on regional brain development. *The Journal of neuropsychiatry and clinical neurosciences*. 2008; 20(3):292–301. [PubMed: 18806232]
- Choi J, Jeong B, Rohan M, Polcari A, Teicher M. Preliminary Evidence for White Matter Tract Abnormalities in Young Adults Exposed to Parental Verbal Abuse. *Biological psychiatry*. 2009; 65(3):227–234. [PubMed: 18692174]
- Cockram J. People With an Intellectual Disability in the Prisons. *Psychiatry, Psychology and Law*. 2005; 12(1):163–173.
- Colarusso RP, Keel MC, Dangel HL. A Comparison of Eligibility Criteria and Their Impact on Minority Representation in LD Programs. *Learning Disabilities Research & Practice*. 2001; 16(1): 1–7.
- Cornell DG, Wilson LA. The PIQ greater than VIQ discrepancy in violent and nonviolent delinquents. *Journal of Clinical Psychology*. 1992; 48(2):256–261. [PubMed: 1573030]
- Curtis RL Jr, Leung P, Sullivan E, Eschbach K, Stinson M. Outcomes of child sexual abuse contacts: Patterns of incarcerations from a national sample. *Child Abuse & Neglect*. 2001; 25(5):719–736. [PubMed: 11428431]
- Fazel S, Xenitidis K, Powell J. The prevalence of intellectual disabilities among 12,000 prisoners - a systematic review. *International Journal of Law and Psychiatry*. 2008; 31(4):369–373. [PubMed: 18644624]
- Gordis EB, Feres N, Olezeski CL, Rabkin AN, Trickett PK. Skin Conductance Reactivity and Respiratory Sinus Arrhythmia Among Maltreated and Comparison Youth: Relations with Aggressive Behavior. *Journal of Pediatric Psychology*. 2010; 35(5):547–558. [PubMed: 19995866]
- Graham-Bermann SA, Howell KH, Miller LE, Kwek J, Lilly M. Traumatic events and maternal education as predictors of verbal ability for preschool children exposed to intimate partner violence (IPV). *Journal of Family Violence*. 2010; 25(4):383–392. DOI 10.1007/s10896-009-9299-3.
- Haapasalo J, Virtanen T. Paths Between Childhood Emotional and Other Maltreatment and Psychiatric Problems in Criminal Offenders. *Journal of Emotional Abuse*. 1999; 1(4):15–35.
- Hayes S, Shackell P, Mottram P, Lancaster R. The prevalence of intellectual disability in a major UK prison. *British Journal of Learning Disabilities*. 2007; 35(3):162–167. doi:10.1111/j.1468-3156.2007.00461.x.

- Heide KM, Solomon EP. Biology, childhood trauma, and murder: Rethinking justice. *International Journal of Law and Psychiatry*. 2006; 29(3):220–233. [PubMed: 16516292]
- Heim, et al. Pituitary-adrenal and autonomic responses to stress in women after sexual and physical abuse in childhood. *JAMA : the Journal of the American Medical Association*. 2000; 284(5):592–597. [PubMed: 10918705]
- Hien D, Ruglass L. Interpersonal partner violence and women in the United States: An overview of prevalence rates, psychiatric correlates and consequences and barriers to help seeking. *International Journal of Law and Psychiatry*. 2009; 32(1):48–55. [PubMed: 19101036]
- Holland T, Clare ICH, Mukhopadhyay T. Prevalence of criminal offending by men and women with intellectual disability and the characteristics of offenders: implications for research and service development. *Journal of Intellectual Disability Research*. 2002; 46(Supplement 1):6–20. [PubMed: 12061335]
- Hosp J, Reschly D. Predictors of restrictiveness of placement for African-American and Caucasian students. *Exceptional Children*. 2002; 68(2):225–238.
- Hosser D, Raddatz S, Windzio M. Child maltreatment, revictimization, and violent behavior. *Violence*. 2007; 22(3):318–333.
- Hubble L, Groff M. Magnitude and direction of WISC-R Verbal-Performance IQ discrepancies among adjudicated male delinquents. *Journal of Youth and Adolescence*. 1981; 10(2):179–184. [PubMed: 24310251]
- Jonson-Reid M, Drake B, Chung S, Way I. Cross-type recidivism among child maltreatment victims and perpetrators. *Child Abuse & Neglect*. 2003; 27(8):899–917. [PubMed: 12951139]
- Jonson-Reid M, Way I. Adolescent sexual offenders: Incidence of childhood maltreatment, serious emotional disturbance, and prior offenses. *American Journal of Orthopsychiatry*. 2001; 71(1):120–130. [PubMed: 11271711]
- Kaufman, AS.; Kaufman, NL. *Kaufman Brief Intelligence Test*. Second ed. AGS Publishing; Circle Pines, Minnesota: 2004.
- Kendall-Tackett K, Lyon T, Taliaferro G, Little L. Why child maltreatment researchers should include children's disability status in their maltreatment studies. *Child Abuse & Neglect*. 2005; 29(2):147–151. [PubMed: 15734180]
- Lansford JE, Miller-Johnson S, Berlin LJ, Dodge KA, Bates JE, Pettit GS. Early physical abuse and later violent delinquency: a prospective longitudinal study. *Child Maltreat*. 2007; 12(3):233–245. [PubMed: 17631623]
- Leone PE. Education Services for Youth with Disabilities in A State-Operated Juvenile Correctional System: Case Study and Analysis. *The Journal of Special Education*. 1994; 28(1):43–58.
- Maxfield MG, Weiler BL, Widom CS. Comparing self-reports and official records of arrests. *Journal of Quantitative Criminology*. 2000; 16(1):87–110.
- McGee R, Wolfe D, Olson J. Multiple maltreatment, attribution of blame, and adjustment among adolescents. *Development and Psychopathology*. 2001; 13:827–846. [PubMed: 11771910]
- Miskovic V, Schmidt L, Georgiades K, Boyle M, Macmillan H. Adolescent females exposed to child maltreatment exhibit atypical EEG coherence and psychiatric impairment: Linking early adversity, the brain, and psychopathology. *Development and Psychopathology*. 2010; 22(02):419–432. [PubMed: 20423551]
- Morgan PL, Farkas G, Hillemeier MM, Maczuga S. Risk factors for learning-related behavior problems at 24 months of age: population-based estimates. *Journal of Abnormal Child Psychology*. 2009; 37(3):401–413. [PubMed: 19057886]
- Murali R, Chen E. Exposure to violence and cardiovascular and neuroendocrine measures in adolescents. *Annals of Behavioral Medicine*. 2005; 30(2):155–63. [PubMed: 16173912]
- Murphy C, Yeargin-Allsopp M, Decoufle P, Drews C. The administrative prevalence of mental retardation in 10-year-old children in metropolitan Atlanta, 1985 through 1987. *American Journal of Public Health*. 1995; 85(3):319. [PubMed: 7892912]
- Murphy DM. The prevalence of handicapping conditions among juvenile delinquents. *RASE: Remedial & Special Education*. 1986; 7(3):7–17.

- Murphy, G.; Mason, J.; Bouras, N. Psychiatric and behavioural disorders in developmental disabilities and mental retardation. Cambridge University Press; 1999. People with developmental disabilities who offend; p. 226-245.
- Murray-Close D, Han G, Cicchetti D, Crick NR, Rogosch FA. Neuroendocrine regulation and physical and relational aggression: The moderating roles of child maltreatment and gender. *Developmental Psychology*. 2008; 44(4):1160–1176. [PubMed: 18605842]
- Obrodovi J, Bush N, Stamperdahl J, Adler N, Boyce W. Biological sensitivity to context: the interactive effects of stress reactivity and family adversity on socioemotional behavior and school readiness. *Child development*. 2010; 81(1):270–89. [PubMed: 20331667]
- Perkins, SC. Factors Associated with the Comorbidity of Violence Exposure and Disabilities. (under review)
- Perkins, SC.; Graham-Bermann, S. Violence Exposure and the Development of School-Related Functioning: Psychopathology, Neurocognition, Language Deficits, and Disabilities, *Journal of Aggression and Violent Behavior: A Review Journal*. (in press)
- Pithers WD, Gray A. The other half of the story: Children with sexual behavior problems. *Psychology, Public Policy, and Law*. 1998; 4(1):200–217.
- Quinn M, Rutherford R, Leone P, Osher D, Poirier J. Youth with Disabilities in Juvenile Corrections: A National Survey. *Exceptional Children*. 2005; 71(3):339–346.
- Reed E, Raj A, Falbo G, Caminha F, Decker MR, Kaliel DC, et al. The prevalence of violence and relation to depression and illicit drug use among incarcerated women in Recife, Brazil. *International Journal of Law and Psychiatry*. 2009; 32(5):323–328. [PubMed: 19615747]
- Rosen D, Seng JS, Tolman RM, Mallinger G. Intimate Partner Violence, Depression, and Posttraumatic Stress Disorder as Additional Predictors of Low Birth Weight Infants Among Low-Income Mothers. *Journal of Interpersonal Violence*. 2007; 22(10):1305–1314. [PubMed: 17766728]
- Scarborough AA, Mccrae JS. School-age special education outcomes of infants and toddlers investigated for maltreatment. *Children and Youth Services Review*. 2009; 32(1):80–88.
- Skiba R, Poloni-Staudinger L, Gallini S, Simmons A, Feggins-Azziz R. Disparate access: The disproportionality of African American students with disabilities across educational environments. *Exceptional Children*. 2006; 72(4):411.
- Smith DK, Leve LD, Chamberlain P. Adolescent Girls' Offending and Health-Risking Sexual Behavior: The Predictive Role of Trauma. *Child Maltreatment*. 2006; 11(4):346–353. [PubMed: 17043319]
- Sobsey D. Exceptionality, education, and maltreatment. *Exceptionality*. 2002; 10(1):29–46.
- Sobsey D. Marital stability and marital satisfaction in families of children with disabilities: Chicken or egg? *Developmental Disabilities Bulletin*. 2004; 32(1):62.
- Sobsey D, Randall W, Parrila R. Gender differences in abused children with and without disabilities. *Child Abuse & Neglect*. 1997; 21(8):707–721. [PubMed: 9280377]
- St. John D, Pai L, Belfer ML, Mulliken JB. Effects of a child with a craniofacial anomaly on stability of the parental relationship. *Journal of Craniofacial Surgery*. 2003; 14(5):704–708. [PubMed: 14501333]
- Straus, MA. Measuring Conflict and Violence: The Conflict Tactics (CT) Scales. In: Straus, MA.; Gelles, RJ., editors. *Physical Violence in American Families*. Transaction Publishers; New Brunswick, New Jersey: 1990. p. 29-47.
- Sullivan PM, Knutson JF. Maltreatment and disabilities: A population-based epidemiological study. *Child Abuse & Neglect*. 2000a; 24(10):1257–1273. [PubMed: 11075694]
- Sullivan PM, Knutson JF. The prevalence of disabilities and maltreatment among runaway children. *Child Abuse & Neglect*. 2000b; 24(10):1275–1288. [PubMed: 11075695]
- Swahn MH, Whitaker DJ, Phippen CB, Leeb RT, Teplin LA, Abram KM, et al. Concordance between self-reported maltreatment and court records of abuse or neglect among high-risk youths. *American Journal of Public Health*. 2006; 96(10):1849–1853. [PubMed: 17008582]
- Talbot J, Riley C. No One Knows: offenders with learning difficulties and learning disabilities. *British Journal of Learning Disabilities*. 2007; 35(3):154–161. doi:10.1111/j.1468-3156.2007.00456.x.

- U.S. Department of Education, National Center for Education Statistics. Digest of Education Statistics, 2009. 2010. (NCES 2010-013), Table 50
- Wareham J, Dembo R. A Longitudinal Study of Psychological Functioning Among Juvenile Offenders: A Latent Growth Model Analysis. *Criminal Justice and Behavior*. 2007; 34(2):259–273.
- Wertlieb EC. Individuals with disabilities in the criminal justice system: A review of the literature. *Criminal Justice and Behavior*. 1991; 18(3):332–350.
- White NA, Loeber R. Bullying and Special Education as Predictors of Serious Delinquency. *Journal of Research in Crime and Delinquency*. 2008; 45(4):380–397.
- Widom CS, White HR. Problem behaviours in abused and neglected children grown up: Prevalence and co-occurrence of substance abuse, crime and violence. *Criminal Behaviour & Mental Health: Special Issue: Criminality, substance abuse and psychiatric disorders: Comorbidity and multiple risk factors*. 1997; 7(4):287–310.
- Yeargin-Allsopp M, Drews C. Mild mental retardation in black and white children in metropolitan Atlanta: a case-control study. *American Journal of Public Health*. 1995; 85(3):324–328. [PubMed: 7892913]

**Table 1**

## Descriptive Statistics Intelligence, Achievement and Attention

Measure	N	Minimum	Maximum	Mean	SD	$\alpha$
KBIT Verbal	88	62	130	91.69	14.03	0.91
KBIT Non-verbal	88	48	130	96.77	14.43	0.85
KBIT Composite	88	54	128	93.35	14.54	0.67
WRAT Reading	93	12	118	89.24	15.78	0.90
WRAT Spelling	95	49	123	90.23	15.99	0.80
WRAT Math	96	45	120	84.53	15.27	0.83
CBCL Attention	106	0	16	6.36	0.39	0.80



**Table 2**

## Summary of Logistic Regression Results Predicting to Disability

Variable	<i>b</i>	SE	WALD	<i>p</i>	Odds Ratio
Cognitive Delay					
Age	.026	.337	.006	.938	1.027
Ethnicity			.163	.983	
African American	-.345	.906	.145	.704	.708
Mixed Ethnicity or other	-.163	.911	.032	.858	.850
Child Maltreatment	.363	.373	.944	.331	1.437
Interpersonal Violence Exposure	.472	.424	1.235	.266	1.603
Verbal Disability					
Age	-.091	.281	.104	.747	.913
Ethnicity			1.994	.574	
African American	-1.545	1.113	1.928	.165	.213
Mixed Ethnicity or other	-.629	.865	.528	.467	.533
Child Maltreatment	1.210	.382	10.031	.002**	3.353
Interpersonal Violence Exposure	1.123	.450	6.227	.013*	3.074
Nonverbal Disability					
Age	-.011	.187	.004	.951	.989
Ethnicity			12.173	.007**	
African American	2.294	.659	12.123	.000***	9.917
Mixed Ethnicity or other	1.580	.690	5.249	.022**	4.857
Child Maltreatment	-.651	.356	3.345	.067~	.521
Interpersonal Violence Exposure	-.472	.376	1.582	.209	.624

**Table 3**

## Summary of Linear Regression Results for Full Scale Intelligence

Variable	B	SE B	$\beta$	<i>p</i>
Intelligence				
Age	-1.254	1.19	-0.11	.293
African American	-7.036 <sup>~</sup>	3.66	-0.22	.058
Mixed ethnicity or other	-6.663 <sup>~</sup>	3.85	-0.20	.087
Child Maltreatment	-2.178	1.84	-0.13	.240
Interpersonal Violence Exposure	-3.814 <sup>~</sup>	2.14	-0.19	.078

\* Note: =  $p < .0500$ ,

<sup>~</sup> =  $p < .1000$

**Table 4**

Hierarchical Regression Results Ethnicity and Violence Predicting to Full Scale Intelligence

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE(B)</i>	$\beta$	<i>B</i>	<i>SE(B)</i>	$\beta$	<i>B</i>	<i>SE(B)</i>	$\beta$
African American	-6.784	3.67	-0.22~	-7.472	3.61	-0.24*	-7.377	3.63	-0.24*
Mixed ethnicity	-7.355	3.92	-0.22~	-8.599	3.88	-0.26*	-8.303	3.94	-0.25*
IPV-E				-4.516	2.14	-0.23*	-4.507	2.15	-0.23*
Family Poverty							1.070	2.10	0.06
$R^2$		.058			.108			.111	
<i>F</i> for change in $R^2$		2.505~			4.463*			.259	

**Table 5**

Hierarchical Logistic Regression Results Violence Predicting to Verbal Disability

Variable	Model 1			Model 2		
	<i>B</i>	<i>SE(B)</i>	$\beta$	<i>B</i>	<i>SE(B)</i>	$\beta$
Child Maltreatment	0.15	0.03	0.42***	0.13	0.05	.35**
IPV-E				0.05	0.05	.11
$R^2$		.173			.180	
<i>F</i> for change in $R^2$		17.737***			.376	

**Table 6**

Hierarchical Regression Results Race and Maltreatment Predicting to Performance Impairment

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE(B)</i>	$\beta$	<i>B</i>	<i>SE(B)</i>	$\beta$	<i>B</i>	<i>SE(B)</i>	$\beta$
African American	0.46	0.11	0.47***	0.44	0.11	0.41***	0.43	0.10	0.44***
Mixed ethnicity	0.25	0.11	0.24*	0.23	0.11	0.23*	0.21	0.11	0.20~
Child Maltreatment				-0.09	0.05	0.14	-0.07	0.05	-0.14
Family Poverty							-0.12	0.06	-0.19~
$R^2$		.190			.217			.251	
<i>F</i> for change in $R^2$		9.503**			2.714			3.589~	