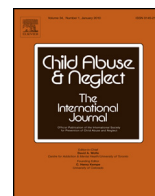




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Research article

Trauma changes everything: Examining the relationship between adverse childhood experiences and serious, violent and chronic juvenile offenders[☆]

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ABSTRACT

Among juvenile offenders, those who commit the greatest number and the most violent offenses are referred to as serious, violent, and chronic (SVC) offenders. However, current practices typically identify SVC offenders only after they have committed their prolific and costly offenses. While several studies have examined risk factors of SVCs, no screening tool has been developed to identify children at risk of SVC offending. This study aims to examine how effective the adverse childhood experiences index, a childhood trauma-based screening tool developed in the medical field, is at identifying children at higher risk of SVC offending. Data on the history of childhood trauma, abuse, neglect, criminal behavior, and other criminological risk factors for offending among 22,575 delinquent youth referred to the Florida Department of Juvenile Justice are analyzed, with results suggesting that each additional adverse experience a child experience increases the risk of becoming a serious, violent, and chronic juvenile offender by 35, when controlling for other risk factors for criminal behavior. These findings suggest that the ACE score could be used by practitioners as a first-line screening tool to identify children at risk of SVC offending before significant downstream wreckage occurs.

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Introduction

Approximately 1 in 8 reported violent crimes in the United States are committed by a juvenile offender (FBI, 2012). However, less than 10% of all juvenile offenders commit over 50% of all serious and violent juvenile offenses (Piquero, 2011). This segment of the youth offending population, known as the serious, violent, and chronic (SVC) offenders, inflict considerable harm and economic costs on society due to the volume and type of crimes that they commit (DeLisi & Piquero, 2011; Loeber & Farrington, 1998).

Although past research suggests that there are several developmental, social, and psychological risk factors for SVC offending (see Fox, Jennings, & Piquero, 2014), the general approach to identifying SVC offenders has typically been reactive

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in nature. Specifically, SVCs are currently identified only after they have accrued multiple felonies and violent offenses, and the resultant harm has already occurred (Loeber & Farrington, 2000). Consequently, both academics (e.g., Loeber & Ahonen, 2014; Loeber & Farrington, 2012; Thornberry, Huizinga, & Loeber, 1995; Zahn, 2009) and practitioners (e.g., Baglivio, Jackowski, Greenwald, & Howell, 2014) have called for a more efficient and effective method for identifying youth at risk for becoming serious, violent, and chronic offenders.

Therefore, the purpose of this research is to determine if a tool developed in the medical field, called the adverse childhood experiences (ACE) score, could be used to evaluate youth at risk of future SVC offending before their criminal behavior begins. The ACE has been found to relate to serious negative health outcomes in adulthood, such as ischemic heart disease, high blood pressure, chronic lung disease, skeletal fractures, liver disease, cancer, and even early death, for those with higher levels of neglect, adversity, or trauma in childhood (Flaherty et al., 2013). Similarly, criminologists and psychologists have found that individuals who commit serious violent crimes tend to have high rates of trauma, abuse, and other harmful experiences in childhood, even when controlling for other environmental and biological factors (Farrington, 2005; Fox et al., 2014; Laub & Sampson, 1994; Moffitt, 1993; Nagin & Tremblay, 1999). As a result, there is reason to believe that the ACE may also be used to identify individuals at high risk of becoming serious, violent, and chronic offenders.

Serious, Violent, and Chronic Juvenile Offenders

In 1995, the U.S. Department of Justice's Office of Juvenile Justice and Delinquency Prevention (OJJDP) commissioned a study group on serious and violent juvenile offenders in order to learn more about the etiology of these offenders, and how best to prevent juveniles from committing serious and violent criminal acts (see Farrington, Loeber, & Tfofi, 2012; Loeber & Farrington, 2000). Through the study group's investigation, as well as the OJJDP-funded longitudinal youth studies conducted in Denver, Pittsburgh, and Rochester, there has been a substantial increase in the literature on the causes, correlates, and prevention strategies for serious, chronic, and violent juvenile behavior.

One of the most significant and recurring findings in the literature is that SVCs are disproportionately victims of trauma, abuse, neglect, and maltreatment during childhood, as compared to the less severe or non-offending juvenile population (Dierkhising et al., 2013; Fox et al., 2014; Loeber & Farrington, 2000). Specifically, new research shows that 90% of juvenile offenders in the United States experience some sort of traumatic event in childhood (Dierkhising et al., 2013), and up to 30% of justice-involved American youth actually meet the criteria for post-traumatic stress disorder due to trauma experienced during childhood (Dierkhising et al., 2013).

Additional studies have shown that individuals who were abused or neglected during childhood are far more likely to commit a violent act than those who did not experience abuse and neglect (Dodge, Bates, & Pettit, 1990; Maxfield & Widom, 1996; Widom, 1989). In the Rochester Youth Development Study, maltreated children were significantly more likely to commit violence between ages 14 and 18, even after controlling for gender, ethnicity, socioeconomic status, and family structure (Smith & Thornberry, 1995). Maxfield and Widom's (1996) seminal study on child abuse also found that experiencing trauma and abuse during childhood increased the odds of juvenile violent behavior by more than 200%.

This connection between childhood maltreatment and antisocial behavior is addressed in the developmental pathology perspective. This perspective examines the roots and nature of deviance in maltreated children. Theorists studying this paradigm have found that abused and neglected children have a higher likelihood of detrimental development outcomes, including psychopathology (Cicchetti & Toth, 1995; Toth & Cicchetti, 2013). The trauma may affect the biological and psychological development of the child by causing some type of neural impairment disrupting the regulatory processes central to maintaining their normal wellbeing (Cicchetti & Rogosch, 2012). For instance, research suggests that adverse childhood experiences may cause chromosome damage (Shalev et al., 2013) and functional changes to the developing brain (Anda, Butchart, Felitti, & Brown, 2010; Cicchetti, 2013; Danese & McEwen, 2012; Teicher et al., 2003). Stressful events, such as those included in the ACE score, may also lead to a heightened neural state triggering the brain to excrete adrenal steroids, growth hormones, amino acids, and other stress mediating chemicals known as the allostatic response (Garland, Boettiger, & Howard, 2011). While these stress-managing chemicals may be beneficial when produced in short, confined bursts, a prolonged chemical response resulting from chronic stress such as ongoing childhood abuse, called an allostatic load, may result in permanent chemical elevations and other destructive physiological and behavioral responses (Cicchetti & Toth, 2005).

As a result of these neurological and psychological changes, the maltreated child is prone to violence in a number of ways. The physiological changes resulting from the allostatic load may lead to extreme, and potentially violent, reactions to even trivial stimuli. The higher inclination toward violence could also be the result of problems with affect regulation in the abused or neglected children. Specifically, According to Toth, Harris, Goodman, and Cicchetti (2011), maltreated children experience difficulties recognizing, expressing, and understanding their emotions. These children exhibit more aggressive and reactive behavior and are more predisposed to detect angry emotional expressions. A study by Howes, Cicchetti, Toth, and Rogosch (2000) also indicated that abusive families also have more difficulty regulating anger in their children. These effects can produce dramatic changes on the emotional development of the child and may be connected to higher levels of externalizing violent behavior.

Exposure to parental incarceration has also been linked to delinquency and other maladaptive behaviors (Geller, Garfinkel, Cooper, & Mincy, 2009; Murray & Farrington, 2008). Among the 411 males in the Cambridge Study of Delinquent Development, Murray and Farrington (2005) found that parental imprisonment predicted antisocial and delinquent outcomes up to

age 32, even after controlling for other childhood risk factors. Exposure to household violence in childhood has also been found to uniquely contribute to later behavioral problems and/or delinquency. [Herrera and McCloskey \(2001\)](#) found that in a sample of 299 children, exposure to violence in the household significantly predicted a referral to juvenile court up to 5 years later.

In short, criminological and public health research suggests that childhood trauma and adversity significantly increases the odds of serious, chronic, and violent offending ([Piquero, Farrington, & Blumstein, 2003](#)), and there are considerable policy and prevention advantages to identifying children at higher risk of becoming SVC offenders before destructive criminal behavior develops ([Farrington, 1989](#); [Loeber & Farrington, 2000](#)). However, successfully predicting future SVC offenders is a difficult task, as no screening tool has been developed for the early identification of SVC offenders ([Piquero, Jennings, & Barnes, 2012](#)).

Consequently, practitioners and academics are relegated to identifying children at risk of SVC offending before they accrue multiple felonies and violent offenses, and the resultant harm to their victims, themselves, and society has occurred ([Fox et al., 2014](#); [Loeber & Farrington, 2000](#)). As a single violent offense (excluding homicide) costs society \$63,870 ([Cohen & Piquero, 2009](#)), and the average criminal career costs between \$2.47 and \$3.34 million per offender ([Cohen, 1998](#)), the price of being reactive when identifying and preventing SVC offenders is staggering.

The development of a SVC screening tool would allow those routinely in contact with children (such as doctors, school nurses, teachers, and criminal justice practitioners) to proactively identify children at risk for SVC offending *before* it starts and intervene with targeted therapeutic programs, in order to help prevent the devastating outcomes associated with childhood trauma and abuse.

The Adverse Childhood Experiences (ACE) Score

The adverse childhood experiences (ACE) score was first used in 1998 in a seminal medical study examining the relationship between childhood abuse and trauma and the leading causes of death in adults ([Felitti et al., 1998](#)). In the retrospective study of over 17,000 middle-aged adults with Kaiser-Permanente health insurance, Felitti and his colleagues identified several traumatic and adverse childhood experiences that significantly and positively correlated with several serious, chronic, and life-threatening ailments in adulthood, including heart disease, high blood pressure, chronic lung disease, skeletal fractures, liver disease, cancer, and even early death ([Felitti et al., 1998](#)). Items in the original ACE score include: emotional, physical, and sexual abuse; witnessing household violence; household substance abuse; household mental illness; and having an incarcerated household member. Additional ACE items included in recent research are: physical and emotional neglect; and parental separation/divorce. Most studies utilize an index comprised of seven to ten ACE items ([Felitti et al., 1998](#); [Finkelhor, Shattuck, Turner, & Hamby, 2013](#); [Palusci, 2013](#)). ACE scores are calculated using the total number of ACE items an individual has experienced.

While each of the traumatic events in the ACE exerts negative impact on an individual's health, behavior, and/or psychological development ([Anda et al., 2010](#)), exposure to multiple adverse experiences has an exponentially more harmful effect ([Felitti et al., 1998](#)). For instance, adults who experience four or more ACEs have twice the risk of stroke as adults who experience three ACEs ([Felitti et al., 1998](#)). This indicates a dose–response effect, as each additional ACE exponentially increases the risk of negative physical and mental health outcomes ([Anda et al., 2006, 2010](#)).

Adverse Childhood Experiences and Future Negative Outcomes

Subsequent research on ACE scores has demonstrated that individuals with multiple ACEs have more psychological and mental health issues including depression, anxiety, post-traumatic stress disorder, eating disorders, insomnia, substance abuse, and conduct disorder ([Anda et al., 2006, 2010](#); [Bellis, Lowey, Leckenby, Hughes, & Harrison, 2014](#); [Chapman, Dube, & Anda, 2007](#)). Higher cumulative ACE scores have also been shown to increase the risk of problematic behaviors such as heavy drinking, smoking, risky sexual behavior, poor education and employment outcomes, and involvement in violence ([Bellis et al., 2014](#); [Hillis, Anda, Felitti, & Marchbanks, 2001](#); [Hillis et al., 2004](#)). ACEs have recently been identified with immediate negative consequences such as chromosome damage ([Shalev et al., 2013](#)) and functional changes to the developing brain ([Anda et al., 2010](#); [Cicchetti, 2013](#); [Danese & McEwen, 2012](#); [Teicher et al., 2003](#)).

It has also been suggested that many negative outcomes associated with high ACE scores are innate solutions adopted to respond and cope with trauma in the absence of healthier and more positive coping options, such as the allostatic load and other developmental pathologies that were previously discussed ([Larkin, Felitti, & Anda, 2014](#)). Such neurological and chemical dysfunction can lead to many negative physiological and behavioral reactions, and could be the origin of the many serious psychological, health, and behavioral problems associated with high ACE scores ([Garland et al., 2011](#)).

Developmental and life-course criminology (DLC) theorists have also identified several distinct trajectories of antisocial behavior, such as [Moffitt's \(1993\)](#) dual taxonomy of life-course persistent (LCP) and adolescence-limited (AL) offenders, which are linked to specific neurodevelopmental deficits and offending patterns across the life-course ([Moffitt, 2006](#); [Patterson & Yoerger, 2002](#); [Piquero & Moffitt, 2005](#)). For instance, AL offenders, who commit deviant and criminal behavior mainly during the teenage years, begin offending in their early to mid teenage years as a response to social pressures such as peer influence or the maturity gap, and mainly commit relatively minor violations such as underage drinking, vandalism, and drug use, before desisting in early adulthood ([Moffitt, 1993](#)). Conversely, LCPs begin offending very early in life, often

in childhood, and commit a wide variety of serious and violent crimes throughout their lives (Farrington, 2003; Moffitt, 1993).

Indeed, empirical research has shown that LCP offending is related to certain neuropsychological (i.e. biological, neurological, hormonal or genetic) deficits that interact with certain negative social environments, such as childhood abuse and poor family functioning, to produce long-term criminal behavior that is seen across the LCP offender's lifetime (Moffitt, 2006; Piquero, Farrington, et al., 2012). For instance, studies have found that genes may make early-onset (i.e. LCP) offenders more sensitive to negative social influences, such as maltreatment and abuse, as compared to adolescence-onset offenders (Eley, Lichtenstein, & Moffitt, 2003; Hoeve et al., 2014; Painter & Scannapieco, 2013; Taylor, Iacono, & McGue, 2000), and children with the monoamine oxidase A (MAOA) allele who were also victims of abuse in childhood were more likely to report mental health problems later in life, compared to maltreated children without this genetic "vulnerability" (Kim-Cohen et al., 2006). As DLC research, particularly Moffitt's taxonomy, suggests that neuropsychological deficits and negative environmental influences such as childhood abuse and trauma occur at higher rates among the LCP offenders, it is expected that the more serious, violent, and chronic juvenile offenders are more likely to experience childhood trauma than their less criminogenic counterparts.

Adverse Childhood Experiences and Criminal Behavior

Very little research has examined the link between the ACE scores and criminal behavior. The only published study on the topic examined the prevalence of ACEs among 64,000 juveniles referred to the Florida Department of Juvenile Justice (FDJJ) using items from a risk assessment for reoffending (Baglivio, Epps, Swartz, Huq, & Hardt, 2014). Results showed that the FDJJ sample of juvenile offenders were 13 times less likely to have no adverse childhood experiences, and over 4 times as likely to have experienced four or more ACEs as the adults in the original ACE study sample (Baglivio, Epps, et al., 2014).

The present study aims to build upon prior research by examining the effectiveness of using ACE scores as a screening tool to identify SVC offenders in a cohort of juvenile offenders when controlling for several of the strongest risk factors for criminal behavior. By understanding the impact that trauma and adversity in childhood has on the increased risk of the serious, violent, and chronic juvenile offending, a more proactive stance on the prevention and reduction of childhood abuse and SVC offenders may be developed.

Methodology

Data and Measures

Data used in this study were collected on a cohort of SVC offenders who aged out of the juvenile justice system between January 1, 2007 and December 31, 2012. Serious, violent, and chronic offenders were defined as any juvenile with three or more felony referrals, in which at least one of the offenses was violent. As a reference group, all juveniles referred to FDJJ for one non-violent felony in this time frame were also included and classified as "one and done" (O&D) offenders. The resulting cohort consists of 22,575 unique offenders, of which 10,714 are SVCs and 11,861 are O&D offenders.

ACE Score Items

The dataset consists of each juvenile's complete criminal record, and all information collected from a risk-assessment, the Positive Achievement for Change Tool (PACT), which is used to evaluate the recidivism risk and rehabilitation needs of each juvenile offender.

While many risk assessment tools are available, and the use of such tools has expanded in recent years, few have empirical support or have been validated on the population with which they are implemented (Skeem, Scott, & Mulvey, 2014). The PACT has been validated in several studies, and includes all relevant risk factors regarding the individual that may be omitted from other common risk assessments. For instance, a meta-analysis conducted on the predictive validity of risk assessments used with juvenile offending populations suggest that the mean weighted effect size (Area Under the Curve/AUC) for second generation assessments is .635, and is .646 for third generation assessments (Schwalbe, 2007). The AUC for the PACT, in its first generation, was found to have an unweighted value between .590 and .640, which suggests that the PACT is already a reliable and predictive assessment (Baglivio, 2009; Baglivio & Jackowski, 2013; Baird et al., 2013; Winokur-Early, Hand, & Blankenship, 2012). Furthermore, while other common juvenile risk assessments including the Structured Assessment of Violence Risk in Youth (SAVRY), Psychopathy Checklist: Youth Version (PCL:YV) and Youth Level of Service/Case Management Inventory (YLS/CMI) include most of the critical historical (e.g., age of criminal onset, offending frequency and crime types, history of childhood trauma and abuse), individual (e.g., attitudes, personality traits, substance abuse), and contextual (e.g., peer delinquency, family environment) risk factors needed to accurately predict the risk of future criminal behavior (Skeem et al., 2014), the PACT is unique in that it places added emphasis on the historical and contextual factors surrounding the child in question and has multiple safeguards in place to ensure this information is accurately evaluated and recorded.

Specifically, PACT data is collected through a semi-structured interview conducted by a juvenile probation officer, a case file review, and a review of official child abuse records. Items from the PACT were used to determine if a child experienced

the trauma, abuse, and adversity outlined by each of the ACE items, and were coded according to the presence (1) or absence (0) of the ACE experience. The items used to calculate an individual's ACE score in this study are: (a) emotional abuse; (b) physical abuse; (c) sexual abuse; (d) emotional neglect; (e) physical neglect; (f) witnessing household violence; (g) household substance abuse; (h) household mental illness; and (i) household member incarceration. An overall ACE score (0–9) was created by summing the total number of ACE items experienced for each of the youth in the FDJJ cohort.

Control Variables

Well established risk factors for criminal behavior were included as control measures in the analysis. Demographic correlates of offending such as gender, race/ethnicity, and age of criminal onset were used as baseline controls (Ellis, Beaver, & Wright, 2009; Moffitt, 1993). In this analysis, race was coded as either white or minority, where any non-Hispanic whites were coded as "0" and all other races/ethnicities (e.g., African-American, Hispanic) were coded as "1." The racial and ethnic background of the youth was self reported by the child. Age of criminal onset was identified by the first adjudicated offense of the juvenile, ranging from age 9 to age 18. Corresponding to the item built into the PACT, the age of onset variable is coded in five categories: "age 12 and under," "age 13 or 14," "age 15," "age 16," and "ages 17–18."

To account for the influence of other risk factors identified in the major criminological and psychological perspectives such as self-control theory (Gottfredson & Hirschi, 1990), social learning theory (Bandura, 1963; Burgess & Akers, 1966), strain theory (Agnew, 1992) measures of the juveniles' impulsivity (low or high impulsivity), anti-social peer influence (low, medium, or high emulation of anti-social peers), and socio-economic status (annual family income) respectively, were also coded for inclusion in the analysis. Each of these measures were assessed by the youth's case officer and coded in the PACT database based on their evaluation of the individual across multiple interviews, the juvenile's responses to the PACT questionnaire, and verification of official records such as those compiled by the Department of Children and Families (DCF) and criminal records and PACT assessments compiled by FDJJ. For instance, if after a full assessment of the youth's records and responses, the interviewer deemed the individual to be highly impulsive or strongly emulating his/her antisocial peers, the responses for each measure were coded accordingly in the PACT dataset. Similarly, while childhood abuse and trauma was self-reported by the youth, these measures were also verified with DCF to determine if claims have been filed, substantiated, or should be initiated by a DCF case worker.

Results

Descriptive Statistics

Table 1 presents the bivariate statistics for all risk factor covariates among the juvenile offending groups. Significant differences between the SVCs and O&Ds were found for all covariates. Approximately 91% of SVCs are male, compared to 78% of the O&D offenders. SVCs are more likely to be minorities than O&Ds, and the age of criminal onset was significantly younger among the SVC offenders as compared to the O&Ds.

Table 1
 Demographics of the sample.

		O&D	SVC	χ^2
Gender	Male	77.5%	90.8%	731.73***
	Female	22.5%	9.2%	
Race	White	42.7%	23.1%	975.15***
	Black, Hispanic or other	57.3%	76.9%	
Age of onset	Age 12 & under	8.4%	47.0%	7021.33***
	Age 13–14	26.4%	36.8%	
	Age 15	21.2%	10.7%	
	Age 16	24.3%	4.4%	
	Age 17 & over	19.7%	1.1%	
Family income	Under \$15,000	18.0%	19.1%	450.79***
	\$15,000–\$34,999	49.2%	59.6%	
	\$35,000–\$49,999	20.8%	15.7%	
	\$50,000 or over	12.1%	5.6%	
Anti-social peers	Does not admire or emulate anti-social peers	53.3%	20.9%	2981.97***
	Somewhat admires or emulates anti-social peers	39.2%	53.0%	
	Strongly admires or emulates anti-social peers	7.5%	26.1%	
Impulsivity	High self-control, usually thinks before acting	71.0%	36.3%	2725.11***
	Highly impulsive, often acts before thinking	29.0%	63.7%	

Note: SVC n = 11,861, O&D n = 10,714.

*** p < .001.

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Table 2
 Bivariate correlations of ACEs.

	ACE 1	ACE 2	ACE 3	ACE 4	ACE 5	ACE 6	ACE 7	ACE 8	ACE 9
ACE 1: emotional abuse	1.00								
ACE 2: physical abuse	0.16	1.00							
ACE 3: sexual abuse	0.08	0.32	1.00						
ACE 4: emotional neglect	0.16	0.11	0.07	1.00					
ACE 5: physical neglect	0.12	0.33	0.24	0.15	1.00				
ACE 6: household violence	0.20	0.53	0.27	0.13	0.35	1.00			
ACE 7: household substance abuse	0.18	0.18	0.10	0.09	0.22	0.25	1.00		
ACE 8: household mental illness	0.10	0.14	0.08	0.02	0.12	0.15	0.12	1.00	
ACE 9: incarcerated household member	0.16	0.19	0.09	0.06	0.19	0.23	0.29	0.13	1.00

Table 3
 Individual ACE prevalence in the O&D and SVC offender groups.

	O&D	SVC	χ^2
ACE 1: emotional abuse	21.3%	39.8%	908.37***
ACE 2: physical abuse	17.8%	33.9%	764.26***
ACE 3: sexual abuse	8.0%	8.8%	5.12
ACE 4: emotional neglect	9.9%	15.4%	154.24***
ACE 5: physical neglect	7.9%	19.6%	663.39***
ACE 6: household violence	21.9%	39.6%	834.98***
ACE 7: household substance abuse	16.0%	29.8%	614.45***
ACE 8: household mental illness	8.5%	14.5%	203.89***
ACE 9: incarcerated household member	49.7%	80.0%	2254.31***

Note: SVC $n = 11,861$, O&D $n = 10,714$.

* $p < .05$.
 *** $p < .001$.

In line with strain theory, significant variation in annual household income was found between the SVC and O&D groups as the families of SVC offenders appear, in general, to be poorer than the O&D families. Social learning theory posits that modeling and association with anti-social peers are the major influences on an individual's development of anti-social behavior. Admiration of anti-social peers was indeed significantly higher for SVC offenders, as 26% of SVCs strongly admire or emulate antisocial peers compared to 7% of the O&Ds. Finally, consistent with self-control theory, a strong and significant variation in the level of impulsivity was found between the SVC and O&D groups, with the SVCs more than twice as likely to be assessed as highly impulsive than the O&D offenders (64% vs. 29%).

Child abuse and other adverse childhood experiences often do not occur in isolation. To demonstrate the relationships between the ACE measures, the bivariate correlations between each item are found in Table 2. The largest correlation between ACE items was found between the presence of physical abuse and household violence ($r = 0.53$). While many of these items are related to one another, only four correlations were higher than 0.30.

The prevalence of ACEs among the SVC and O&D offenders is presented in Table 3. The SVCs experienced significantly more ACE events than the O&D offenders. Having an incarcerated family member was the most prevalent ACE for both groups, although 80% of SVC offenders had family members in prison compared to less than 50% of the O&Ds. For five ACE items (emotional abuse, physical abuse, household substance abuse, household mental illness, and witnessing household violence) the proportion of SVCs that experienced this trauma was nearly double the rate of the O&D offenders. About 20% of the SVC youth were victims of physical neglect, and 15% were victims of emotional neglect, both significantly higher than the 8% and 10% of O&Ds that experienced these ACEs, respectively. The only ACE for which there was a minor difference between SVCs and O&D offenders was the rate of sexual abuse experienced, with 9% of the SVC offenders and 8% of the O&D offenders experiencing this type of abuse.

Fig. 1 illustrates the cumulative prevalence of ACEs among the SVC and O&D groups. As ACE scores increase, the gap between SVC and O&D offenders widens. On average, the SVC offenders had twice the number of ACEs as O&D offenders. SVCs with 4 or more ACEs were more than double the proportion of O&D offenders (33% vs. 14%). SVCs with 6 or more ACEs were more than triple the rate of the O&Ds (10% vs. 3%). Finally, while more than 90% of SVC offenders experienced at least one traumatic event in childhood, fewer than 70% of the O&D offenders experienced 1 or more ACEs.

Multivariate Analyses

To determine if ACE scores can successfully distinguish between SVC and O&D offenders, a series of multivariate logistic regressions were conducted. In the first model, presented in Table 4, block entry was utilized to evaluate the impact of the main predictor variable (ACE score) on the odds of a juvenile becoming a SVC vs. O&D offender, above and beyond the effect of relevant demographic and theoretical covariates. In the second analysis, shown in Table 5, the nine items that make up the total ACE score are individually evaluated for their unique impact on the risk of SVC offending, when controlling for all theoretical and demographic covariates. As several items in the ACE score are believed to co-occur

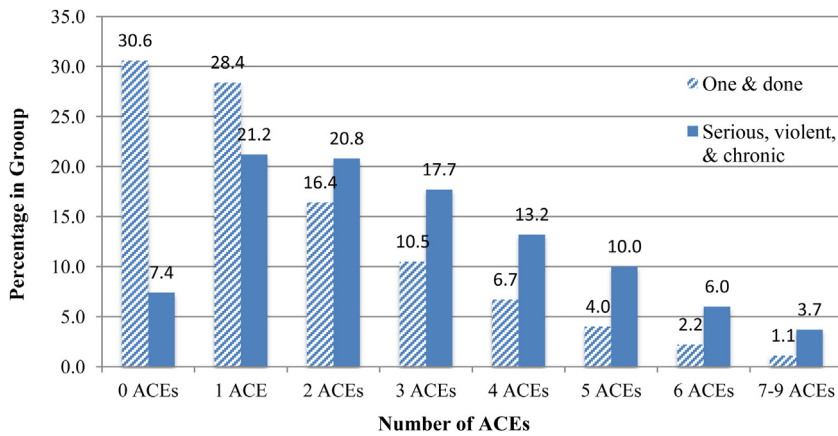


Fig. 1. ACE score prevalence in the O&D and SVC offender groups.

Table 4

Model 1: total ACE score predicting SVC vs. O&D offending.

	B	SE	OR
ACE score	.298	.012	1.35***
Gender	1.55	.055	4.69***
Race	1.09	.041	2.97***
Age of onset	-1.06	.018	.348***
Anti-social peers	.720	.030	2.05***
Impulsivity	.681	.040	1.98***
Family income	.002	.023	1.00

Note: OR = odds ratio; Nagelkerke $R^2 = .567$, $p < .001$.

*** $p < .001$.

Table 5

Logistic regression result – individual ACE items.

	B	SE	OR
ACE 1: emotional abuse	.229	.044	1.26***
ACE 2: physical abuse	.454	.051	1.58***
ACE 3: sexual abuse	-.170	.074	.844*
ACE 4: emotional neglect	.073	.058	1.07
ACE 5: physical neglect	.283	.049	1.23***
ACE 6: household violence	.204	.049	1.23***
ACE 7: household substance abuse	.192	.048	1.21***
ACE 8: household mental illness	.091	.059	1.09
ACE 9: incarcerated household member	.786	.041	2.19***
Gender	1.43	.056	4.16***
Race	1.03	.042	2.79***
Age of onset	-1.05	.018	.350***
Anti-social peers	.711	.030	2.04***
Impulsivity	.708	.041	2.03***
Family income	.018	.023	1.02

Note: OR = odds ratio; Nagelkerke $R^2 = .567$, $p < .001$.

* $p < .05$.

*** $p < .001$.

in violent juvenile populations, tests of multicollinearity were conducted. No items were significantly correlated at the .05 level, and all tolerance levels were above .55, exceeding the .40 threshold of multicollinearity.

The first multivariate model was statistically significant and rather successful at predicting a juvenile's offender classification, as 80% of SVCs and 81% of O&D offenders were correctly predicted based upon the covariates in the model. Results of the analysis show that the youth's ACE score was a strong and significant predictor of SVC offending, above and beyond the impact of all other risk factors for criminal behavior in the model. In fact, the addition of the ACE measure significantly improved the fit of the model and provided a superior predictor of SVC offending than the control variables alone. Specifically, for each additional ACE that a child experiences, the odds of becoming an SVC offender increases by 35% even when controlling for gender, race, age of onset, impulsivity, peer influence, and family income. This means that children with two ACEs are 70% more likely to be SVCs, 4 ACEs increases a child's SVC risk by 140%, and six or more ACEs leads to more than a 200% higher risk of SVC vs. single felony offending.

The second multivariate analysis, which examined the individual components that make up the total ACE score, along with all covariates, was also statistically significant ($p < .001$). The strongest predictor of SVC offending among the ACEs was having an incarcerated household member, as this more than doubled the odds that a juvenile will become an SVC offender even when controlling for all other covariates and items in the ACE score. Physical abuse was also a strong and significant predictor of offending type, where individuals who experienced physical abuse during childhood were 58% more likely to be SVC than O&D offenders. Four ACE items were each found to individually raise the risk of SVC offending between 20% and 26%: physical neglect, emotional abuse, household violence, and household substance abuse. Sexual abuse was actually shown to be a risk factor for O&D offending as it increased the odds by 16%. In short, results indicate that all but two ACE items, emotional neglect and having a household member suffering from a mental illness, were significant predictors of serious, violent, and chronic offending among the FDJJ youth.

Discussion

This study evaluated the impact of adverse childhood experiences on a cohort of juvenile offenders in Florida, to better understand the impact that ACEs have on serious, violent, and chronic criminal behavior. Results indicate that there is a significant difference in the prevalence of adverse childhood experiences between the SVC and O&D offenders, with SVC offenders showing higher prevalence of individual ACE's as well as higher composite ACE scores. The total number of ACEs among the SVC offenders was more than double that of the O&Ds, and the number of juveniles that experienced six or more types of trauma, abuse, and adversity was triple the rate for the SVCs vs. O&Ds.

The multivariate analysis indicates that it is possible to distinguish between SVCs and O&D using a juvenile's ACE score. Each ACE a child experienced increased the risk of being a serious, violent, and chronic offender by more than 35%, even when controlling for other known risk factors for criminal behavior.

The components analysis showed that some ACEs have more impact on risk of SVC offending than indicated in the aggregated model, as physical abuse and incarcerated household members each raised the SVC risk by 58% and 119%, respectively. Most other ACE components, with the exception of emotional neglect, sexual abuse, and household mental illness, were shown to raise the risk of SVC offending between 21% and 26% each.

Although very limited research has examined the relationship between trauma in the ACE score and criminal behavior, the current study suggests that not only do these experiences increase the risk of SVC offending later in life, but there is a non-linear effect between experiencing multiple forms adversity in childhood and an increased risk of committing serious, violent, and chronic crime later in life. These findings support the propositions of the developmental pathology perspective, as each additional traumatic experience in childhood was found to increase the likelihood of exhibiting aggressive and "pathological" (i.e., severe criminality) behavior, even when controlling for the major demographic and criminological risk factors. While the study could not identify the specific biological and neurological changes that may have taken place among the abused children, it was able to highlight the injurious relationship between the stress believed to result from early childhood trauma and subsequent chronic antisocial behavior. The findings also support the predictions of Moffitt's developmental taxonomy, as the youth with the most significant developmental and environmental risk factors (i.e., those who experienced multiple events of childhood trauma and abuse, had an early criminal onset, had high levels of impulsivity), were significantly more likely to become serious, violent, and chronic juvenile offenders. While this study aimed only to assess the development of juvenile offending behavior, the SVC trajectory maps directly onto Moffitt's LCP offending group, and suggests that the young SVC offenders may continue to commit violence and serious crimes throughout the life-course similar to the LCP offenders.

Results of this study also support past research findings by showing that the prevalence of ACEs among juvenile offenders is substantially higher than the ACEs seen in Felitti and colleagues' original study sample, regardless of their offending risk and rate (Baglivio, Epps, et al., 2014). This study also expands the knowledge base by suggesting that ACEs have a significant impact on SVC offending above and beyond the influence of major risk factors for crime such as gender, race, age of onset, impulsivity, peer influence, and socio-economic status.

Still, it should be noted that in the current study, not every ACE had an equal impact on the increased risk of serious, violent, and chronic offending. Two ACE items, emotional neglect and household mental illness, were shown to not have a significant impact at all. Even more surprisingly, sexual abuse was found to be a stronger predictor of membership in the O&D offending group instead of the SVC category when statistically controlling for the other ACE item measures and control variables. This finding does not align with prior research on the impact of sexual abuse on criminality or other externalized behaviors, as the literature generally suggests that sexual abuse is one of the most salient, severe, and distressing forms of trauma to occur during childhood (Burkhart & Fromuth, 1996; Felitti et al., 1998; Finkelhor, Omerod, & Turner, 2009). However, some researchers (e.g., Dong, Anda, Dube, Giles, & Felitti, 2003) have also recommended that the effects of childhood sexual abuse should be evaluated alongside other traumatic experiences, as achieved in the present research. Possible causes of these unexpected findings and potential directions for future research are outlined in the section to follow.

Limitations and Future Research

While this study demonstrates that the ACE score shows promise as a tool for identifying children who are at risk of becoming serious, violent, and chronic juvenile offenders, there are several limitations. First, the data were collected as part

of a FDJJ risk assessment, and not for the explicit purpose of the present research. Consequently, only items collected in the FDJJ's PACT were available for use in the present study. For example, the demographic variables were measured based on the child, and no such data was collected for the parents or family members. This may limit the understanding of race and other important social factors related to family composition, but it would be very difficult for DJJ to reliably collect this data on all family members. Also, while the present study examined the impact of ACEs on the increased risk of repeated serious and violent offending when compared to juveniles who committed one felony, it would also be beneficial to compare the SVC offenders' ACE scores to a non-offending population.

The data also may contain collection bias, where individuals may underreport past abuse or other adverse childhood experiences. Many individuals may be evaluated in later adolescence and asked to recall experiences of their early childhood. As such, important information may be forgotten, blocked out, or concealed. The utilization of the structured interview is aimed to reduce such collection bias, as the case-worker is trained to look for important cues of abuse and not simply follow the answers of the child. The caseworkers also have access to the DCF child abuse registry database and are able to check any records in that system to see if any reported allegations were confirmed or found to be unsubstantiated. Regardless, certain behaviors may still be underreported in the data.

The data is also limited in that some juveniles may have less time in the study to become an SVC offender. For example, some individuals may come into contact with DJJ at age 10, while others may not be processed until age 17. The later onset juveniles would thus only have one year to recidivate. While recognizing the limitation, we believe this also illustrates Moffitt's assertion that early onset offenders commit more crime, not just because they are chronic offenders, but also because they start earlier and last longer than adolescent onset offenders. Under this perspective, individuals who develop delinquent behavior later in adolescence would be predicted less likely to become SVC offenders due to their later age of onset. Adolescent onset at age 17 also only represents 19.7% of the juvenile offenders classified as one-and-done and the measure was controlled for in the logistic regression analysis. Finally, a prospective longitudinal study design or structural equation model would improve the causal ordering of trauma and offending, and help to better understand the relationship between ACE's and subsequent criminal behavior. Despite these limitations, this study provides an important preliminary step in understanding the complex relationships between childhood trauma and chronic offending.

Policy Implications and Conclusion

There are several important policy implications and applied uses for this research. One clear recommendation is to implement policies and programs that help prevent the occurrence of ACEs among children, and reduce the likelihood that high risk children will become SVC offenders in the future. Unlike other offender risks and needs tools (e.g., SAVRY, PCL:YV, PACT), ACE scores can be used as an early screening tool by pediatricians, school personnel, and other practitioners to identify risk factors for offending before a child is ever involved in the criminal justice system. While adverse childhood experiences are not the only risk factors for SVC offending, given the number of medical, psychological, behavioral, and criminal outcomes that high scores on the ACE score has been directly linked with, there is reason to believe that the ACE score can help identify and prevent high risk children from becoming SVC offenders as well as suffering a host of physical and mental health issues. Armed with evidence that traumatic events in childhood could lead to a variety of public health issues including serious, violent, and chronic criminal behavior, practitioners can intervene in the child's life and help avoid these unfortunate, yet preventable, outcomes from occurring in the future.

Still, policy-makers might raise concerns that prevention programs aimed at reducing the issues identified in the ACE score would need to be comprehensive, ongoing, and therefore extremely costly to taxpayers during a period of limited financial resources. However, several programs designed to address ACEs are not very costly, but highly cost effective in terms of crime prevention. According to a comprehensive analysis conducted by the Washington State Institute for Public Policy, prevention programs such as Multi-Systemic Therapy (MST), Functional Family Therapy (FFT), and Parent-Child Interaction Therapy (PCIT), cost \$3,261 (FFT) to \$7,370 (MST) per child in the program, while the net benefit of these programs, in terms of direct crime prevention, ranged between \$5617 (PCIT) and \$30,706 (FFT) per child (Lee et al., 2012). In terms of total return on investment, for every \$1 invested in the FFT, MST, and PCIT programs, there was an average of \$7 in future savings (Lee et al., 2012). Similar results were also found by the 2000 Nobel Prize in Economics winner James Heckman, as he showed that there was \$8.70 in savings to society for each \$1 invested in trauma-specific prevention programs (Heckman & Krueger, 2003).

As the number of children experiencing ACEs continues to increase (Finkelhor et al., 2009), there is diminishing justification for the reactive stance currently used to identify and treat SVC offenders. It is also clear how easily prevention and intervention programs outweigh the costs of serious, violent, and chronic offending over the life course. Given the financial benefits of implementing trauma prevention programs, and the multitude of harmful outcomes ACEs cause later in life, there is empirical evidence for the old adage that a penny of prevention is worth a pound of cure.

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