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Early Childhood Predictors of Boys' Antisocial and Violent Behavior in Early Adulthood

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Abstract

Research on early childhood predictors of violent behaviors in early adulthood is limited. The current study investigated whether individual, family, and community risk factors from 18 to 42 months of age were predictive of violent criminal arrests during late adolescence and early adulthood using a sample of 310 low-income male participants living in an urban community. In addition, differences in trajectories of overt conduct problems (CP), hyperactivity/attention problems (HAP), and co-occurring patterns of CP and HAP from age 1.5 to 10 years were investigated in regard to their relationship to violent and nonviolent behaviors, depression, and anxiety at age 20. Results of multivariate analyses indicated that early childhood family income, home environment, emotion regulation, oppositional behavior, and minority status were all significant in distinguishing violent offending boys from those with no criminal records. Additionally, trajectories of early childhood CP, but not ADHD, were significantly related to self-reports of violent behavior, depressive symptoms and anxiety symptoms. Implications for the prevention of early childhood risk factors associated with adolescent and adult violent behavior for males are discussed.

Keywords

violent behavior; conduct problems; attention-deficit/hyperactivity disorder; trajectories; low-income

In addition to the physical and psychological harm to the victims, youth engagement in violent behavior comes at great societal and individual cost (Cohen & Piquero, 2009; Miech et al., 1999). Despite overall decreases in rates of violent criminal behavior in recent years, the U. S. Department of Justice (2017) estimates that over 1,200,000 violent crimes (i.e., physical assault, rape, homicide, and robbery) were committed in the United States in 2016 alone. Further, with 35% of the perpetrators of violent crime under the age of 25 (U.S. Department of Justice, 2017), it is especially important to investigate possible early developmental precursors of risk in an attempt to inform prevention efforts. By identifying early risk factors, it may be possible to target such factors for prevention and early

intervention, as behaviors during infancy and toddlerhood have been shown to be more malleable than later childhood (Reid, 1990).

Previous work with the current sample (Sitnick et al., 2017) identified multiple proximal and distal risk factors associated with adolescents' engagement in violent crime. However, it is unclear if the same risk factors continue to be influential during early adulthood when perpetrators are no longer considered minors within the legal system. Thus, the current study aims to determine if previously established early childhood predictors of adolescent violent behavior extend to violent criminal behavior in early adulthood. In addition, as others have identified childhood conduct problems (CP) and attention-deficit/hyperactivity disorder (ADHD) as risk factors for increased antisocial behavior (AB), and in some cases, violent behavior during adolescence (Moffitt, 1990; Shaw, Lacourse, & Nagin, 2005). As children are often not diagnosed with ADHD until school age, the current study will investigate symptoms of ADHD in the form of hyperactivity/attention problems (HAP). Specifically, the current study investigates whether early-starting trajectories of CP and hyperactivity/attention problems (HAP) are predictive of violent behaviors and other indicators of maladjustment in early adulthood.

The importance of early childhood

With few exceptions (e.g., Dodge, Greenberg, Malone, & Conduct Problems Prevention Research Group, 2008; Loeber et al., 2005), the majority of research investigating predictors of violent criminal behavior during early adulthood and adolescence generally focus on antecedents occurring during middle childhood and adolescence (Hill, Lui, & Hawkins, 2001; Tolan, Gorman-Smith, & Henry, 2003). Furthermore, studies frequently combine violent and nonviolent AB and fail to examine whether these different forms of AB show common or different etiological profiles (Moffitt & Caspi, 2001; Shaw, Hyde, & Brennan, 2012). However, some researchers have posited that different developmental pathways may be present for those who engage in violent versus nonviolent behavior (Tremblay, 2006). If this is the case, it may be possible to identify early risk factors specific to later violent behavior, which could then serve as targets for prevention in early childhood. As there is limited work in early childhood focusing on later violent behavior, we review literature on early childhood antecedents of general AB, including violent behavior, with the aim of determining if those risk factors are distinct for the prediction of violence or less serious forms of AB.

With the transition from infancy to the toddler period, developmental challenges increase. Children become mobile within their environment but do not yet have the cognitive or emotion regulation skills to be fully independent from parents, which often results in increases in oppositional and aggressive behavior during the "terrible twos" (Shaw & Bell, 1993). Attachment theory suggests that parental responsiveness and sensitivity during this developmental period can promote later child compliance (Erickson, Sroufe, & Egeland, 1985; Lyons-Ruth, Alpern, & Repacholi, 1993) and reduce their likelihood of developing conduct problems (CP) at later ages (Shaw, Owens, Vondra, Keenan, & Winslow, 1996), highlighting the importance of early responsive and sensitive parenting. The long-term consequences of harsh and over-controlling parenting behavior are evident in Patterson's

(1982) coercion theory, which posits that responding to children's emerging quest for autonomy by modeling verbal and physical aggression during the toddler years can contribute to subsequent increases in children's oppositional and aggressive behavior. The relationship between rejecting, coercive parenting and children's disruptive behavior can become cyclical in nature and ultimately lead to CP outside of the home (Scaramella & Leve, 2004; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Research in early childhood supports these pathways towards increased aggression (Shaw et al., 1994, 1998; Sitnick et al., 2015). In contrast to a home environment characterized by overcontrolling and rejecting parenting, research also has established that more supportive and positive parenting during early childhood are related to reduced risk of emerging CP (Dishion et al., 2008; Gardner, Sonuga-Barke, & Sayal, 1999; Shaw et al., 2003; 2012). Although few studies have traced such relationships to violent behavior in adulthood, one study found that warm and nurturing parenting and enriched stimulation for children was related to decreased risk of violent behavior during adulthood (Walker, Chang, Vera-Hernández, & Grantham-McGregor, 2011).

Previous work with the current sample of low-income, urban boys found that rejecting parenting during the toddler period increased the likelihood of being arrested for a violent versus nonviolent crime during adolescence (Sitnick et al., 2017). Additionally, poor emotion regulation in early childhood and being of minority status also distinguished violent from nonviolent arrests. The study also found that early family income, minority status, oppositional behavior, and emotion regulation by age 3 increased the likelihood of being arrested for a violent crime relative to those adolescents who were never arrested. Family income, however, was the only distinguishing factor between those who were arrested for nonviolent crimes and those who were never arrested. While these results suggest that there are distinct risk factors for violent and nonviolent behavior, it is unclear whether or not these same factors will continue to be influential in predicting arrests for violent crimes in adulthood – a primary goal of the current study.

Other studies have also implicated various child level factors as potential risk factors for later violent and less serious forms of AB. Early oppositionality has been associated with later CP (Shaw et al., 1998) and prior research suggests that oppositionality as early as age 6 is associated with adolescent violent behavior (Broidy et al., 2003; Kokko et al., 2006; Nagin & Tremblay, 1999). Relatedly, poor early emotion regulation is a well-established risk factor for later AB (Caspi, Henry, McGee, Moffitt, & Silva, 1995; Moffitt & Caspi, 2001). Moffitt et al. (2011) found low self-control observed at age 3.5 to be predictive of various economic burdens on society at age 38, most notably crime. As early adolescent development of self-regulation has been associated with multiple types of adolescent criminal behavior (Monahan, Steinberg, Cauffman, & Mulvey, 2013) and violent behavior (Cauffman et al., 2017), it may be possible to trace individual differences in emotion regulation back during the toddler/preschool periods as a risk factor for early adult violent behavior. Theoretically having self-control in early childhood may be even more critical for preventing later violent behavior for children reared in American urban poverty, based on the limited opportunities to achieve financial independence following prosocial channels (Loeber et al., 2005; Tolan, et al., 2003). Hence, for some children living in poverty, limited financial resources and inadequate access to quality education and health-care services may

in turn constrain future employment opportunities in early adulthood and increase risk for engaging in criminal activity to secure income.

Early trajectories of problem behavior

In addition to using family and community level risk factors in early childhood, it follows that researchers would want to pay particular attention to child antecedents of disruptive and AB, specifically aggression and oppositional behavior, as well as ADHD. Prior research suggests that children follow relatively stable trajectories of these types of disruptive problem behavior beginning around age 2, with little change in rank order across trajectory groups (NICHD Early Child Care Research Network, 2004; Shaw et al., 2003, 2005). In addition to studying early oppositionality and aggression, in terms of comorbidity the majority of youth with early-onset CP exhibit core features of ADHD, including HAP (Shaw et al., 2005). However, despite prior research on the co-occurrence between CP and HAP, few studies have examined heterogeneity in developmental trajectories of CP and HAP beginning in early childhood. Although there are studies that have been initiated during the school-age period (Nagin & Tremblay, 1999; Fontaine et al., 2008), in one of the only studies initiated during early childhood, Shaw et al. (2005) examined separate trajectories of overt CP and HAP from ages 2 to 10 using the current sample of low-income and racially diverse boys. The authors identified four trajectory groups for both CP and HAP, including persistently high and persistently low CP and HAP groups, as well as moderately high and moderately low desister CP and HAP groups. These trajectories were consistent with prior studies examining trajectories of CP and HAP (Fontaine et al., 2008; Nagin & Tremblay, 1999), suggesting that CP and HAP follow similar developmental courses from early childhood onward. All three investigative teams also found similar patterns of co-occurrence between the CP and HAP trajectory groups. Specifically, their analyses showed that a majority of youth showing chronic CP usually also showed chronic HAP (55–96%). In contrast, a more sizeable portion of children showing chronic HAP remained free of chronic CP.

Extensive research has linked the co-occurrence of early CP (e.g., Loeber & Dishion, 1983; Waschbusch, 2000) and HAP (e.g., Babinski et al., 1999; Sibley et al., 2011) to serious forms of AB in adolescence and early adulthood. However, studies examining associations between early symptoms of ADHD and later AB often fail to account for co-occurring CP, making it difficult to determine the unique contributions of HAP in early childhood to adult AB. Studies that *have* examined CP and HAP simultaneously have yielded inconclusive findings. Some studies have found that HAP in early or middle childhood is unrelated to AB in adolescence or adulthood after accounting for CP (e.g., Nagin & Tremblay, 1999; Mannuzza, Klein, Abikoff, & Moulton, 2004), yet others have found significant effects of HAP independent of prior levels of AB (e.g., Babinski et al., 1999; Sibley et al., 2011).

It is possible that this inconclusive pattern of findings regarding HAP and later AB is related to the frequent use of an overall measure of AB that aggregates across multiple types of aggressive, destructive, and norm-violating behaviors. This aggregate approach ignores behavioral heterogeneity within AB, including important differences between violent and nonviolent forms of AB (e.g., Lahey & Waldman, 2003). While CP and HAP appear to

follow comparable developmental courses beginning in early childhood, these problem behaviors may not be equally predictive of violent and nonviolent AB in early adulthood. Indeed, previous studies suggest that while youth with CP-only are at increased risk for more serious crimes involving violent behavior (e.g., assault, robbery), youth presenting only with hyperactivity and impulsivity in early childhood are more likely to engage in less serious and non-violent crimes as adults (e.g., public disorder, property crimes; Babinski et al., 1999; Barkley, Fischer, Smallish, & Fletcher, 2004). However, whether CP and HAP are differentially related to violent and nonviolent behavior remains unclear, with few studies examining this issue utilizing distinctive *trajectories* of CP and HAP that can be used to capture heterogeneity in developmental pathways.

Despite prior research linking early trajectories of CP and HAP with later AB, it is unclear whether these trajectories are uniquely predictive of adult AB or predict a range of behavioral problems in early adulthood. Childhood CP and HAP are each separately associated with increased risk for later depressive (Lahey, Loeber, Burke, Rathouz, & McBurnett, 2002; Meinzer et al., 2016) and anxiety symptoms (Lahey et al., 2002; Schatz & Rostain, 2006). However, little research has examined whether specific trajectories of CP and HAP beginning in early childhood are related to adult internalizing problems. Consistent with prior research suggesting that a small fraction of the adult population may demonstrate multiple types of problem behaviors that account for a disproportionate share of societal costs (e.g., Caspi et al., 2016), we hypothesized that children following trajectories of persistent CP and/or co-occurring CP/HAP may also show the high levels of depressive and anxiety symptoms in early adulthood.

The current study

The current study had two overall aims. First, we sought to extend Sitnick et al.'s (2017) findings on the early childhood precursors of violent AB during adolescence, using data from the Pitt Mother & Child Project to examine a similar set of child, family, and community level early childhood predictors in relation to violent behavior during young adulthood. Second, using early and middle childhood developmental trajectories of CP and HAP previously established by Shaw et al. (2005) in the current sample of low-income men, we also investigated the relative influence of early trajectories of CP and/or HAP in relation to violent behavior and internalizing problems. We hypothesized that a similar constellation of child and family level predictors would discriminate violent from nonviolent offenses and nonoffending, and that trajectories of persistently high CP would better discriminate young adult violent behavior and internalizing symptoms than persistently high levels of ADHD in early and middle childhood.

Methods

Participants

Participants were drawn from the Pitt Mother & Child Project, a prospective longitudinal study of child vulnerability and resiliency in low-income, high-risk youth (Shaw et al., 2003). Beginning in 1991, 310 infant boys and their primary caregivers were recruited from Women, Infants, and Children Program (WIC) Nutritional Supplement Clinics in Allegheny

County, Pennsylvania (PA), when the boys were between 6 and 17 months old. As the original intent of the study was to examine precursors of AB, the study was restricted to boys because of their higher rates of serious AB later in childhood and adolescence relative to girls (Kessler et al., 1994).

At the time of recruitment, the boys were between 6 and 17 months and 53% of them were European American, 36% were African American, 5% were biracial, and 6% were of other races (e.g., Asian American or Hispanic). At the study's outset, the mean per capita income was \$241 per month (\$2892 per year), and the mean Hollingshead SES score was 24.5, indicating a working class sample (Hollingshead, 1975). Mothers ranged in age from 17 to 43 years ($M = 27.82$, $SD = 5.33$). Sixty-three percent of mothers reported their relationship status as married or cohabitating, 28% had always been single, 8% were divorced or separated, and 1% were other (e.g., widowed). Fifty-nine percent of the mothers had 12 years of education or less. Thus, a large proportion of the boys in this study were considered to be at elevated risk for antisocial outcomes because of their low socioeconomic status and the child sex.

Retention rates have been consistently high throughout the two decades of data collection. Of the 310 families recruited for the initial assessment at age 1.5 years, data were available on 302 at the age 2 assessment. Subsequent lab or home assessments were convened when children were ages 3.5, 5, 6, 8, and 10, during which time retention rates ranged from 84–91% per assessment. Retention rates remained high through adolescence and early adulthood, with some data available for 251 families (81%) at the age 17 assessment, and 256 families (83%) at the age 20 and 22 assessments. It is noteworthy that there were significant differences in attrition at age 20 specific to arrest records [$F(2, 26) = 4.774$, $p = .009$], such that individuals who were arrested for violent criminal behavior (see court records below) were more likely to have missing data at age 20 than nonviolent offenders and those with no criminal records. This is not surprising as these individuals were more likely to be incarcerated and unable to come to the laboratory for a visit.

To test the second study hypothesis that CP and HAP trajectories from early-to-middle childhood are related to maladjustment in early adulthood, we utilized the same sample of 284 boys used by Shaw et al. (2005). Authors restricted their analyses to participants with measures of CP at three or more time points for purposes of modeling individual trajectories. As reported by Shaw et al. (2005), those included versus excluded in the analyses did not significantly differ with respect to key variables at age 2, including maternal age, maternal education, child fearlessness, child negative emotionality, maternal depressive symptoms, or rejecting parenting. As there were small sample sizes of certain trajectory groups (e.g., chronic CP: $n = 19$) and missing data on age 20 outcomes, expectation-maximization (EM) algorithm was used to replace missing values for the 284 participants in our subsample.

Procedure

Two- to three-hour assessments were conducted almost annually in families' homes and/or laboratory settings with mothers and their participating child from toddlerhood through early adulthood. The assessments providing data for the present study occurred at ages 1.5, 2, 3.5, 5, 5.5, 6, 8, 10, and 20 years. During assessments that took place prior to the child turning 18

years of age, mothers completed a series of questionnaires regarding socio-demographic characteristics, their family functioning (e.g., parenting), and their child's behavior. At age 20, participants completed questionnaires regarding their behaviors and attitudes. Additionally, juvenile court records from Allegheny County, PA, were collected when participants were between 15.9 and 18 years of age and adult court records were obtained via public records searches in the state of Pennsylvania. All participants provided consent and were compensated for their time after each assessment. All procedures received Institutional Review Board approval at the University of Pittsburgh.

Measures

Child oppositional behavior.—To assess disruptive and emotional problem behavior, mothers completed the 103-item Toddler Behavior Checklist (TBC; Larzelere, Martin & Amberson, 1989) when the boys were 18 months of age. Mothers rated boy's behavior in the past month on a 4-point scale. The 22-item oppositional subscale was used for these analyses ($\alpha = .90$; sample items "hits adults" and "is disobedient at home").

Child emotion regulation.—Boys were administered the cookie task at 42 months (Marvin, 1977), a delay of gratification task designed to assess emotion regulation. The task required children to wait for a cookie in a room that was cleared of all other toys while their mother completed a questionnaire. Mothers were given a transparent bag containing the child's preferred cookie and were instructed to keep the cookie within the boy's view but out of reach for three minutes. Boys' emotion regulation was coded into five mutually exclusive behaviors: active distraction, passive waiting, physical comfort seeking, focus on delay object, and information gathering, and the display of anger (for more details see Gilliom et al., 2002). The presence or absence of regulation behaviors was coded in 10-second intervals. Inter-rater reliability ranged from 0.64 to 0.79. For the current study, active distraction (intentionally shifting focus of attention away from the desired object to engage in other activities) was utilized based on past research supporting its use as an effective emotion regulation strategy and predictive of reduced risk for later AB (Gilliom et al., 2002; Grolnick et al., 1996).

Home environment.—To assess quality of the home environment, the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1994) was administered when participants were 24 months of age. The HOME assesses the quality and quantity of support and stimulation in the child's home environment using a 45-item observation and parent interview. Examiners rated the responsiveness, acceptance, and involvement of parents as well as organization, play materials, and variety of resources available to the child within the home environment. The current study utilizes the total HOME score ($\alpha = .82$) and items are scored such that higher scores reflect more positive and supportive home environments.

Trajectories of CP and HAP.—The present study examined trajectories of overt CP, HAP, and co-occurring patterns of CP and HAP, which were previously established by Shaw et al. (2005) using data from ages 2 to 10. Five items focusing on physical aggression, oppositional behavior, and temper tantrums found on both early child and child/adolescent versions of the Child Behavior Checklist (CBCL; Achenbach, 1991, 1992) were aggregated

to generate a factor for CP, and three items tapping attention, impulsivity, hyperactivity were generated to form a factor for HAP. Both were assessed via parent-report and demonstrated adequate internal consistency (CP: $\alpha = .56-.71$; HAP: $\alpha = .61-.78$). A full description of how these trajectories were created can be found in Shaw et al. (2005).

Demographics.—Mother's report of *minority status* (0 = European American, 1 = other races and ethnicities) and a composite of mother's report of *family income per year* at 18 and 24 months of age were included as covariates. Additionally, Census data was geocoded at the block group level at ages 18 and 24 months to assess *neighborhood risk* (see Winslow & Shaw, 2007). The neighborhood risk variable comprised the following block group level variables: (a) median family income, (b) percent families below poverty level, (c) percent households on public assistance, (d) percent unemployed, (e) percent single-mother households, (f) percent African American, and (g) percent bachelor's degree and higher. These individual variables were standardized, summed (after reverse scoring median family income and percent bachelor's degree), and then averaged to create an overall neighborhood risk score for each block group (see Winslow & Shaw, 2007 for more details). A composite score of neighborhood risk at ages 18 and 24 months was used in the current analyses.

Court records.—After receiving written permission from primary caregivers ($n = 272$; 87% of the initial recruitment sample), juvenile court records of arrests were obtained from local county offices on an annual basis when youth were between 15 and 18 years of age. Consistent with prior work using this sample (Sitnick et al., 2017), petitions were used to minimize the potential for social class and race to influence the outcome of court proceedings as petitions are filed after the arrest but prior to court proceedings. Juvenile petitions are equivalent to the number of criminal charges pressed against the boy in Pennsylvania. Boys with a petition for violent acts or threat of violent acts were categorized as violent offenders. The following petitions were included in this category for their harm or potential for harm to others: homicide and attempted homicide, forcible rape, indecent and sexual assault, aggravated assault, robbery, arson, and weapons possession. If a participant had petitions for both nonviolent and violent criminal behavior, the violent offense would supersede the other offenses in terms of group placement.

Similarly, adult arrest records in the state of Pennsylvania were obtained for all participants ($N = 310$) via public record search from the ages of 18 to 22. In keeping with the Federal Bureau of Investigation's (U.S. Department of Justice, 2017) definition of violent crime, participants were categorized as having a violent offense as an adult if they had arrest records for homicide and attempted homicide, forcible rape, indecent and sexual assault, aggravated assault, robbery, or arson. Unlike with the juvenile petitions, weapons offenses were not included for adults as it is possible for adults to legally possess firearms. Again, individuals with both violent and nonviolent offenses were categorized as violent. It is noteworthy that adult court records for all participants in the state of Pennsylvania were searched. If no court records were obtained, then participants were scored as having no adult offenses. However, since searchers were limited to Pennsylvania, it is possible that nonoffenders have offenses outside of the state.

Finally, juvenile and adult records were combined such that participants who had any violent juvenile or adult offenses were categorized as “violent offenders.” Participants with any offenses that did not include any violent behavior were categorized as “nonviolent offenders,” and participants with neither juvenile or adult offenses were categorized as “nonoffenders.” Combining juvenile and adult court records was advantageous as some of the juvenile violent offenders were still incarcerated for their offenses at the time of the adult records search which would have inaccurately resulted in the participant being classified as a nonoffender if only adult records were included in the current analyses. To minimize missing data for those participants who had missing data for their juvenile court records, these participants were coded as having no juvenile court records similar to the treatment of adult court records however, as with adult records, it is possible that those participants had offenses in other states.

Self-reported violent and von-violent antisocial behavior.—At age 20, participants completed a 53-item, modified version of the Self-Report of Delinquency Questionnaire (SRD; Elliott, Huizinga, & Ageton, 1985). Men rated the frequency with which they engaged in delinquent behavior, alcohol and drug use, and related offenses during the prior year using 3-point scale (1 = *never* and 3 = *more often*). While the original scale contains 62 items, 9 items (e.g., “have you run away from home?”) were removed to reflect developmentally appropriate acts of delinquency. For the present study, boys’ violent behavior scores were computed by summing 11 items describing aggressive or violent acts, such as “Have you physically hurt or threatened to hurt someone to get them to have sex with you?” ($\alpha = .75$). Non-violent AB scores were computed by summing the remaining 42 items, and a sample item included “Have you stolen or tried to steal things worth \$100 or more” ($\alpha = .88$).

Self-reported depression.—At age 20, men completed the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock & Erbaugh, 1961), a well-established and widely used measure of depressive states. Men rated the intensity of depressive symptoms over the past 6 months on a 3 point-scale (0 = *no symptomatology* to 4 = *severe symptomatology*), and a score was derived by summing these items ($\alpha = .86$). Reliability and external validity of the BDI are high (Beck, Steer, & Garbin, 1988).

Self-reported anxiety.—At age 20 men reported on their anxiety symptoms using the 21-item Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). Men rated how much each symptom bothered them over the past month using a 3-point scale ranging from *not at all* to *severely/it bothered me a lot*. A total score was created by summing all items, with sample items including “fear of losing control” and “unable to relax” ($\alpha = .93$).

Data Analyses

Analyses for the current study were conducted in two parts. The first part investigated early childhood predictors of violent and non-violent criminal behavior and the second part investigated trajectories of CP and ADHD symptomatology and their relationship with later violent behavior, nonviolent AB, depression, and anxiety. All analyses were conducted using SPSS Statistics 24 (IBM Corp, 2013). To investigate whether previously established early

childhood predictors of adolescent violent behavior extend to violent behavior in early adulthood, multinomial logistic regressions were conducted with three comparison groups: violent offenders versus nonviolent offenders, violent offenders versus nonoffenders, and nonviolent offenders versus nonoffenders. The full sample ($N = 310$) was utilized for these analyses. Family income was skewed and therefore log transformed prior to analyses. All continuous variables were mean centered. An iterative process was used such that all predictors were included in the initial regression and subsequent analyses conducted eliminated predictors that were no longer significant in the multivariate analyses.

For the second aim of the study, analyses of variance (ANOVAs) were conducted to test the association between trajectories of CP and HAP from ages 2 to 10 and subsequent adult behavioral outcomes. Analyses of ANOVAs were restricted to participants with measures of CP at three or more time points for purposes of modeling individual trajectories resulting in a sample of $N = 284$. Significant ANOVAs were followed with post-hoc comparisons to examine pairwise differences between trajectory groups. Bonferroni corrections were employed to adjust for multiple comparisons.

Results

Early childhood predictors of arrests

Descriptive statistics are shown in Table 1. In the categorization of arrest records, 69 (22.3%) participants were categorized as violent offenders, 79 (25.5%) as nonviolent offenders, and 162 (52.2%) as nonoffenders. As shown in Table 2, the majority of the sample remained in the same group when they were juveniles and adults; however, it is noteworthy that approximately 40% of the sample shifted group membership from adolescence to adulthood.

Bivariate correlations are presented in Table 3 with participant's group status dummy coded such that nonoffenders are the reference group. Placement in the violent offenders group was significantly correlated ($p < .05$) for all predictors (i.e., home environment, oppositional behavior, emotion regulations, family income, neighborhood risk, and minority status). However, placement in the nonviolent offenders group was not significantly related to any of the predictors (Insert Tables 1–3 here).

Initial multivariate analyses were conducted such that the home environment, oppositional behavior, emotion regulation, income, neighborhood risk, and minority status were included as predictors of court record group membership. Despite the significant univariate relationship between neighborhood risk and violent offenders ($r = .16$, $p < .01$), neighborhood risk was no longer significant in the multivariate model. Therefore, neighborhood risk was excluded from the remaining analyses, as doing so did not change the pattern of results. The final multinomial logistic regression model including the home environment, oppositional behavior, emotion regulation, income, and minority status is presented in Table 4. The overall model was significant at the $p < .01$ level ($\chi^2 = 58.96$, $df = 10$), indicating acceptable fit; the Nagelkerke's Pseudo R-square was 0.25. Results indicated that no predictors were significant in distinguishing between nonoffenders and nonviolent offenders. However, lower levels of emotion regulation ($OR = 1.09$, 95% $CI[1.01, 1.18]$, p

< .05) during early childhood significantly distinguished violent offenders from nonviolent offenders such that higher levels of emotion regulation decreased the odds of being in the violent offenders group relative to the nonviolent offenders. Finally, when comparing nonoffenders to violent offenders, family income (OR = 2.69, 95% CI [1.25, 5.76], $p < .05$), home environment quality (OR = 1.08, 95% CI [1.01, 1.16], $p < .05$), oppositional behavior (OR = .96, 95% CI [.93, 0.99], $p < .05$), emotion regulation (OR = 1.10, 95% CI [1.02, 1.19], $p < .05$), and minority status (OR = 3.43, 95% CI [1.39, 8.45], $p < .01$) were significant discriminators, such that minority status and higher levels of 18-month oppositional behavior were associated with being in the violent offender group. Similarly, higher levels of family income, home environment ratings, and emotion regulation during early childhood decreased the odds of being in the violent versus nonoffending group (Insert Table 4 here).

Adult Outcomes Associated with CP Trajectory Groups

We next examined whether trajectories of CP, HAP, and co-occurring CP/HAP from ages 2 to 10 would predict adult AB and internalizing problems. As reported in Table 5, results from the one-way ANOVAs indicated a significant effect of CP trajectory group on violent behavior, non-violent AB, depressive symptoms, and anxiety symptoms at age 20. Pairwise contrasts with a Bonferroni correction showed that boys in the chronic CP group reported higher levels of all four outcomes relative to the low CP and medium desister groups. Boys showing chronic and elevated levels of CP also showed higher levels of depression and anxiety relative to the medium decline group, although these two groups did not significantly differ with respect to violent or nonviolent behavior in early adulthood (Insert Tables 5–7 here).

Adult Outcomes Associated with HAP Trajectory Groups

Turning to the young adult outcomes associated with early HAP trajectory classifications, findings revealed a significant effect of HAP membership on self-reported non-violent AB at age 20 (see Table 6). Post-hoc comparisons indicated that children following a trajectory of chronic HAP from ages 2 to 10 showed higher levels of non-violent AB at age 20 than the low HAP group. No other differences in early adult outcomes were evident between HAP trajectory groups.

Adult Outcomes Associated with Comorbid CP & HAP Trajectory Groups

Our final set of analyses focused on early adult outcomes associated with patterns of co-occurring CP and HAP from ages 2 to 10. As shown in Table 7, one-way ANOVAs yielded a statistically significant effect of CP/HAP trajectory classification on all four measures of violent behavior, non-violent AB, depressive symptoms, and anxiety symptoms. Post-hoc contrasts indicated that children with chronic HAP + chronic CP demonstrated significantly higher levels of violent behavior and depressive symptoms than the low CP + low HAP and ‘others’ groups. The chronic HAP + chronic CP group also showed higher levels of non-violent AB at age 20 relative to the low CP + low HAP group and higher levels of anxiety than the ‘others’ group. While the chronic HAP + chronic CP group reported higher levels of depressive symptoms than the chronic HAP group, these two groups did not differ with respect to other measures of adult functioning.

Discussion

The current study is one of the first to investigate multiple early childhood predictors of early adult violent behavior using prospective data from multiple sources. Results indicate that by 2–3 years of age, for urban, ethnically diverse boys, we can reliably identify predictors of violent behavior during early adulthood. Specifically, when compared to those with no arrest records, boys later arrested for violent behavior were more likely to demonstrate high levels of oppositional behavior, poor emotional regulation skills, low levels of family income and quality care in the home during early childhood, and be African American versus European American. Additionally, early individual differences in emotion regulation distinguished those arrested for violent criminal behavior from those with nonviolent arrest records. These findings are consistent with longitudinal research from Moffitt and colleagues (2011) suggesting that early levels of self-control are particularly salient for adult outcomes, including criminal offenses. Further, results of the current study suggest that trajectories of CP beginning in early childhood distinguish adult violent behavior, nonviolent AB, and internalizing problems. Unlike trajectories of CP, early trajectories of HAP were not predictive of later problem behavior in isolation; however, children with high levels of co-occurring HAP and CP appeared to be most at risk for multiple types of problem behaviors in early adulthood, with the exception of the high HAP-only group from which it differed only in regards to adult depression.

Previous work with the current sample investigated early childhood predictors of adolescent violent criminal behavior (Sitnick et al., 2017). The current study extended previous work to early adulthood using young adult reports rather than criminal records. Hence, some of the differences might be attributable to the use of a different method for ascertaining violent behavior (e.g., self-reports typically include higher frequencies than arrest records). Although there are notable similarities across developmental period and assessment method, some notable exceptions also were evident. In investigating predictors of adolescent violent criminal behavior (Sitnick et al., 2017), early rejecting parenting, emotion regulation, and minority status distinguished adolescents who were arrested for violent versus nonviolent crimes. However, in the current study early emotion regulation was the only significant predictor to distinguish violent and nonviolent criminal behavior. Similarly, whereas family income during early childhood was a salient predictor to distinguish adolescent nonviolent criminal behavior from those with no juvenile records, income was no longer significant when including adult outcomes.

Turning to factors that predicted violent behavior not found in our prior work on adolescent outcomes, our results indicated that having a positive and supportive home environment served a protective function in relation to violent offending. The current study supports previous work suggesting a supportive home environment is predictive of lower levels of general AB (Walker et al., 2011). Although the HOME has been criticized because some of its content might be confounded by differences in socioeconomic status and ethnicity/race (Bradley, Corwyn, & Whiteside-Mansell, 1996), it is noteworthy that the HOME remained significant in the current analyses even after controlling for minority status, neighborhood risk, and income. These findings suggest that there are additional protective factors beyond economic resources that come with a positive home environment in relation to later violent

behavior. Although rejecting parenting at child age 18–24 months did discriminate violent from nonviolent behavior during adolescence based on brief observations of parent-child interaction (Sitnick et al., 2017), the total score of the HOME might have provided a more global and informative impression of the home environment and hence better prediction of AB to young adulthood.

It is interesting that despite significant univariate correlations with criminal arrest records (see Table 3), neighborhood risk was not a significant predictor in the multivariate analyses. While some research suggests that living in dangerous neighborhoods increases the likelihood that youth will engage in criminal behavior, specifically gang related violence (Hill et al., 2001). Others have found that the effects of exposure to neighborhood risk are before age of formal school entry because of young children's limited physical autonomy to engage with their surroundings independent of their parents (Duncan, Brooks-Gunn, & Klebanov, 1994; Kellam, Ling, Merisca, Brown, & Ialongo, 1998). Thus, the current findings are consistent with most research studying neighborhood effects in early childhood.

Turning to the analyses that linked boys' early trajectories of CP and HAP to later adjustment, we found that boys with chronically high levels of CP from ages 2 to 10 had higher levels of violent behavior, nonviolent criminal behavior, depression, and anxiety in early adulthood relative to children in the persistently low and moderate desister groups. Results from the present study corroborate and extend prior research showing that children who demonstrate elevated levels of CP as early as toddlerhood often continue to do so throughout adolescence and early adulthood (Moffitt et al., 2002; NICHD Early Child Care Research Network, 2004; Odgers et al., 2008).

Unlike trajectories of CP, early trajectories of HAP were generally not predictive of later problem behavior when they existed in isolation. When we only considered HAP symptomology from ages 2 to 10, the only outcome that statistically differed between HAP trajectories was nonviolent criminal behavior, which was higher in the chronic HAP group compared to the low HAP group. However, in contrast to children with persistently high HAP and high CP, the chronic HAP-only group did not differ from the low CP/HAP group on adult outcomes. Thus, chronic HAP was no longer predictive of adult AB once accounting for its overlap with co-occurring CP. These findings are consistent with prior work showing that although children with ADHD symptoms are at increased risk for exhibiting serious CP in early adulthood (e.g., Hechtman, Weiss, & Perlman, 1984), early ADHD provides little incremental value to the prediction of later AB once early CP are considered (Lahey et al., 2000; Lahey et al., 2010). Furthermore, findings from the present study do not suggest that CP and HAP are differentially related to violent and nonviolent behavior.

Consistent with prior research suggesting that a small fraction of the adult population may account for a disproportionate share of societal costs (e.g., Caspi et al., 2016), children with co-occurring CP and HAP not only showed the highest levels of AB, but they also demonstrated greater depressive and anxiety symptoms compared to other groups. Notably, similar to the current results showing that emotion regulation in toddlerhood was the only significant predictor distinguishing violent and nonviolent criminal behavior in adulthood,

Caspi et al. (2016) found that low self-control in childhood predicted adult membership in the multiple-high-cost segment of the population. Additionally, although Shaw et al. (2005) did not examine self-control per se, authors found that child fearlessness was an important factor discriminating CP and HAP groups, such that children following trajectories of high HAP and high CP were more fearless compared with children with persistently low HAP/low CP. Collectively, results suggest that childhood self-control is an important factor to consider in the early identification and treatment of children showing early co-occurring patterns of CP and HAP.

Consistent with the dual-failure model, it is possible that the aggressive and aversive behavior of children with early CP may contribute to interpersonal problems (e.g., conflict with caregivers, peer rejection) and poor academic performance, which in turn lead to mood problems (Capaldi & Stoolmiller, 1999). However, while it is possible that depressive and anxiety symptoms may follow from demoralizations related to repeated failures, the lack of earlier measures of depression or anxiety and use of a non-experimental study design preclude inferring directionality of this association between early CP and later internalizing problems.

Implications for Prevention

As the results of the current follow-up were consistent with our previous research in identifying early child and parenting predictors of later violent behavior (Sitnick et al., 2017), the implications for prevention efforts are also similar for young boys. Results of the current study and other investigations (Moffitt, 2015) suggest that promoting the development of self-regulation skills are paramount for boys living in urban poverty who are at increased risk for early-starting trajectories of CP and later violent offending. Improvements in young children's skills can occur through direct work with children or via parenting programs. Indeed, the HighScope Perry Preschool Study found that preschool interventions and parent support for at-risk children were linked to fewer violent offenses during adolescence and into adulthood (Schweinhart et al., 2005), likely through improving children's self-regulation skills in early childhood. Other interventions for young children have also had success in addressing the risk factors linked to adolescent violent behavior in the current study. For example, the Promoting Alternative Thinking Strategies curriculum (Domitrovich, Cortes, & Greenberg, 2007) and the Family Check-Up (Dishion et al., 2008) have been linked to improvements in children's emotion regulation skills and CP (Shelleby et al., 2012; Dishion et al., 2014), with increases in positive parenting often mediating the relationship between the intervention and CP (Dishion et al., 2008).

Limitations and Conclusions

The current study has several limitations. First, as participants were limited to males from low-income families living in an urban setting, findings cannot be generalized to females, children in families of higher socioeconomic status, or those living in nonurban settings. The use of court records in the first part of the analyses was advantageous in identifying violent offenses egregious enough to warrant arrest, but then limits the data to those who were arrested within PA. Arrest records from other states were not included and therefore participants may have been misclassified. In the second part of analyses, attrition rates must

be considered. There was significant attrition for those arrested for violent crime, so it is possible that participants who were not available for age 20 visits, possibly due to being incarcerated, would have inflated the rates of self-reported maladjustment behaviors. It is also important to note that we relied on continuous measures of CP and HAP collected from a community sample rather than formal DSM diagnoses of ADHD and Conduct Disorder (CD). Studies using clinical samples have shown that although children with diagnoses of ADHD+CD are at greatest risk for delinquency in early adulthood relative to ADHD-only, CD-only, and non-disordered controls (Sibley et al., 2011), children with ADHD-only also appear at higher risk for later offending relative to controls (Mannuzza et al., 2004; Sibley et al., 2011). It is possible that discrepant findings regarding the unique association between HAP in early childhood and later AB may in part be related to differences in sample characteristics and continuous vs. dichotomous measurement of CP and HAP.

Finally, as many children in the chronic CP group also showed chronic HAP in early childhood, we lacked statistical power to evaluate a “pure” chronic CP group. Thus, it remains unclear whether children presenting with both chronic HAP and chronic CP are more impaired as adults relative to children with chronic CP only. Indeed, research suggests an additive combination of HAP and CP, such that children presenting with both types of behavioral problems exhibit more severe and varied types of AB relative to children with CP-only (Sibley et al., 2011; Washbusch, 2002).

The current study is one of the first to investigate early childhood precursors of early adult violent behaviors utilizing an at-risk sample. Our results suggest that prevention efforts that specifically target later violent behavior should focus on supportive and positive home environments and children’s emotion regulation skills during early childhood. As results indicate that early trajectories of CP are associated with violent behavior and internalizing problems, by targeting children with high levels of CP in early childhood, prevention efforts may reduce risk for violent behavior during adulthood and mitigate risk for other forms of psychopathology.

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Table 1

Descriptive statistics for the total sample

	<i>M</i>	<i>SD</i>	<i>Range</i>
Oppositional behavior (Age 18 months ; Mother report)	32.99	11.27	0 – 65
Emotional regulation (Age 42 months; Observed)	10.92	5.14	1 – 18
Home environment (Age 24 months; Observed)	31.97	6.23	7.0 – 44.0
Family monthly income (Age 18 & 24 months; Mother report)	1046.07	642.99	205 – 4000
Neighborhood risk (Age	.39	1.17	–2.04 – 3.10
SRD Violent Behavior (Age 20; Self-Report)	11.82	1.59	11 – 22
SRD Non-Violent Behavior (Age 20; Self-Report)	51.58	7.16	42 – 79
BDI Depressive Symptoms (Age 20; Self-Report)	5.22	5.04	0 – 32
BAI Anxiety Symptoms (Age 20; Self-Report)	6.05	7.37	0 – 49
Minority status	<i>n</i> = 150 (48.4%)		
Violent offenders	<i>n</i> = 69 (22.3%)		
Nonviolent offenders	<i>n</i> = 79 (25.5%)		
Nonoffenders	<i>n</i> = 162 (52.2%)		
Conduct problems low group	<i>n</i> = 29 (10.2%)		
Conduct problems moderate desister group	<i>n</i> = 94 (33.1%)		
Conduct problems medium decline group	<i>n</i> = 142 (50.0%)		
Conduct problems chronic group	<i>n</i> = 19 (6.7%)		
ADHD – low	<i>n</i> = 16 (5.6%)		
ADHD – moderate desister	<i>n</i> = 77 (27.2%)		
ADHD – moderate stable	<i>n</i> = 134 (47.1%)		
ADHD – chronic	<i>n</i> = 57 (20.1%)		
Chronic HAP	<i>n</i> = 16 (5.6%)		
Chronic CP	<i>n</i> = 18 (6.3%)		
Low HAP + Low CP	<i>n</i> = 60 (21.1%)		
Others	<i>n</i> = 160 (56.3%)		

Table 2

Cross-tabs groupings comparing juvenile and adult records

	No adult offense	Adult nonviolent offense	Adult violent offense
No Juvenile offense *	162	34	9
Juvenile nonviolent offense	31	14	7
Juvenile Violent offense	26	19	8

* Note: As all 310 individual were included in the adult analyses, any missing data for juvenile records was entered as a juvenile nonoffender.

Table 3

Correlations

	1.	2.	3.	4.	5.	6.	7.
1. Violent offenders	1.0						
2. Nonviolent offenders	-.31**	1.0					
3. HOME environment – 24 months	-.19**	-.04	1.0				
4. Oppositional behavior 18 months	.10*	-.01	-.03	1.0			
5. Emotion Regulation 42 months	-.16**	.06	.06	.01	1.0		
6. Family income 18 & 24 months	-.19**	-.07	.36**	-.21	.11	1.0	
7. Neighborhood risk 18 & 24 months	.16**	.04	-.35**	.00	-.04	-.42**	1.0
8. Minority status	.26**	.07	-.38**	-.02	-.08	-.32**	.51**

*

 $p < .05$

**

 $p < .01$

Note: Nonparametric correlations are reported for the categorical variables minority status and court petition grouping. Court petitions groupings were dummy coded such that nonoffenders is the reference group with those classified as having a violent offense have a score of 1 for the violent offenders variable and those nonviolent offenders have a score of 1 for the nonviolent offenders variable.

Table 4

Multinomial Logistic Regression Results

	Nonoffenders ^a vs. Nonviolent offenders			Violent offenders ^a vs. Nonoffenders			Violent offenders ^a vs. Nonviolent offenders		
	β	p-value	Odds Ratio	β	p-value	Odds Ratio	β	p-value	Odds Ratio
Family income 18 & 24 months	-.45	.14	.64	1.01	.013	2.75	.42	.32	1.53
HOME environment 24 months	-.02	.48	.98	.07	.044	1.07	.05	.16	1.05
Oppositional behavior 18 months	.01	.35	1.01	-.04	.012	.96	-.03	.12	.94
Emotion Regulation 42 months	-.01	.76	.99	.10	.013	1.10	.09	.04	1.09
Minority status	.47	.17	.62	-1.17	.023	3.21	-.67	.22	1.96

^a Note. Indicates the reference group.

Adult Outcomes Associated with Trajectories of Parent-Reported Conduct Problems from 2 to 10 years

Table 5.

Adult Outcomes	Low (1) (<i>n</i> = 16)	Moderate Desister (2) (<i>n</i> = 77)	Moderate Stable (3) (<i>n</i> = 134)	Chronic (4) (<i>n</i> = 57)	Analysis of Variance (ANOVA) Results
Violent Behavior (SRD; Age 20)	11.23 (0.94) ^{1 < 3,4}	11.51 (1.20) ^{2 < 3,4}	12.15 (1.91) ^{3 > 1,2}	13.08 (2.86) ^{4 > 1,2}	$F(3, 276) = 6.87, p < .01$
Non-Violent Behavior (SRD; Age 20)	49.16 (5.65) ^{1 < 4}	51.24 (7.46) ^{2 < 4}	52.49 (7.56)	57.00 (10.96) ^{4 > 1,2}	$F(3, 276) = 4.43, p < .01$
Depressive Symptoms (BDI; Age 20)	3.76 (4.48) ^{1 < 4}	4.48 (4.43) ^{2 < 4}	5.68 (6.13) ^{3 < 4}	10.45 (8.69) ^{4 > 1,2,3}	$F(3, 276) = 6.45, p < .01$
Anxiety Symptoms (BAI; Age 20)	4.49 (5.98) ^{1 < 4}	5.80 (7.79) ^{2 < 4}	5.60 (8.73) ^{3 < 4}	11.90 (13.76) ^{4 > 1,2,3}	$F(3, 276) = 3.24, p < .05$

Note. SRD = Self-Reported Delinquency; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory. Means (standard deviations) are provided in columns with corresponding *F*-tests. Superscript numbers denote significant differences in mean scores between classes based on Bonferroni post-hoc comparisons. Underlined superscript numbers denote marginally significant differences in mean scores between classes.

Table 6.
Adult Outcomes Associated with Trajectories of Parent-Reported Hyperactivity/Attention Problems from 2 to 10 years

Adult Outcomes	Low (1) (<i>n</i> = 16)	Moderate Desister (2) (<i>n</i> = 77)	Moderate Stable (3) (<i>n</i> = 134)	Chronic (4) (<i>n</i> = 57)	Analysis of Variance (ANOVA) Results
Violent Behavior (SRD; Age 20)	11.03 (0.66) ^{1 < 4}	11.75 (1.67)	11.93 (1.78)	12.32 (1.98) ^{4 > 1}	<i>F</i> (3, 276) = 2.41, <i>p</i> = .07
Non-Violent Behavior (SRD; Age 20)	46.84 (4.20) ^{1 < 3, 4}	51.78 (7.92)	52.10 (7.34) ^{3 > 1}	53.66 (8.81) ^{4 > 1}	<i>F</i> (3, 276) = 3.11, <i>p</i> < .05
Depressive Symptoms (BDI; Age 20)	2.95 (4.37)	5.04 (4.93)	5.30 (5.73)	6.86 (7.33)	<i>F</i> (3, 276) = 2.09, <i>p</i> = .10
Anxiety Symptoms (BAI; Age 20)	5.22 (7.75)	5.97 (9.20)	5.42 (7.95)	7.60 (10.13)	<i>F</i> (3, 276) = 0.84, <i>p</i> = .48

Note. SRD = Self-Reported Delinquency; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory. Means (standard deviations) are provided in columns with corresponding *F*-tests. Superscript numbers denote significant differences in mean scores between classes based on Bonferroni post-hoc comparisons. Underlined superscript numbers denote marginally significant differences in mean scores between classes.

Table 7.
Adult Outcomes Associated with Trajectories of Conduct Problems (CP) and Hyperactivity/Attention Problems (HAP)

Adult Outcomes	Chronic HAP (1) (<i>n</i> = 16)	Chronic HAP + Chronic CP (2) (<i>n</i> = 18)	Low HAP+ Low CP (3) (<i>n</i> = 60)	Others (4) (<i>n</i> = 160)	Analysis of Variance (ANOVA) Results
Violent Behavior (SRD; Age 20)	11.94 (1.26)	13.08 (2.86) ^{2 > 3,4}	11.48 (1.24) ^{3 < 2}	11.92 (1.84) ^{4 < 2}	<i>F</i> (3, 276) = 3.93, <i>p</i> < .01
Non-Violent Behavior (SRD; Age 20)	51.89 (7.16)	57.00 (10.96) ^{2 > 3,4}	50.59 (6.90) ^{3 < 2}	52.04 (7.62) ^{4 < 2}	<i>F</i> (3, 276) = 3.23, <i>p</i> < .05
Depressive Symptoms(BDI; Age 20)	5.99 (6.47) ^{1 < 2}	10.45 (8.69) ^{2 > 1,3,4}	4.43 (4.29) ^{3 < 2}	5.03(5.56) ^{4 < 2}	<i>F</i> (3, 276) = 5.64, <i>p</i> < .01
Anxiety Symptoms(BAI; Age 20)	6.38 (7.68)	11.90 (13.76) ^{2 > 3,4}	6.21 (7.57) ^{3 < 2}	5.08 (8.45) ^{4 < 2}	<i>F</i> (3, 276) = 3.47, <i>p</i> < .05

Note. SRD = Self-Reported Delinquency; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory. Means (standard deviations) are provided in columns with corresponding *F*-tests. Superscript numbers denote significant differences in mean scores between classes based on Bonferroni post-hoc comparisons. Underlined superscript numbers denote marginally significant differences in mean scores between classes.