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DOI

[10.1177/0093854814558505](https://doi.org/10.1177/0093854814558505)

Publication date

2015

Document Version

Final published version

Published in

Criminal justice and behavior

[Link to publication](#)

Citation for published version (APA):

Hoeve, M., Colins, O. F., Mulder, E. A., Loeber, R., Stams, G. J. J. M., & Vermeiren, R. R. J. M. (2015). Trauma and mental health problems in adolescent males: Differences between childhood-onset and adolescent-onset offenders. *Criminal justice and behavior*, 42(7), 685-702. <https://doi.org/10.1177/0093854814558505>

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TRAUMA AND MENTAL HEALTH PROBLEMS IN ADOLESCENT MALES

Differences Between Childhood-Onset and Adolescent-Onset Offenders

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Justice-involved youths are more likely to have mental health problems than peers in the community. Therefore, it is important to develop an understanding of the antecedents of mental health problems in this group. The present study examined the association between childhood trauma and mental health problems in juvenile justice-involved adolescent males ($N = 422$), comparing childhood-onset with adolescent-onset offenders. Childhood-onset offenders were more likely than adolescent-onset offenders to report mental health and substance use problems, as well as childhood maltreatment. Via structural equation modeling, we found that childhood trauma predicted mental health problems in both offender groups. Multigroup analysis revealed a moderation effect of offender group: The association between trauma and mental health problems was stronger in adolescent-onset offenders than in childhood-onset offenders. Thus, mental health problems were more prevalent in childhood-onset offenders, but these problems were less well-explained by childhood trauma in childhood-onset than in adolescent-onset offenders. Theoretical and practical implications are discussed.

Keywords: maltreatment; psychopathology; forensic; adolescents; age of onset of offending

AUTHORS' NOTE: *This work was supported by a Marie Curie grant of the European Commission awarded to Machteld Hoeve (FP7-PEOPLE-2010-IOF, project 274337), The Netherlands Organization for Health Research and Development (ZonMw, project 159010002), and the Correctional Institutions Agency of the Ministry of Security and Justice. Correspondence concerning this article should be addressed to Machteld Hoeve, Research Institute of Child Development and Education, University of Amsterdam, P.O. Box 15780, 1001 NG Amsterdam, The Netherlands; e-mail: m.hoeve@uva.nl.*

CRIMINAL JUSTICE AND BEHAVIOR, 2015, Vol. 42, No. 7, July 2015, 685–702.

DOI: 10.1177/0093854814558505

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Youths in juvenile justice settings are more likely to have mental health problems than their peers in the general population (e.g., Veen, Stevens, Doreleijers, van der Ende, & Vollebreght, 2010). Prevalence rates of those who meet criteria for any psychiatric disorder have been found to be as high as approximately 65% in incarcerated juveniles (Wasserman, McReynolds, Schwalbe, Keating, & Jones, 2010), where adolescent mental health problems prevalence rates have been shown to be 15% to 20% in the community (e.g., Roberts, Attkisson, & Rosenblatt, 1998; Verhulst, van der Ende, Ferdinand, & Kasius, 1997).

The high rate of disorders in juvenile justice youths can have consequences for more than just clinical management, as mental health disorders have been found to be related to recidivism. Several longitudinal studies have found evidence that those who have mental health problems are more likely to reoffend (Colins et al., 2011; Cottle, Lee, & Heilbrun, 2001; Hoeve, McReynolds, McMillan, & Wasserman, 2013; Hoeve, McReynolds, & Wasserman, 2013; McReynolds, Schwalbe, & Wasserman, 2010; Schubert, Mulvey, & Glasheen, 2011; Vermeiren, Schwab-Stone, Ruchkin, De Clippele, & Deboutte, 2002; Wierson & Forehand, 1995). Given that mental health problems are prevalent and increase the risk of reoffending, it is important to develop an understanding of the antecedents of mental health problems in connection to developmental pathways of crime. The present study's focus is on the association between childhood trauma and mental health problems in justice-involved youth, and whether this association is different for childhood-onset and adolescent-onset offenders.

TRAUMA AND MENTAL HEALTH PROBLEMS

One possible reason as to why mental health problems are more prevalent in justice-involved youths than in community youths is exposure to traumatic events, such as childhood maltreatment, neglect, or witnessing violence. Research has documented high rates of traumatic life events in juvenile justice youths (for a review, see Ford, Chapman, Connor, & Cruise, 2012). For example, in a study of Russian male adolescent delinquents, 96% reported at least one traumatic event (Ruchkin, Schwab-Stone, Kuposov, Vermeiren, & Steiner, 2002), and in a study of Dutch girls in juvenile justice institutions, 85% were exposed to at least one traumatic event (Hamerlynck, 2008). Comparable high rates were found in a detained sample in Chicago; 93% of boys and 84% of girls reported traumatic life events (Abram, Teplin, Charles, & Longwordth, 2004). More recently, in a national U.S. sample of juvenile justice youths, almost 80% reported a lifetime traumatic exposure (Wasserman & McReynolds, 2011). These rates are much higher than in community youths, where rates have found to be around 25% (Costello, Erkanli, Fairbank, & Angold, 2002).

Although studies of justice-involved youth have found high rates of traumatic exposure and mental disorder in delinquent youths, research that examined whether childhood maltreatment contributes to mental health problems in this group is limited. In a study of juvenile detainees, trauma exposure was positively associated with posttraumatic stress disorder (PTSD), which in turn was associated with other mental health problems, including anxiety, depression, alcohol and drug abuse, and conduct problems (Kerig, Ward, Vanderzee, & Moeddel, 2009). Furthermore, in a sample of adolescent detainees, childhood emotional abuse was positively associated with psychotic experiences (Colins, Vermeiren, Vreugdenhil, et al., 2009). Girls in compulsory residential care who were exposed to early-life interpersonal trauma were more likely to report a variety of mental

health problems (Leenarts et al., 2013). Thus, although research in this group is limited, there is some evidence that exposure to abuse and neglect explains the high prevalence of psychiatric disorder in justice-involved youth.

CHILDHOOD-ONSET AND ADOLESCENT-ONSET OFFENDERS

Developmental criminologists and psychologists have proposed several distinct trajectories of antisocial behavior, of which the distinction between childhood-onset and adolescent-onset offenders (Moffitt, 2006; Patterson & Yoerger, 2002; Piquero & Moffitt, 2005) is the most well-known. Adolescent-onset offenders show delinquent behavior during adolescence and are less likely to have significant individual problems or problematic family backgrounds. Childhood-onset offenders, in contrast, show an early onset of relatively serious and violent delinquency that is continued over the life course. Neurodevelopmental risk factors are elevated, and family functioning of this group is relatively poor (Moffitt, 2006). Given that impairment in neurodevelopmental processes and poor family functioning is more likely in the childhood-onset group, it may be expected that childhood-onset offenders have experienced more traumatic events during childhood than adolescent-onset offenders. Recent research has provided insight into how child maltreatment and injury during critical times of brain development can lead to major abnormalities or neurodevelopmental deficits (see, for example, Painter & Scannapieco, 2013). Therefore, childhood-onset offenders in particular may have experienced trauma in childhood, which contributes to their risk of developing mental health problems.

Although level differences in trauma and mental health problems are likely between childhood- and adolescent-onset offenders, the process of childhood maltreatment resulting in mental health problems may be similar in both groups. Alternatively, early intrinsic vulnerabilities that are more likely in childhood-onset offenders (such as difficult temperament, emotional reactivity, and low cognitive abilities) may explain poor mental health conditions during adolescence, regardless of traumatic exposure. For example, previous studies have shown that genetic influences are stronger in early-onset than late-onset offenders (Eley, Lichtenstein, & Moffitt, 2003; Taylor, Iacono, & McGue, 2000). However, this genetic vulnerability might make childhood-onset offenders more sensitive to the negative impact of childhood maltreatment. Evidence for this assumption has been found in research showing that the relationship between childhood maltreatment and later mental health problems was found to be stronger in children with a low-activity monoamine oxidase A (MAOA) genotype (Kim-Cohen et al., 2006). Therefore, traumatic exposure in childhood-onset offenders might more often result in mental health problems than in adolescent-onset offenders.

Research on psychopathology by age-of-onset subtype is scarce, yet some evidence has been found to suggest that psychopathology in childhood-onset offenders is more severe than in adolescent-onset offenders (Vermeiren, 2003). An earlier study of Russian incarcerated youths (Ruchkin, Kuposov, Vermeiren, & Schwab-Stone, 2003) showed that disruptive behavior disorder (DBD), depression, and PTSD in particular were more prevalent in those with childhood-onset conduct problems than in those with adolescent-onset conduct problems. Furthermore, in a high-risk community sample of youths (Aguilar, Sroufe, Egeland, & Carlson, 2000), those with adolescent-onset externalizing problems endorsed elevated levels of stress and internalizing problems. Recently, a study of justice-involved boys

(Colins & Vermeiren, 2013) showed that those with childhood-onset conduct disorder (CD) symptoms were more likely to have higher prevalence rates of attention-deficit hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD). Whether those childhood-onset offenders who are exposed to trauma during childhood are more, equally, or less likely to develop mental health problems in adolescence than adolescent-onset peers is, to our knowledge, unknown.

THE CURRENT STUDY

In this study, we investigate associations between childhood trauma and mental health problems in a sample of justice-involved boys. The high rates of trauma exposure and mental health problems make justice-involved youths particularly suitable for studying the association between the two phenomena. In addition, we examine potential differences between childhood-onset and adolescent-onset offending. Very few studies focused on level differences in trauma and mental health problems between childhood and adolescent-onset justice-involved boys. Moreover, to our knowledge, this is the first study to examine potential moderator effects of age-of-onset subtype on the association between childhood maltreatment and mental health problems in a sample of males in the juvenile justice system.

We first examine differences in the rates of trauma and mental health problems between childhood-onset and adolescent-onset offenders. On the basis of earlier research, we expect that mental health problems will be more prevalent in childhood-onset offenders than in adolescent-onset offenders. Second, we investigate associations between trauma and mental health problems. On the basis of the few previous studies discussed earlier, we expect that childhood maltreatment will be associated with mental health problems in justice-involved youth. Finally, we will explore whether this association is moderated by offender group (childhood- vs. adolescent-onset). The trauma–psychopathology link might be similar for childhood- and adolescent-onset offenders, because processes underlying mental health problems might be the same for both subtypes despite potential-level differences in childhood trauma and psychopathology. However, given that childhood-onset offenders experience more problems and likely have less protective factors than adolescent-onset offenders, we could speculate that traumatic exposure in this group may be more strongly associated with mental health problems than in adolescent-onset offenders.

METHOD

SAMPLE AND PROCEDURES

Data were collected as part of a standardized mental health screening and assessment in two large Dutch juvenile justice facilities between July 2009 and September 2012. A total of 807 boys were assessed shortly after they entered the facility. These boys were detained pretrial or incarcerated (postadjudication). Participants and their parents were informed that information from clinical assessment would be used for scientific research employing a consent procedure that required passive informed consent. The data were transferred anonymously to the researchers, so that it is impossible to trace information back to individuals. Given that routine mental health screening was part of clinical care, the relevant boards of the juvenile justice institutions waived the requirement to obtain informed consent from youth and, for youths younger than 18, parent(s)/caretaker(s). The Medical Ethical Review

Board of the Leiden University Medical Center certified that our study was conducted in accordance with the Dutch Medical Research Involving Human Subjects Act Dutch law on research in humans.

The age of the boys ranged from 13 to 24 ($M_{\text{age}} = 16.7$). Of the boys, 21% were native Dutch, 27.3% had a Moroccan background, 20.1% had a Surinamese or Dutch Antilles background, and 31.6% had some other ethnic background. Data on demographics, childhood trauma, and mental health problems were available for all boys, but self-reported delinquency was only available for 422 boys. Therefore, the final sample consisted of 422 participants.

MEASURES

Demographics

Boys reported their age at the time of assessment and ethnic background. Ethnic background was dichotomized into nonindigenous (i.e., the boys or at least one of his parents was/were born abroad) versus indigenous (i.e., the boy and his parents were born in The Netherlands), following the definition of the Dutch central bureau of statistics (CBS, Statistics Netherlands). Information about time between entrance into the facility and point of assessment was calculated by subtracting date of entrance into the facility from date of assessment. Time of entrance was collected via the facility's intake staff person.

Childhood Trauma

To elicit the boys' histories of maltreatment, they completed the Dutch version (Thombs, Bernstein, Lobbstaël, & Arntz, 2009) of the Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998). The CTQ is a self-report questionnaire that measures the frequency of abuse and neglect. The questionnaire consists of 27 items assessed on a 5-point Likert-type scale ranging from 1 (*never true*) to 5 (*very often true*). The questionnaire yields scores for childhood physical abuse, emotional abuse, physical neglect, emotional neglect, and sexual abuse as well as a minimization/denial scale. Earlier research on this questionnaire in adult (Thombs et al., 2009) and adolescent (Bernstein et al., 2003) psychiatric samples revealed satisfactory psychometric characteristics. In the current study, Cronbach's alpha of the scale for physical neglect was very low (.38) and therefore we did not use this scale in our analysis. The alphas of remaining scales ranged from .69 to .85, which can be interpreted as acceptable ($\alpha \geq .7$) to good ($\alpha \geq .8$) according to the rules of thumb of George and Mallery (2003).

Mental Health Problems

The Massachusetts Youth Screening Instrument—Second Version (MAYSI-2; Grisso, Barnum, Fletcher, Cauffman, & Peuschold, 2001) is a 52-item self-report inventory using a yes or no response format. The MAYSI-2 is designed to identify symptoms of distress or troublesome behavior that could require further evaluation. The Dutch version provides a reliable screening of mental health problems in adolescent males in Dutch juvenile justice facilities (Colins et al., 2014). We considered five of the seven MAYSI-2 subscales: Angry-Irritable, Depressed-Anxious, Alcohol/Drug Use, Suicide Ideation, and Somatic Complaints. The Traumatic Experiences subscale was not examined because of overlap with the CTQ

scales, and the Thought Disturbance subscale was not used because Cronbach's alpha was too low in the present study (.45). To increase reliability of the subscale Somatic Complaints in the present study, we removed the item about having serious headaches, which resulted in a sufficient alpha of .60. The alphas of remaining scales ranged from .61 to .83.

Psychiatric Disorder

The Diagnostic Interview Schedule for Children, Version 4 (DISC-IV; Schaffer et al., 1996) was used to assess psychiatric disorder and psychotic symptoms on the basis of the youths' self-reports. The DISC-IV measures disorders based on symptoms according to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association [APA], 1994). It is highly structured, has been evaluated in both clinical and community samples, and has been used in various samples of detained youths (e.g., Abram et al., 2004; Colins, Vermeiren, Schuyten, & Broekaert, 2009; Teplin, Welty, Abram, Dulcan, & Washburn, 2012; Vreugdenhil, Doreleijers, Vermeiren, Wouters, & van den Brink, 2004). For the present study, we included DBD (CD, ODD, ADHD), substance use disorder (alcohol, marijuana, and other substance disorders), and psychotic symptoms.

The Development and Well-Being Assessment (DAWBA) interview was used to assess internalizing disorders (Goodman, Ford, Richards, Gatward, & Meltzer, 2000). The reliability of DAWBA diagnoses was found to be very satisfactory, and agreements between DAWBA diagnoses and clinicians' diagnoses were found to be higher than what was expected from previous research on other structural diagnostic instruments (Aebi et al., 2012). For the present study, we used the modules for major depression and the following anxiety disorders: PTSD, panic disorder, agoraphobia, and generalized anxiety disorder (GAD). For all these disorders, the DAWBA uses a past 4 weeks time frame, except for GAD (past 6 months). From the information obtained from the DISC-IV and DAWBA scales, we further examined the presence of (a) any disorder (DBD, substance use disorder, anxiety, or depression), (b) at least two disorders (comorbidity), and (c) number of disorders.

Offending

We used a self-reported delinquency questionnaire (Van der Laan & Blom, 2006; Van der Laan, Blom, & Kleemans, 2009), which consists of 31 items on delinquent acts ranging in severity from vandalism and petty theft up to injuring someone with a knife or other weapon. First, for the 31 types of offending activities, participants were asked whether they had ever been involved in each of these acts. Next, for each of the acts, where they had responded with "yes," they were then asked how old they were when they committed the act for the first time, and how often they had committed the act in the past year. We used the information of the age of onset items. Following Moffitt and colleagues (e.g., Moffitt & Caspi, 2001; Moffitt, Caspi, Harrington, & Milne, 2002), we defined our groups a priori using a cutoff age of 12 to distinguish between the age-of-onset groups. This method closely reflects the age-of-onset subtype specification in the *DSM-IV* and *DSM-5* (*Diagnostic and Statistical Manual of Mental Disorders*, 5th ed.; APA, 2013). Those who were younger than 12 years of age were considered childhood-onset offenders and those who reported to have committed a delinquent act at age 12 or older were referred to as adolescent-onset offenders. In

addition, for descriptive purposes we used age of onset and past year data on vandalism, property crime, and violence.

ATTRITION

Given that the final sample for which full data were available consisted of 422 boys of the total sample ($N = 807$), analyses were carried out to test whether there were differences between groups in terms of age, ethnic background, time between entrance into the facility and time of assessment, childhood maltreatment, and mental health problems. Chi-square tests showed that remaining in the final sample was associated with ethnic background, $\chi^2(1) = 4.6, p < .05$, indicating that more indigenous than nonindigenous boys remained in the study. In addition, remaining in the final sample was associated with the number of days between entrance into the facility and time of assessment, $t(799) = -3.0, p < .01$. This indicates that those who had stayed more days in the facility until the assessment took place were more likely to remain in the study. Independent t tests showed no differences between participants in the final sample and nonparticipants in terms of childhood maltreatment and mental health problems (details available on request). Thus, although selective attrition was found on some of the demographic variables, no selective attrition was found on childhood maltreatment and mental health problems, indicating that selective attrition had only limited effects on our results.

ANALYSES

We applied chi-square, t tests, and logistic regression analyses to predict offender group from demographic variables, trauma, mental health problems, and psychiatric disorder. We set the significance level at $\alpha = .05$. Structural equation modeling (SEM) has the advantage that it provides information on the model fit for the entire model after controlling for measurement error (Holmbeck, 1997). Therefore, we used SEM to investigate links between childhood trauma and mental health problems and whether these associations were moderated by offender group (childhood vs. adolescent-onset). For childhood maltreatment and mental health scores, many respondents have lower scores. The childhood maltreatment and mental health problem scales were treated as censored variables (Tobin, 1958).

Goodness-of-model fit was judged based on the chi-square test of model fit, the root mean square error of approximation (RMSEA; Steiger & Lind, 1980), and the comparative fit index (CFI; Bentler, 1990). A significant chi-square value indicates a significant discrepancy between the model and the data. In large samples, the overall chi-square test is very powerful and is nearly always significant. Therefore, we mainly considered approximate fit measures, such as the RMSEA and CFI. RMSEA values smaller than .05 to indicate close fit and values smaller than .08 were considered satisfactory (Hu & Bentler, 1999). Furthermore, a model should have a CFI value greater than .90 (Hu & Bentler, 1999). If the chi-square value was nonsignificant, with a CFI greater than .90 and a RMSEA less than .08, we considered a model fit as acceptable, but if possible we improved the model until the model fit resulted in a nonsignificant chi-square value, with a CFI greater than .95 (Hu & Bentler, 1999) or RMSEA less than .05. We used modification indices (MIs) to guide model specification. The difference in fit between models was tested with the chi-square difference test using the DIFFTEST option in Mplus, which is required using weighted least squares means and variance adjusted (WLSMV) estimation (Asparouhov & Muthén, 2006).

We also compared the parameter estimates across offender groups (childhood-onset and adolescent-onset) using multigroup models. In these models, we started by constraining all parameters to be equal across groups, and freed parameter constraints if it significantly improved model fit.

RESULTS

Table 1 provides sample characteristics ($N = 422$). Participants' age ranged from 13 to 24 and were on average 16.7 years of age ($SD = 1.4$). The number of days between entrance into the facility and the assessment ranged from 0 to 47 days and was on average 2.1. The majority (76.1%) had an ethnic background other than Dutch. About half (49.2%) reported at least one disorder, and more than a quarter (28.7%) reported two or more disorders. About a quarter had started delinquent behavior before the age of 12 (childhood-onset; $n = 102$, 24.2%; M_{age} of onset = 9.2, $SD = 1.6$) and three quarters started at age 12 or older (adolescent-onset, $n = 320$, M_{age} of onset = 14.6, $SD = 1.8$).

CHILDHOOD-ONSET VERSUS ADOLESCENT-ONSET

Childhood-onset offenders reported significantly higher rates of vandalism, property crime, and violence than did adolescent-onset offenders (see Table 1). They started committing these acts at a significantly younger age than adolescent-onset offenders. As expected, childhood-onset offenders reported significantly higher levels of childhood maltreatment and mental health problems. Also, on the basis of the information from the DISC-IV and DAWBA scales, we found that almost 70% of the childhood-onset offenders reported any disorder, while less than half of the adolescent-onset group met criteria for at least one of the assessed disorders. Comorbidity (at least two disorders) was significantly more prevalent in the childhood-onset group (46.4%) than in the adolescent-onset group (22.9%). Examination of specific disorders revealed that DBDs (ADHD, ODD, and CD), substance use disorders, GAD, and psychotic symptoms were significantly more prevalent in childhood-onset than in adolescent-onset offenders. Both groups did not significantly differ with regard to depression, PTSD, social phobia, panic disorder, and agoraphobia.

To examine whether childhood maltreatment, mental health problems, and psychiatric disorder uniquely predict childhood-onset offending, we conducted multivariate logistic regression analysis. Only variables that were (marginally) significant in the bivariate analyses (Table 1) were included in the models. The first model predicted group membership (childhood-onset vs. adolescent-onset offenders) from any disorder and childhood maltreatment (emotional and physical abuse, minimization/denial), adjusting for demographic characteristics (nonindigenous participants, days before assessment). This revealed that any disorder and emotional abuse significantly predicted offender group membership: The odds to be a childhood-onset offender were 2.3 times greater for those with at least one disorder relative to those with no disorder, odds ratio (OR) = 2.3, 95% confidence interval (CI) = [1.3, 3.8], $p < .001$, and 1.1 times greater for those with a unit higher in the level of emotional abuse, OR = 1.1, 95% CI = [1.0, 1.2], $p < .05$. Next, the same analysis was conducted, but with mental health problems (alcohol/drug use, angry-irritable, depression/anxious) instead of any disorder included in the model. Alcohol/drug abuse, OR = 1.2, 95% CI = [1.0, 1.3], $p < .05$, and angry-irritableness, OR = 1.2, 95% CI = [1.1, 1.4], $p < .001$, significantly predicted childhood-onset offending. A trend was found for emotional abuse, OR = 1.1, 95%

TABLE 1: Sample Characteristics for Childhood-Onset (n = 102) and Adolescent-Onset Offenders (n = 320)

	Childhood-Onset		Adolescent-Onset		Difference	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>
Demographic characteristics						
Nonindigenous ^a	69	67.6	252	78.8	1	5.2*
Age	16.5	1.4	16.7	1.3	420	1.4
Days before assessment	1.8	1.6	2.2	3.3	420	1.3 [†]
Delinquency characteristics						
Vandalism age of onset	11.9	2.8	15.7	1.8	128.8	12.7***
Vandalism past year ^a	58	56.9	63	19.8	1	51.7***
Property crime age of onset	11.5	2.9	15.3	1.7	123.5	12.4***
Property crime past year ^a	66	64.7	100	31.4	1	35.7***
Violence age of onset	12.6	3.1	16.0	1.7	120.7	10.4***
Violence past year ^a	64	62.7	79	24.9	1	49.1***
Childhood maltreatment (CTQ)						
Emotional abuse	7.5	3.6	6.0	2.3	127.3	-4.0***
Physical abuse	6.5	3.2	5.6	2.0	128.0	-2.7**
Sexual abuse	5.4	2.2	5.1	0.6	105.7	-1.2
Emotional neglect	9.1	4.1	8.8	4.1	420	-0.6
Minimization/denial	0.8	1.0	1.2	1.2	193.3	3.7***
Mental health problems (MAYSI-2)						
Alcohol/drug use	2.2	2.3	1.0	1.7	140.7	-4.7***
Angry-irritable	3.0	2.3	1.7	2.0	420	-5.5***
Depression-anxious	1.5	1.4	1.1	1.5	420	-2.4*
Suicide ideation	0.3	0.8	0.2	0.6	144.3	-1.1
Somatic complaints	1.6	1.1	1.4	1.3	420	-1.4
Psychiatric disorder (DISC-IV and DAWBA)						
Any disorder ^a	67	69.1	125	42.7	1	20.3***
At least two disorders ^a	45	46.4	67	22.9	1	19.7***
Number of disorders	1.9	2.0	0.8	1.2	121.2	-5.2***
Attention-deficit/hyperactivity disorder ^a	18	17.8	19	6.1	1	12.6***
Oppositional defiant disorder ^a	12	11.8	9	3.0	1	12.1***
Conduct disorder ^a	39	38.6	35	11.6	1	37.1***
Alcohol abuse ^a	27	26.5	31	10.2	1	17.2***
Alcohol dependence ^a	8	8.0	11	3.6	1	3.3 [†]
Marijuana abuse ^a	29	29.0	44	14.4	1	10.8***
Marijuana dependence ^a	24	24.0	24	7.9	1	18.6***
Other drug abuse ^a	3	3.0	1	0.3	1	5.4*
Other drug dependence ^a	2	2.0	1	0.3	1	2.8 [†]
Depression ^a	11	10.8	26	8.3	1	0.6
Posttraumatic stress disorder ^a	9	8.8	17	5.4	1	1.5
Social phobia ^a	1	1.0	0	0	1	3.1 [†]
Panic disorder ^a	2	2.0	14	4.5	1	1.3
Agoraphobia ^a	10	9.9	25	8.1	1	0.3
Generalized anxiety disorder ^a	4	3.9	3	1.0	1	4.1
Psychotic symptoms ^a	65	64.4	81	26.7	1	46.5***

Note. Figures are means (*M*), standard deviations (*SD*), and *t* tests (*t*). Days before assessment = number of days in facility before assessment. CTQ = Childhood Trauma Questionnaire; DISC-IV = Diagnostic Interview Schedule for Children, Version 4; MAYSI-2 = Massachusetts Youth Screening Instrument—Second Version; DAWBA = Development and Well-Being Assessment.

a. Counts, percentages, and chi-square test.

†*p* < .10. **p* < .05. ***p* < .01. ****p* < .001.

TABLE 2: Correlations Between Demographic Characteristics, Childhood Maltreatment, and Mental Health Problems (N = 422)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1 Nonindigenous	—											
2 Age	-.10*	—										
3 Days before assessment	.08†	-.01	—									
4 Emotional abuse	-.21*	.06	.03	—								
5 Physical abuse	.11†	.10	.07	.71*	—							
6 Sexual abuse	-.05	.13	-.03	.46*	.29*	—						
7 Emotional neglect	-.13*	.08*	-.01	.41*	.34*	.22*	—					
8 Alcohol/drug use	-.28*	.21*	-.13	.40*	.32*	.15	.22*	—				
9 Angry-irritable	-.15*	-.06	-.10	.50*	.34*	.32*	.26*	.54*	—			
10 Depression-anxious	-.09†	.07	-.11	.46*	.35*	.33*	.21*	.41*	.63*	—		
11 Suicide ideation	-.20*	.00	-.24†	.32*	.25*	.27†	.19*	.32*	.40*	.62*	—	
12 Somatic complaints	-.06	-.13*	.00	.29*	.18*	.00	-.01	.30*	.37*	.50*	.25*	—

Note. Days before assessment = number of days in facility before assessment.

† $p < .10$. * $p < .05$.

CI = [1.0, 1.3], $p = .06$. Differences between the two offender groups in physical abuse, minimization/denial, and depression-anxiety disappeared in the multivariate models. The models had a significant fit, and explained about 15% of the variance in age-of-onset subtyping, Nagelkerke $R^2 = 14.1$, $\chi^2(6) = 39.0$, $p < .001$ for the model with any disorder, and Nagelkerke $R^2 = 16.4$, $\chi^2(8) = 49.2$, $p < .001$ for the model with mental health problems.

ASSOCIATION BETWEEN MALTREATMENT AND MENTAL HEALTH PROBLEMS

A correlation matrix is presented in Table 2. We found significant relationships ($p < .05$) among the subscales of the CTQ and those of the MAYSI-2. In addition, we generally found significant positive associations between childhood maltreatment and mental health problems, with the highest correlations found between emotional neglect, on one hand, and angry-irritable, $r = .50$, or depression-anxious, $r = .46$, on the other hand. Sexual abuse was only significantly associated with angry-irritable and depression-anxious (Table 2).

A structural equation model was used to examine the relationship between childhood trauma and mental health problems (see Figure 1). We started the modeling procedure by fitting a model to the childhood trauma and mental health problems variables. We expected that the CTQ and MAYSI-2 subscales would form latent variables and thus allow for a more parsimonious model. The model was adjusted for demographic variables (ethnicity, age, and days in facility before point of assessment). The model was specified by allowing the factor loadings and paths to be freely estimated. The initial model yielded an unacceptable fit to the data, $\chi^2(50, 422) = 120.8$, $p < .001$, RMSEA = .058, CFI = .891.

Guided by MIs, we added the relationship between the Somatic Complaints and Depression-Anxious subscales to the model. This significantly improved model fit, $\Delta\chi^2(1) = 17.2$, $p < .001$. We then regressed the latent variable mental health problems on the covariate nonindigenous in the third model. This again significantly improved model fit, $\Delta\chi^2(1) = 6.3$, $p < .05$. In the next step, we added the path from time between entrance into the facility and assessment to mental health problems, and this also improved model fit, $\Delta\chi^2(1) = 4.2$, $p < .05$. We then added the relationship between the Suicide Ideation and Depression-Anxious subscales to the model. This significantly improved model fit, $\Delta\chi^2(1) = 12.2$, $p < .001$.

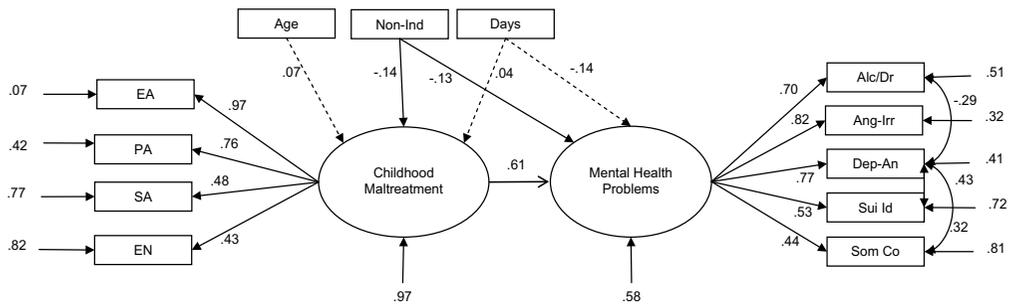


Figure 1: Structural Equation Model With Standardized Parameter Estimates

Note. Dashed lines indicate nonsignificant path estimates ($p > .05$). Non-Ind = nonindigenous, Days = number of days in facility before assessment, EA = emotional abuse, PA = physical abuse, SA = sexual abuse, EN = emotional neglect, M/D = minimization/denial, Alc/Dr = Alcohol/drug use, Ang-Irr = Angry-irritable, Dep-An = Depression-anxious, Sui Id = Suicide ideation, Som Co = Somatic complaints. $\chi^2(45, 422) = 90.4$, $p < .05$, RMSEA = .049, CFI = .930.

We finally added the relationship between the Depression-Anxious and Alcohol/Drug Use subscales to the model. The final model provided an acceptable fit to the data, $\chi^2(45, 422) = 90.4$, $p < .001$, RMSEA = .049, CFI = .930, and the model fit was significantly better than the initial model, $\Delta\chi^2(5) = 28.4$, $p < .001$. The path from trauma to mental health problems was significant, $\beta = .61$, indicating that those with a history of trauma exposure were more likely to have mental health problems. In this model, 42% of the variance of mental health problems was explained. These findings suggest that childhood maltreatment predicts adolescent mental health problems, adjusting for ethnic background, age, and time between entrance into the facility and assessment.

MODERATION EFFECTS OF AGE OF ONSET

Next, multigroup models were used to examine potential moderation effects of offender group (childhood-onset vs. adolescent-onset; see Figure 2). Equality constraints were placed on (a) the paths from the covariates to childhood maltreatment and from childhood maltreatment to mental health problems, (b) the relationships between subscales, and (c) the intercepts. The initial multigroup model yielded a satisfactory, but not close, fit to the data, $\chi^2(113, 422) = 158.3$, $p < .01$, RMSEA = .044, CFI = .915.

Guided by MIs, we allowed the loading of somatic complaints on mental health to be unequal across groups; the equality constraints on all other paths and intercepts remained unchanged. This significantly improved model fit, $\Delta\chi^2(1) = 7.5$, $p < .01$. Next, we allowed the path between the latent variables to be estimated freely among groups, which also improved model fit significantly, $\Delta\chi^2(1) = 6.9$, $p < .01$. The final model fit was satisfactory, $\chi^2(111, 422) = 140.3$, $p = .03$, RMSEA = .035, CFI = .945. The factor loading of somatic complaints was not significant in the childhood-onset and significant in the adolescent-onset group. The effect of childhood maltreatment on mental health problems was significant in both the childhood-onset, $\beta = .39$, and adolescent-onset, $\beta = .65$, offender groups, but the effect in adolescent-onset offenders was larger than in childhood-onset offenders. The final model with the removed equality constraints provided a significantly better fit than the baseline model with the equality constraints on all paths in each group, $\Delta\chi^2(2) = 13.1$, $p < .01$.

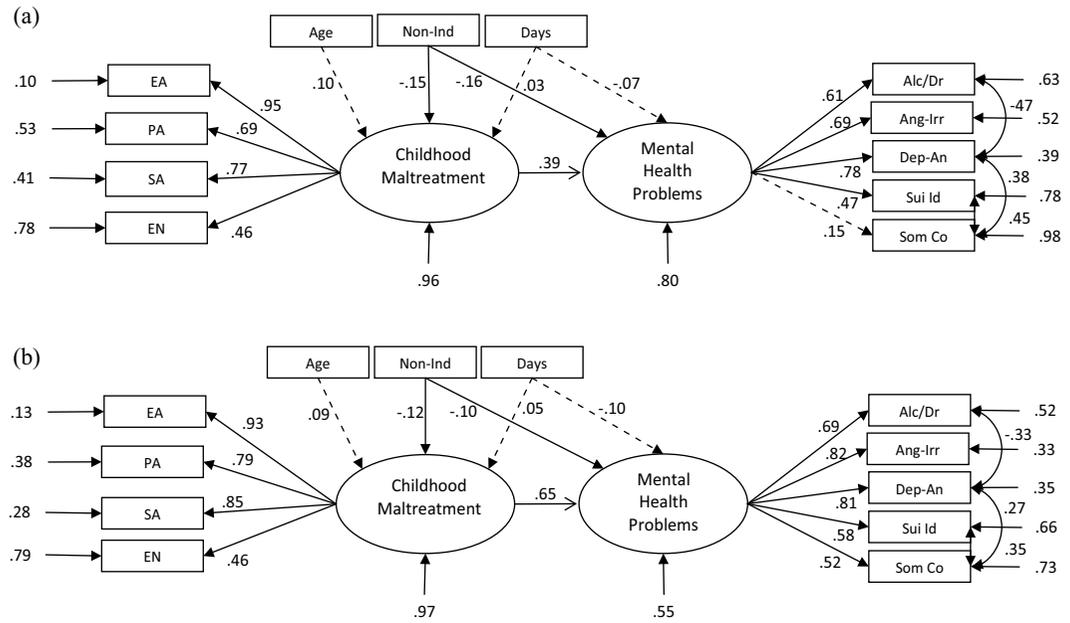


Figure 2: Multigroup Model Comparing Standardized Parameter Estimates From Structural Equation Model Across (a) Childhood-Onset Offenders (b) and Adolescent-Onset Offenders

Note. Dashed lines indicate nonsignificant path estimates ($p > .05$). Non-Ind = nonindigenous, Days = Number of days in facility before assessment, EA = emotional abuse, PA = physical abuse, SA = sexual abuse, EN = emotional neglect, M/D = minimization/denial, Alc/Dr = Alcohol/drug use, Ang-Irr = Angry-irritable, Dep-An = Depression-anxious, Sui Id = Suicide ideation, Som Co = Somatic complaints. $\chi^2(111, 422) = 140.3, p = .03, RMSEA = .035, CFI = .945$.

This finding indicates that significant moderator effects of offender group were found: The association between childhood maltreatment and mental health problems was stronger for adolescent-onset offenders than for childhood-onset offenders.

DISCUSSION

The present study examined the association between childhood trauma and mental health problems in juvenile justice-involved males. In addition, we examined differences between childhood-onset and adolescent-onset offenders in the rates of maltreatment and mental health problems as well as in the association between maltreatment and mental health problems. We found that childhood-onset offenders were more likely to report a history of child abuse and to report higher rates of mental health problems, emotional abuse, problems related to substance use, and angry-irritableness in particular. Furthermore, childhood trauma predicted mental health problems in both offender groups. However, associations were stronger in adolescent-onset offenders than in childhood-onset offenders.

Childhood-onset male offenders reported higher rates of mental health problems than did adolescent-onset male offenders. Those who started delinquency before the age of 12 were more likely to have any disorder than those who started after age 12, adjusting for demographic characteristics and childhood maltreatment. This is consistent with the findings from earlier research (Aguilar et al., 2000; Colins & Vermeiren, 2013; Ruchkin et al., 2003),

revealing that the childhood-onset group reported higher prevalence rates of psychiatric disorder than the adolescent-onset group. Consistent with previous research, we found that DBD (Colins & Vermeiren, 2013; Ruchkin et al., 2003) and PTSD (Aguilar et al., 2000; Ruchkin et al., 2003) were more prevalent in childhood-onset offenders, but we also found that substance use disorders and psychotic symptoms were elevated in this group, which was not found by previous research. Furthermore, in contrast to one of the earlier studies (Ruchkin et al., 2003), we found no differences in rates of depression between the two offender groups.

Mental health problems in adolescent-onset male offenders were found to be relatively high. In our sample, almost half of the adolescent-onset offenders had one or other disorder assessed with the DISC-IV compared with 15% to 20% in the community (e.g., Roberts et al., 1998; Verhulst et al., 1997). Our findings are consistent with a recent review (Fairchild, Van Goozen, Calder, & Goodyer, 2013), concluding that adolescent-onset offenders' levels of functioning were somewhere between childhood-onset offenders and nonoffenders. Although poor functioning is less extreme in adolescent-onset than in childhood-onset antisocial youths, conditions of youths in both groups are worse than in nonantisocial controls. In contrast to the dual taxonomy of Moffitt (1993), Fairchild et al.'s (2013) review showed that adolescent-onset offending is often not limited to the adolescent period, and that both childhood- and adolescent-onset offending are associated with emotion processing deficits. Our findings are in line with these recent review's conclusions. However, we also found that the association between childhood maltreatment and mental health problems differed significantly between the two age-of-onset groups. This suggests that the childhood-onset pathway is qualitatively different from the adolescent-onset pathway, which is in line with Moffitt's developmental taxonomy and contrasts with findings of Fairchild et al. (2013).

Our findings revealed that the association between childhood trauma and mental health problems was significantly weaker in childhood-onset male offenders than in adolescent-onset counterparts. In those with a childhood-onset in offending, childhood trauma and covariates explained only 20% of the variance in mental health problems. This was less than half of the variance explained in those with an adolescent-onset in offending (45%). Thus, a relatively large amount of variance in mental health problems of childhood-onset offenders is not explained by traumatic experiences during childhood. Research has shown that childhood-onset offenders on average experience higher levels of neurobiological adversity (Fairchild et al., 2013), and early intrinsic vulnerabilities in childhood-onset offenders may explain poor mental health conditions during adolescence, regardless of traumatic exposure. Thus, in addition to environmental influences, such as childhood maltreatment, other risk factors (e.g., neurobiological influences) may increase the risk of adolescent mental health problems in childhood-onset offenders. The latter may play a stronger role in the development of mental health problems in childhood-onset offenders than in adolescent-onset offenders, which might explain why associations between childhood maltreatment and adolescent mental health problems are weaker in childhood-onset than in adolescent-onset offenders. However, this warrants cautious interpretation, because studies on genetic influences in both subtypes of offenders are scarce, and findings thus far have been inconclusive (Fairchild et al., 2013). Moreover, studies on MAOA genotype, maltreatment, and mental health problems have shown that genetic influences can enhance the negative impact of environmental stress (Kim-Cohen et al., 2006).

We found that somatic complaints were not explained by childhood trauma in childhood-onset offenders. Previous research has shown that traumatic exposure is associated with the development of somatic dysfunction (e.g., Paras et al., 2009). It has been suggested that the neuroendocrine system mediates the link between trauma and physical health problems, as early stress has been associated with dysregulation of the hypothalamic-pituitary-adrenal axis (Mulvihill, 2005; Paras et al., 2009). In line with previous research, we found an association between maltreatment and somatic complaints in adolescent-onset offenders. However, why this association was not found in childhood-onset offenders warrants further research.

The present study's strengths are the use of a data set that was collected as part of a standardized routine mental health screening and assessment, and therefore the current research questions are investigated under real-life conditions. In addition, the sample consisted of a relatively large, ethnically diverse group of justice-involved boys. Finally, the study used standardized questionnaires and structured diagnostic interviews that have been well-validated and are commonly used in youth in juvenile justice settings. Despite these strengths, several limitations should be noted. First, childhood maltreatment and age of onset of offending was measured retrospectively. However, the study's focus was on justice-involved youths, which makes it very difficult to prospectively collect information from the period before youths enter the juvenile justice system. Second, we lacked information on offending behavior up to young adulthood and were therefore not able to examine other developmental offending pathways. It would be interesting to compare, for example, the life-course persistent path with adolescent-limited and recovery paths (those who start early but recover during adolescence; Moffitt et al., 2002). Third, the sample consisted of boys only. Both offending trajectories as well as their associations to mental health problems could be different for girls. For example, Silverthorn and Frick (1999) stated that female offenders typically show an adolescent-onset to their offending behavior and proposed a third developmental pathway, labeled the delayed-onset pathway. In addition, studies of justice-involved youth have found gender differences in traumatic exposure (Wasserman & McReynolds, 2011) as well as in mental health problems (Wasserman et al., 2010). Future studies should focus on female offending trajectories and how these relate to childhood trauma and mental health problems. Finally, further studies would benefit from involving multiple informants in their research (Colins, Vermeiren, Schuyten, Broekaert, & Soyez, 2008). However, this may be difficult in juvenile justice populations, because finding significant others, such as parents willing to participate in a study, can be difficult. In addition, parents may not be able to recall or identify mental health problems in their offspring, and facility staff will not be able to report on mental health problems right after the boys have entered the facility.

The current investigation has several implications for policy and practice. Childhood maltreatment contributed to mental health problems in juvenile justice-involved males, suggesting that those with a history of child abuse and neglect likely are in need of treatment. We found that the association between childhood maltreatment and adolescent mental health problems is weaker in childhood-onset offenders. This might suggest that the effect of treating trauma symptoms could be smaller in childhood-onset than in adolescent-onset offenders. However, given that the association was significant in both offender groups, we argue that all males in juvenile justice agencies should be screened for trauma, and those with a history of child abuse and neglect should receive treatment of trauma-related mental

health problems. Addressing the youths' trauma early in the public health system, or while in the juvenile justice system, is critical to promoting the youths' well-being and mental health. Levels of child abuse, particularly sexual abuse, and internalizing mental health problems have been found to be higher in girls than in boys in the juvenile justice system (e.g., Kerig et al., 2009). As a result, there might be a risk for underidentification of trauma and mental health problems in males. Earlier, it has been found that sexual abuse is associated with mental health problems regardless of gender, yet males in particular are at risk for not having their abuse detected and reported (Maikovich-Fonga & Jaffee, 2010).

The present study confirms that the prevalence of mental health problems among juvenile justice boys is high. Given that many youths commence juvenile justice system contact without having accessed mental health services in their communities (e.g., Novins, Duclos, Martin, Jewett, & Manson, 1999), and that those with a childhood-onset in offending were particularly more likely to endorse one or more mental health disorders, early identification of mental health problems and access to mental health services for those exposed to childhood trauma should be improved, as this might prevent those youths from entering the juvenile justice system.

CONCLUSION

This study extends research that compares risk factors between childhood-onset and adolescent-onset offenders to examining childhood trauma and mental health problems in these types of offenders. We found that childhood-onset offenders were more likely than adolescent-onset offenders to report mental health problems and childhood maltreatment. The association between trauma and mental health problems was stronger in adolescent-onset offenders than in childhood-onset offenders. Thus, mental health problems were more prevalent in childhood-onset offenders, but these problems were less well-explained by childhood trauma in childhood-onset than in adolescent-onset offenders. The relatively high rates of mental health problems in adolescent-onset offenders contradict the assumptions of Moffitt's (1993) developmental taxonomy. Our finding that the association between trauma and mental health problems was significantly stronger in adolescent-onset than in childhood-onset offenders suggests that the childhood-onset pathway is qualitatively different from the adolescent-onset pathway, which is in line with Moffitt's (1993) developmental taxonomy.

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