The association between childhood maltreatment, mental health problems, and aggression in justice-involved boys

Hoeve, M.; Colins, O.F.; Mulder, E.A.; Loeber, R.; Stams, G.J.J.M.; Vermeiren, R.R.J.M.

DOI
10.1002/ab.21586

Publication date
2015

Document Version
Final published version

Published in
Aggressive Behavior

AGGRESSIVE BEHAVIOR
Volume 41, pages 488–501 (2015)

The Association Between Childhood Maltreatment, Mental Health Problems, and Aggression in Justice-Involved Boys

Machteld Hoeve[1]*, Olivier F. Colins[2,3], Eva A. Mulder[2,3], Rolf Loeber[4], Geert Jan J. M. Stams[1], and Robert R. J. M. Vermeiren[5,6,7]

[1]*Research Institute of Child Development and Education, University of Amsterdam, Amsterdam, the Netherlands*
[2]*Department of Child and Adolescent Psychiatry, Curium – Leiden University Medical Center, Leiden, the Netherlands*
[3]*Academic Workplace Forensic Care for Youth (Academische Werkplaats Forensische Zorg voor Jeugd), Zutphen, the Netherlands*
[4]*Western Psychiatric Institute and Clinic, University of Pittsburgh Medical School, Pittsburgh, Pennsylvania*
[5]*Department of Child and Adolescent Psychiatry, Curium – Leiden University Medical Center, Leiden, the Netherlands*
[6]*Department of Child and Adolescent Psychiatry, VU University Medical Center, Amsterdam, the Netherlands*
[7]*Academic Workplace Forensic Care for Youth (Academische Werkplaats Forensische Zorg voor Jeugd), Zutphen,, the Netherlands*

The link between childhood maltreatment and adolescent aggression is well documented; yet, studies examining potential mechanisms that explain this association are limited. In the present study, we tested the association between childhood maltreatment and adolescent aggression in boys in juvenile justice facilities ($N = 767$) and examined the contribution of mental health problems to this relationship. Data on childhood maltreatment, mental health problems, and aggression were collected by means of self-report measures and structural equation models were used to test mediation models. We found that mental health problems mediated the link between maltreatment and aggression. Results demonstrated different pathways depending on the type of aggression examined. The association between childhood maltreatment and reactive aggression was fully mediated by a variety of mental health problems and for proactive aggression the association was partially mediated by mental health problems. We also found that reactive and proactive aggression partially mediated the association between maltreatment and mental health problems. These findings suggest that a transactional model may best explain the negative effects of childhood trauma on mental health problems and (in particular reactive) aggression. In addition, our findings add to the existing evidence that reactive and proactive aggression have different etiological pathways. Aggr. Behav. 41:488–501, 2015. © 2015 Wiley Periodicals, Inc.

Keywords: childhood trauma; psychopathology; aggression; youth; forensic

INTRODUCTION

Childhood maltreatment is related to a wide array of adverse short- and long-term effects on mental and physical health of the victims (see Brown, Fang, & Florence, 2011; Twardosz & Lutzker, 2010 for reviews). The societal costs of childhood maltreatment (Brown et al., 2011) are not limited to medical and psychological care provided to the victims. Indeed, victims of childhood maltreatment are at risk of becoming perpetrators of violence themselves later in life, a phenomenon that has been labeled as the "cycle of violence" (e.g., Maxfield & Widom, 1996; Widom, 1989; Wilson, Stover, & Berkowitz, 2009). This "cycle of violence" is particularly of concern when considering the notoriously high rates of childhood maltreatment among juvenile justice-involved youths (e.g., Abram, Teplin, Charles, & Longwordth, 2004; Colins et al., 2009b; Kerig, Ward, Vanderzee, & Moeddel, 2009).

Contract grant sponsor: Marie Curie grant of the European Union; contract grant number: FP7-PEOPLE-2010-IOF; contract grant sponsor: The Netherlands Organization for Health Research and Development; contract grant number: ZonMw; contract grant sponsor: The Correctional Institutions Agency of the Ministry of Security and Justice.
Conflicts of interest: None
*Correspondence to: Machteld Hoeve, University of Amsterdam, Research Institute of Child Development and Education, P.O. Box 15780, 1001 NG Amsterdam, the Netherlands. E-mail: m.hoeve@uva.nl

Received 21 January 2014; Revised 3 February 2015; Accepted 3 February 2015

DOI: 10.1002/ab.21586
Published online 18 March 2015 in Wiley Online Library (wileyonlinelibrary.com).

Among these youths, exposure to traumatic life events, including child abuse and neglect or domestic violence, is associated with aggression (Ford, Chapman, Connor, & Cruise, 2012), even when adjusted for family factors, child characteristics, and biological factors (Dodge, Bates, & Pettit, 1990). However, relatively little empirical research exists on the contribution of mental health problems to the association between childhood trauma and later violence and aggression, especially not in criminal justice involved youths. Accordingly, it is unknown whether mental health problems mediate the association between childhood maltreatment and aggressive behavior or are a consequence of maltreatment and aggressive behavior. This study was designed to fill this void in knowledge.

THE CYCLE OF VIOLENCE

Widom (1989) analyzed official records and compared arrests for violence in adults who were maltreated as children, with arrests in matched controls with no history of child abuse and neglect. This landmark study showed that childhood maltreatment increased the risk for juvenile and adult arrest, violent and chronic offending, and was related with an earlier onset and higher frequency of offending. This "cycle of violence" hypothesis has been supported in various studies that used various methodologies (Widom, 2014). For example, abused and neglected boys were more likely to report juvenile delinquency and violence than those without a history of child abuse and neglect (Stouthamer-Loeber, Loeber, Homish, & Wei, 2001). Further, maltreated boys were five times and girls almost four times more likely to be arrested for a juvenile crime than their counterparts in the matched control group (English, Widom, & Brandford, 2001). Although the association between childhood maltreatment and juvenile crime is significant for boys and girls, boys typically have higher rates of official recorded criminal and violent behavior than girls. Moreover, among maltreated children arrest rates in adolescence were found to be higher in boys than in girls (32.0% vs. 8.4%; English et al., 2001). Therefore, the focus of the present study is on boys. Several theoretical models have been put forward that purport to explain the link between childhood trauma and aggression (See Kerig & Becker, 2010, for a comprehensive overview). These models differ in the extent to which mental health problems mediate the association between trauma and aggression. A first model, the Trauma Coping Model (Ford, Chapman, Mack, & Pearson, 2006), described how trauma causes mental and physical distress, which leads to emotional dysregulation, impulsiveness, dysfunctional information processing, and eventually to aggression and increases the risk for mental health problems (Twardosz & Lutzker, 2010). A second model, based on a social learning perspective, holds that physical abuse may include overt and relational modeling of aggression by caregivers, which in turn increases the risk for aggressive behavior in youth (Ford et al., 2012; Kerig & Becker, 2010; Widom, 2014). A third model holds that childhood maltreatment may result in emotional numbing and callousness as a way to cope with the abuse, which in turn results in emotional detachment (Kimonis, Fanti, Isoma, & Donoghue, 2013; Porter, 1996). Thus, the Trauma Coping Model suggests that the link between childhood maltreatment and later aggression is mediated by mental health problems, such as depression, anxiety, and irritability, whereas the social learning and emotional numbing hypotheses suggest that violence is mediated by processes that may not include mental health problems.

Ample research has documented that childhood trauma impacts mental health problems (Anda et al., 2006; Veysey, 2008), including posttraumatic stress, anxiety, depression, somatic complaints, as well as oppositional-defiant, conduct, and substance abuse problems (e.g., Copeland, Keeler, Angold, & Costello, 2007a; Kerig et al., 2009). However, studies examining the association between trauma, mental health problems, and aggression in juvenile justice samples are scarce. In a study of juvenile justice-involved youths (Ford, Hartman, Hawke, & Chapman, 2008), various types of trauma, including physical abuse, domestic violence, and neglect, were associated with posttraumatic stress disorder, suicide ideation, and substance abuse. Kerig et al. (2009) found that maltreatment was associated with a higher rate of posttraumatic stress disorder (PTSD), which in turn predicted more mental health problems. Recently, Widom (2014) documented significantly more mental health problems in maltreated violent offenders with PTSD than maltreated and non-maltreated violent offenders without PTSD and normal controls. Although one line of research suggests that childhood maltreatment results in mental health problems (the mediator), which in turn may result in aggression (the outcome), another line of research suggests that a reverse pathway could also be true: childhood maltreatment results in aggression, which in turn may increase the risk for mental health problems. For example, prospective longitudinal research has shown that depression was a precursor of aggression (e,g., Underwood, Beron, & Rosen, 2011; Vaillancourt et al., 2014), reactive aggression in particular (Fite, Rubens, Preddy, Raine, & Pardini, 2013).

Thus, research has shown that child maltreatment is related to mental health problems, particularly posttraumatic stress symptoms and aggression. In summary,

although studies have concentrated on associations between the following: (i) child maltreatment and mental health problems; (ii) child maltreatment and aggression; and (iii) aggression and mental health problems, investigation of the relations between child maltreatment, mental health problems, and aggression in one study is scarce, particularly in juvenile justice settings.

REACTIVE AND PROACTIVE AGGRESSION

There is evidence to suggest that childhood trauma and mental health problems are differentially linked to different types of aggression, that is, reactive and proactive aggression. Reactive aggression has been designated as a hostile response to a perceived threat, which is defensive, emotional, "warm-blooded," and impulsive, whereas proactive aggression has been characterized as an aggressive act motivated by an external reward, which is instrumental, premeditated, and "cold-blooded," with little evidence of autonomic arousal (Raine et al., 2006; Steiner et al., 2011).

A meta-analysis (Card & Little, 2006) revealed that internalizing problems were associated with reactive aggression, but not with proactive aggression. Further, in two earlier studies of emotionally disturbed children (Ford, Fraleigh, & Connor, 2009) and elementary-school children (Dodge, Lochman, Harnish, Bates, & Pettit, 1997), child abuse was related to reactive aggression, but not to proactive aggression. Moreover, in a study of justice-involved youth (Stimmel, Cruise, Ford, & Weiss, 2014), posttraumatic stress symptom severity, hyperarousal in particular, was associated with reactive aggression, but not proactive aggression. This research shows that differential pathways may lead from childhood maltreatment to mental health problems and aggression, depending on the type of aggression. A deeper understanding of the contribution of mental health problems to the association between childhood maltreatment and different types of aggression are likely to lead to improvement of interventions for maltreated children designed to prevent later violence and aggression. Given that studies have found different antecedents and correlates for reactive and proactive aggression, it is possible that different paths to reactive and proactive aggression exist, which may require different assessment, prevention, and intervention strategies.

In sum, research has shown that rates of traumatic exposure and mental health disorders are particularly high in juvenile justice samples. Although justice-involved boys display the most severe problems in various life domains and are at risk for the most negative developmental outcomes, including adult violent offending, they constitute a relatively neglected subgroup in research on the development of adolescent antisocial behavior (Kerig et al., 2009). Despite the burden of problems related to childhood maltreatment and aggressiveness in justice-involved boys, research that has focused on links between childhood trauma, mental health problems, and aggression is limited in this group. In order to develop early detection strategies and interventions for those at risk for later aggression and violence, it is important to clarify paths from childhood maltreatment to adolescent mental health problems and aggression.

THE PRESENT STUDY

In the present study, we examined the association between childhood trauma and aggression in a sample of justice-involved boys. In addition, we investigated whether this association was mediated by mental health problems. We also examined whether different paths existed from childhood trauma to mental health problems and different forms of aggression. We expected that reactive aggression particularly would be associated with trauma and that this association would be mediated by mental health problems. In contrast, we expected to find no or weaker associations between childhood trauma and proactive aggression. If a significant association existed between childhood trauma and proactive aggression, we expected that the emotional numbing model of Porter (1996) would apply, and that mental health problems would not or only partly mediate the trauma-aggression link. Given that aggression has also been found to precede mental health problems, we analyzed reverse mediation models, that is, we examined whether the association between childhood maltreatment and mental health problems was mediated by aggression.

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 had entered the facility. These boys were detained pretrial or incarcerated (post-adjudication). 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 making it impossible to trace information back to individuals. Given that routine mental health screening was part of

TABLE I. Correlations Between Demographic Characteristics, Childhood Maltreatment, Mental Health Problems, and Aggression

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	*M*	*SD*
1	Non-indigenous[a]	–													607	79.3
2	Age	−.11													16.7	1.3
3	Days before assessment	.05	−.02												1.9	2.4
4	Emotional abuse	−.19*	.08	.02											6.3	2.7
5	Physical abuse	.04	.12	.05	.72*										5.9	2.4
6	Sexual abuse	.02	.12	.03	.46*	.46*									5.1	1.0
7	Emotional neglect	−.10	.08	−.01	.45*	.39*	.26								8.7	4.1
8	Alcohol/drug use	−.30*	.24*	−.01	.41*	.37*	.32*	.26*							1.3	2.0
9	Angry-irritable	−.18*	−.04	−.05	.47*	.37*	.30	.26*	.55*						1.9	2.2
10	Depression-anxious	−.10	.05	−.06	.43*	.38*	.45*	.25*	.40*	.67*					1.2	1.5
11	Suicide ideation	−.16	.05	−.10	.33*	.28*	.33	.19	.43*	.53*	.64*				0.2	0.7
12	Reactive aggression	−.15*	.02	−.01	.40*	.37*	.25	.21*	.53*	.55*	.31*	.27*			2.5	3.1
13	Proactive aggression	−.13*	−.01	.02	.45*	.41*	.31	.14*	.50*	.64*	.38*	.35*	.71*	–	7.3	4.3

Note. $N = 767$.
[a]*n* and % instead of *M* and *SD*; Days before assessment = Number of days in facility before assessment.
*$P < .001$.

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, from 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.

Full data on demographics, childhood maltreatment, mental health problems, and aggression were available for 767 boys. Table I presents the sample characteristics. Age of the boys ranged from 13 to 24. The majority had an ethnic background other than Dutch. Of the boys, 21.0% was native Dutch, 27.3% had a Moroccan background, 20.1% had a Surinamese or Dutch Antillean background, and 31.6% had some other ethnic background. The number of days between entrance into the facility and the assessment ranged from 0 to 47 days and was on average almost 2 days.

Measures

Demographics. Boys reported their age and ethnic background at the time of assessment. 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). We followed the definition of the Dutch central bureau of statistics (Statistics Netherlands, 2015). Information about time between entrance into the facility and point of assessment was calculated by subtracting the date of entrance into the facility from the date of assessment. Time of entrance was collected via the facility's intake staff person.

Childhood maltreatment. Boys' histories of maltreatment were assessed using the Dutch version (Thombs, Bernstein, Lobbestael, & 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 five-point Likert type scale ranging from 1 = never true to 5 = very often true. The questionnaire yields scores for childhood Emotional Abuse, Physical Abuse, Sexual Abuse, Emotional Neglect, and Physical Neglect. 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 α of the scale physical neglect was very low (.42) and we, therefore, did not use this scale in our analyses. The Cronbach's αs of the remaining scales ranged from .78 to .82.

Mental health problems. The MAYSI-2 (Grisso, Barnum, Fletcher, Cauffman, & Peuschold, 2001) is a 52-item self-report inventory designed to identify symptoms of distress or troublesome behavior that could require further evaluation. Questions can be answered by yes or no. The MAYSI-2's reliability is good; scores relate as expected to other behavioral self-report inventories (Grisso et al., 2001; Hayes, McReynolds, & Wasserman, 2005; Wasserman et al., 2004). The Dutch version also provides a reliable screening of mental health problems in adolescent boys in Dutch juvenile justice facilities (Colins et al., 2014). We considered four of the seven MAYSI-2 subscales: Alcohol/Drug Use (8 items), Angry-Irritable (9 items), Depressed-Anxious (9 items), and Suicide Ideation (5 items). The Traumatic Experiences subscale was not examined because of overlap with the CTQ scales; the Somatic Complaints and Thought Disturbance subscales were not used, because Cronbach's αs were poor in the

present study (.45 and .59, respectively). In order to improve the subscale Depressed-Anxious, we removed the items about giving up hope in life and difficulties with having relationships with persons outside the family. This resulted in an α of .65. However, the corrected item-total correlations for all remaining items were >.30. The Cronbach's αs of remaining scales ranged from .73 to .83.

Aggression. The Reactive–Proactive Questionnaire (RPQ, Raine et al., 2006) was administered to measure aggressive behavior. The scale consists of two subscales distinguishing between fear-induced, irritable, and hostile affect-laden defensive responses to provocation (i.e., reactive aggression) and instrumental and organized aggressive behavior (i.e., proactive aggression). The proactive aggression subscale consists of 12 items, including for example vandalism for fun, threatening and bullying, and yelling to manipulate. The reactive aggression subscale consists of 11 questions about for example being angry when frustrated, becoming mad when lost a game, and hit when teased. Participants were asked to rate each item in terms of its frequency of occurrence using a 3-point scale ranging from 0 = never to 2 = often. Psychometric qualities of this self-report instrument have been found to be good for both the original version (Raine et al., 2006) and the Dutch version (Cima, Raine, Meesters, & Popma, 2013; Colins, 2014), which we used in this study. For the present sample, Cronbach's αs of the scales were good (.85 for the reactive and .83 for the proactive subscale).

Analyses

We conducted Structural Equation Modeling (SEM) to investigate links between childhood trauma and aggression, and whether these associations were mediated by mental health problems. The software package M*plus* (Muthén & Muthén, 2007) was used to examine the fit of the proposed models to the data. In the analysis, childhood maltreatment, mental health problems, and aggression scales were treated as censored variables. Censored variables are variables with a large fraction of observations at the minimum or maximum value. For childhood maltreatment, mental health, and aggression scores, many respondents have lower scores. Regression coefficients from analyzing censored dependent variables are called Tobit regression coefficients (Tobin, 1958). M*plus* estimates models with categorical and censored variables with Weighted Least Squares Mean and Variance adjusted (WLSMV) estimation.

Goodness of model fit was judged based on the chi-square ($\chi 2$) test of model fit, the root mean squared error of approximation (RMSEA, Steiger & Lind, 1980), and the comparative fit index (CFI, Bentler, 1990). A significant $\chi 2$ value indicates a significant discrepancy between the model and the data. In large samples, the overall $\chi 2$ 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 indicate close fit, and values smaller than .08 are considered satisfactory. Further, a model should have a CFI value greater than .90 (Hu & Bentler, 1999). If CFI>.90 and RMSEA<.08, we considered a model fit as acceptable, but if possible we improved the model until CFI>.95 (Hu & Bentler, 1999) or RMEA<.05. We used modification indices (MIs) to guide model specification. To guard against chance results, we tested MIs. The difference in fit between models was tested with the $\chi 2$ difference test using the DIFFTEST-option in M*plus*, which is required using WLSMV estimation (Asparouhov & Muthén, 2006).

Mediation was tested as follows. A path model with direct effects from childhood maltreatment (independent variables) to mental health problems (mediation variable), from mental health problems to aggression (dependent variable), and from childhood maltreatment to aggression was fitted. If this model fitted the data satisfactorily, we inspected the significance of the mediational relations, that is, the indirect effects from childhood maltreatment via mental health problems to aggression. If a mediational relation was present, indicated by a significant indirect effect, we tested the significance of the direct effect. Significant direct effects in addition to significant indirect effects indicate partial mediation. Absence of the direct effects indicates full mediation (Baron & Kenny, 1986; Li, 2011).

RESULTS

A correlation matrix and sample characteristics regarding maltreatment, mental health problems, and aggression are presented in Table I. We found small to large positive correlations between childhood trauma and aggression-related variables, with *r*s ranging from .14 (emotional neglect and proactive aggression) to .45 (emotional abuse and proactive aggression). Overall, we found statistically significant associations between childhood maltreatment and mental health problems, with the highest correlations found between Depression-Anxious and Emotional Abuse ($r = .43$) and Sexual Abuse ($r = .45$), respectively. Mental health problems were significantly associated with aggression. We tested whether correlations between reactive and proactive aggression were significantly different ($P < .01$; Steiger & Lind, 1980). The correlations between Alcohol/Drug Use and reactive versus proactive aggression did not differ significantly, $Z = -.9$, $P = .192$. Angry-Irritable,

$Z = -4.3$, $P < .001$, Depression-Anxious, $Z = -2.7$, $P = .006$, and Suicide Ideation, $Z = -3.1$, $P = .002$, were more strongly related to proactive aggression than to reactive aggression.

Structural Equation Models

Structural equation models were used to examine whether mental health problems mediated the association between childhood trauma and aggression. We started the modeling procedure by fitting a mediation model with paths from childhood trauma to mental health problems and aggression and from mental health problems to aggression. The model was adjusted for demographic variables by regressing childhood trauma on nonindigenous, age, and days in facility before point of assessment. In the first model, we fitted a more parsimonious model, with the CTQ, MAYSI-2, and RPQ subscales forming latent variables. The model was specified by allowing the factor loadings and paths to be freely estimated. The variances of the latent variables were fixed at one. The initial model yielded an acceptable fit to the data, $\chi^2(59, N = 767) = 202.9$, $P < .001$, RMSEA = .056, 90%CI [.048, .065], CFI = .916. Guided by modification indices, mental health problems were regressed on nonindigenous in the next model. This significantly improved model fit, $\Delta\chi^2(1) = 16.6$, $P < .001$ and resulted in an acceptable model fit, $\chi^2(58, N = 767) = 174.4$, $P < .001$, RMSEA = .051, 90%CI [.043, .060], CFI = .932. Next, we related Depression-Anxious with Angry-Irritableness. This again significantly improved model fit, $\Delta\chi^2(1) = 21.3$, $P < .001$. The final model provided an satisfactory fit to the data, $\chi^2(57, N = 767) = 162.2$, $P < .001$, RMSEA = .049, 90%CI [.040, .058], CFI = .939. The model fit of the final model (see Fig. 1) was significantly better than the fit of the initial model, $\Delta\chi^2(2) = 30.7$, $P < .001$. The results revealed full mediation from childhood maltreatment to aggression via mental health problems. The path from childhood maltreatment to aggression was not significant ($\beta = .01$, $P = .86$), but the paths from childhood maltreatment to mental health problems ($\beta = .65$, $P < .001$), and from mental health problems to aggression ($\beta = .79$, $P < .001$) were significant (see Fig. 1). As expected, the indirect effect of childhood maltreatment on aggression was significant ($\beta = .51$, $P < .001$). In this model, 48% of the variance in mental health problems and 64% of the variance in aggression were explained. Findings suggest that the association between childhood maltreatment and aggression was mediated by mental health problems.

In order to test which specific mental health problems mediated the link between childhood maltreatment and aggression and whether paths are different for Reactive and Proactive Aggression, we fitted a mediation model with the subscales of the MAYSI-2 and the RPQ as observed variables instead of the latent mental health problems and aggression variables (Fig. 2). The estimation of the initial model failed to converge to a solution, and, therefore, we allowed Reactive and Proactive Aggression to be related. This model yielded an unacceptable fit to the data, $\chi^2(53, N = 767) = 283.5$, $P < .001$, RMSEA = .068, 90%CI [.059, .076], CFI = .892. In order to improve model fit, we first added the association between Depression-Anxious and Angry-Irritable, which significantly improved model fit, $\Delta\chi^2(1) = 52.4$, $P < .001$, model fit

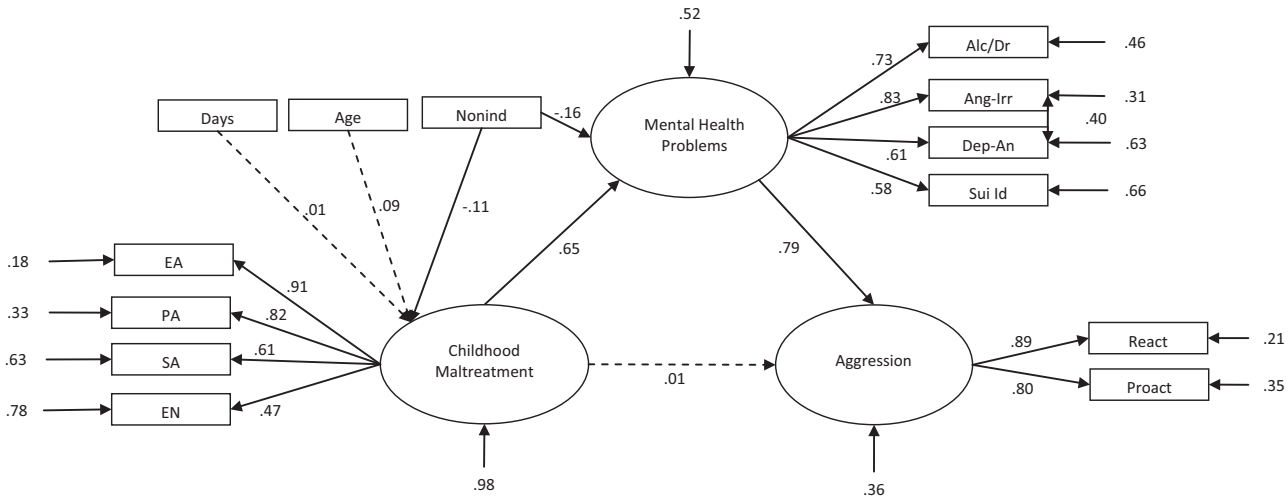

Fig. 1. Structural equation model of mediator effects of mental health problems (standardized parameter estimates). *Note*. Nonind, Nonindigenous; Days, Number of days in facility before assessment, EA, Emotional abuse; PA, Physical abuse; SA, Sexual abuse; EN, Emotional neglect; Alc/Dr, Alcohol/drug use; Ang-Irr, Angry-Irritable; Dep-An, Depression-anxious; Sui Id, Suicide ideation; React, Reactive aggression; Proact, Proactive aggression. Dashed lines indicate non-significant path estimates ($P > .05$).

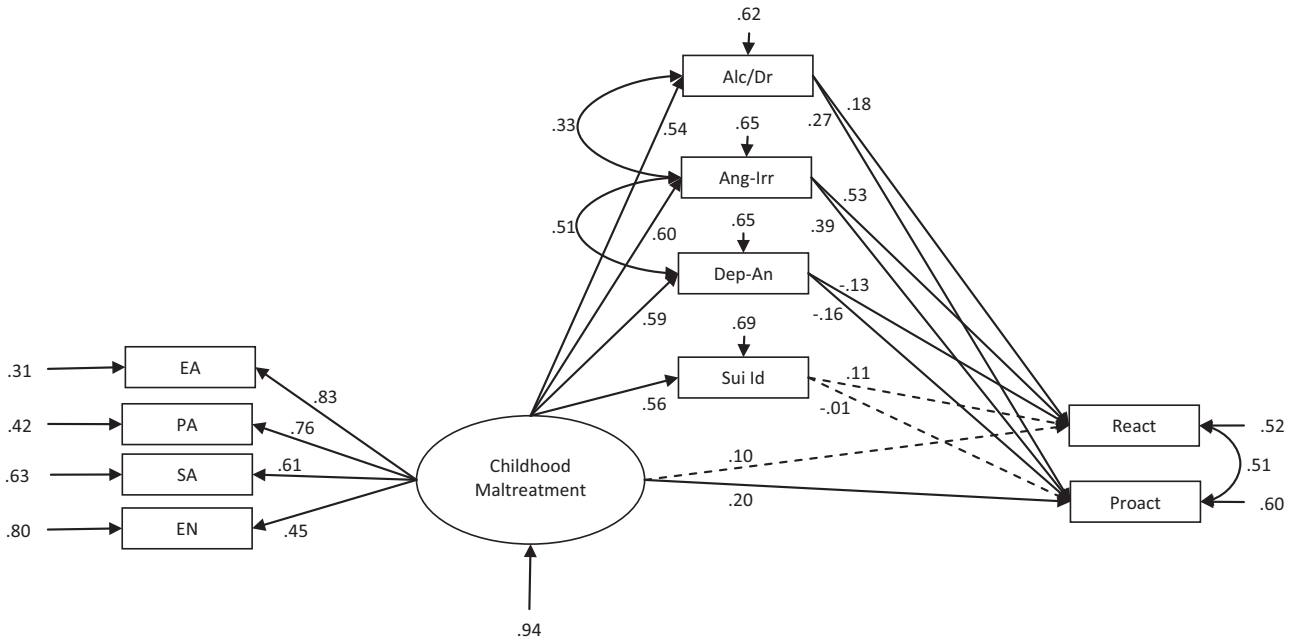

Fig. 2. Structural equation model with observed mental health problems and types of aggression (standardized parameter estimates). ***Note*****. EA, Emotional abuse; PA, Physical abuse; SA, Sexual abuse; EN, Emotional neglect; Alc/Dr, Alcohol/drug use; Ang-Irr, Angry-Irritable; Dep-An, Depression-anxious; Sui Id, Suicide ideation; React, Reactive aggression; Proact, Proactive aggression. Covariates are not presented in the figure: Childhood Maltreatment was regressed on Age ($\beta = .15$, $P = .02$), on Nonidigenous ($\beta = -.18$, $P < .001$), and Number of days in facility before assessment ($\beta = -.01$, $P = .92$), Alc/Dr ($\beta = -.20$, $P < .001$) and Ang-Irr ($\beta = -.160$, $P < .001$) were regressed on Age. Dashed lines indicate non-significant path estimates ($P > .05$).**

indices: $\chi^2(52, N = 767) = 202.8$, $P < .001$, RMSEA = .061, 90%CI [.053, .071], CFI = .912. Next, Angry-Irritableness was regressed on age, which again improved model fit significantly, $\Delta\chi^2(1) = 24.2$, $P < .001$, model fit indices: $\chi^2(51, N = 767) = 179.0$, $P < .001$, RMSEA = .057, 90%CI [.048, .066], CFI = .925. Next, Alcohol/Drug use was regressed on nonindigenous, which improved model fit significantly, $\Delta\chi^2(1) = 18.5$, $P < .001$, model fit indices: $\chi^2(50, N = 767) = 159.3$, $P < .001$, RMSEA = .053, 90%CI [.044, .063], CFI = .936. Finally, we added the association between Angry-Irritableness and Alcohol/Drug use, $\Delta\chi^2(1) = 30.0$, $P < .001$. The final model provided an acceptable fit to the data, $\chi^2(49, N = 767) = 138.7$, $P < .001$, RMSEA = .049, 90%CI [.039, .059], CFI = .948 and model fit was significantly better than the fit of the initial model, $\Delta\chi^2(4) = 110.2$, $P < .001$. The direct association between childhood maltreatment and *Reactive* Aggression was not significant ($\beta = -.10$, $P = .29$; Fig. 2). Significant indirect paths (see Table II) were found for Alcohol/Drug Use ($\beta = .10$, $P = .002$), Angry-Irritableness ($\beta = .32$, $P < .001$), and Depression-Anxious ($\beta = -.08$, $P = .04$). The indirect path via Suicide Ideation was non-significant ($\beta = .06$, $P = .15$). For *Proactive* Aggression, a significant direct link with childhood maltreatment was found ($\beta = .20$, $P = .03$; Fig. 2). Further, significant indirect paths were found via Alcohol/Drug Use ($\beta = .15$, $P < .001$; Table II), Angry-Irritableness ($\beta = .23$, $P < .001$), and Depression-Anxious ($\beta = -.09$, $P = .02$). The indirect path via Suicide Ideation was non-significant ($\beta = -.00$, $P = .94$). Thus, findings indicate that the maltreatment-*reactive* aggression link was fully mediated and the maltreatment-*proactive* aggression link was partially mediated by mental health problems, including alcohol/drug use, angry-irritableness, and depression-anxiety.

In order to test a potential reverse pathway, we fitted an alternative model (Gelfand et al., 2009), with the mediator as outcome and the outcome as mediator. Thus, we examined whether aggression mediated the association between childhood trauma and mental health problems. Again, we started the modeling procedure by fitting a mediation model with paths from childhood trauma to aggression and mental health problems, and from aggression to mental health problems. Childhood trauma was regressed on demographic variables (non-indigenous, age, and days in facility before point of assessment). In the first model, we fitted the parsimonious model, with the CTQ, MAYSI-2, and RPQ subscales forming latent variables. The initial model yielded an acceptable fit to the data, $\chi^2(59, N = 767) = 202.9$, $P < .001$, RMSEA = .056, 90%CI [.048, .065], CFI = .916. Guided by modification indices, in the next model, mental health problems were regressed on

TABLE II. Standardized Indirect Effects

Variables	Reactive aggression	Proactive aggression
Indirect effect on aggression via mental health problems		
Alcohol/drug use	.10**	.15***
Angry-irritable	.32***	.23***
Depression-anxious	−.08*	−.09*
Suicide ideation	.06	−.00
Indirect effect on mental health problems via aggression		
Alcohol/drug use	.01	.07
Angry-irritable	−.06	−.18*
Depression-anxious	−.47***	−.52***
Suicide ideation	−.30*	−.40**

*$P < .05$, **$P < .01$, ***$P < .001$.

nonindigenous. This significantly improved model fit, $\Delta\chi^2(1) = 13.9$, $P < .001$ and resulted in an acceptable model fit, $\chi^2(58, N = 767) = 184.8$, $P < .001$, RMSEA = .053, 90%CI [.045, .062], CFI = .926. Next, we related Depression-Anxious with Angry-Irritableness. This again significantly improved model fit, $\Delta\chi^2(1) = 25.0$, $P < .001$, fit indices: $\chi^2(57, N = 767) = 171.2$, $P < .001$, RMSEA = .051, 90%CI [.042, .060], CFI = .933. Next, we related Suicide Ideation with Depression-Anxious. This again significantly improved model fit, $\Delta\chi^2(1) = 27.6$, $P < .001$. The final model provided an satisfactory fit to the data, $\chi^2(56, N = 767) = 155.0$, $P < .001$, RMSEA = .048, 90%CI [.039, .057], CFI = .942. The model fit of the final model (see Fig. 3) was significantly better than the first model, $\Delta\chi^2(3) = 51.8$, $P < .001$. The results revealed partial mediation from childhood maltreatment to mental health problems via aggression. The indirect effect of childhood maltreatment on aggression was significant ($\beta = .34$, $P < .001$) and the direct path from childhood maltreatment to aggression remained significant ($\beta = .35$, $P < .001$). In this model, 78% of the variance of mental health problems and 30% of the variance of aggression were explained.

Next, we fitted a mediation model with the subscales of the MAYSI-2 and the RPQ as observed variables instead of the latent mental health problems and aggression variables (Fig. 4). This model yielded an unacceptable fit to the data, $\chi^2(54, N = 767) = 297.9$, $P < .001$, RMSEA = .077, 90%CI [.068, .085], CFI = .858. In order to improve model fit, we first related the Physical Abuse and Emotional Abuse subscales, which significantly improved model fit, $\Delta\chi^2(1) = 92.4$, $P < .001$, model fit indices: $\chi^2(53, N = 767) = 243.4$, $P < .001$, RMSEA = .068, 90%CI [.060, .077], CFI = .889. Next, we added the association of Emotional Neglect and Emotional Abuse, which again improved model fit significantly, $\Delta\chi^2(1) = 60.8$, $P < .001$, model fit indices: $\chi^2(51, N = 767) = 189.3$, $P < .001$, RMSEA = .059, 90%CI [.050, .068], CFI = .920. Next, the association between Emotional Neglect and Physical Abuse was added to the model, which improved model fit significantly, $\Delta\chi^2(1) = 36.8$, $P < .001$, model fit indices: $\chi^2(51, N = 767) = 155.7$, $P < .001$, RMSEA = .052, 90%CI [.043, .061], CFI = .939. Finally,

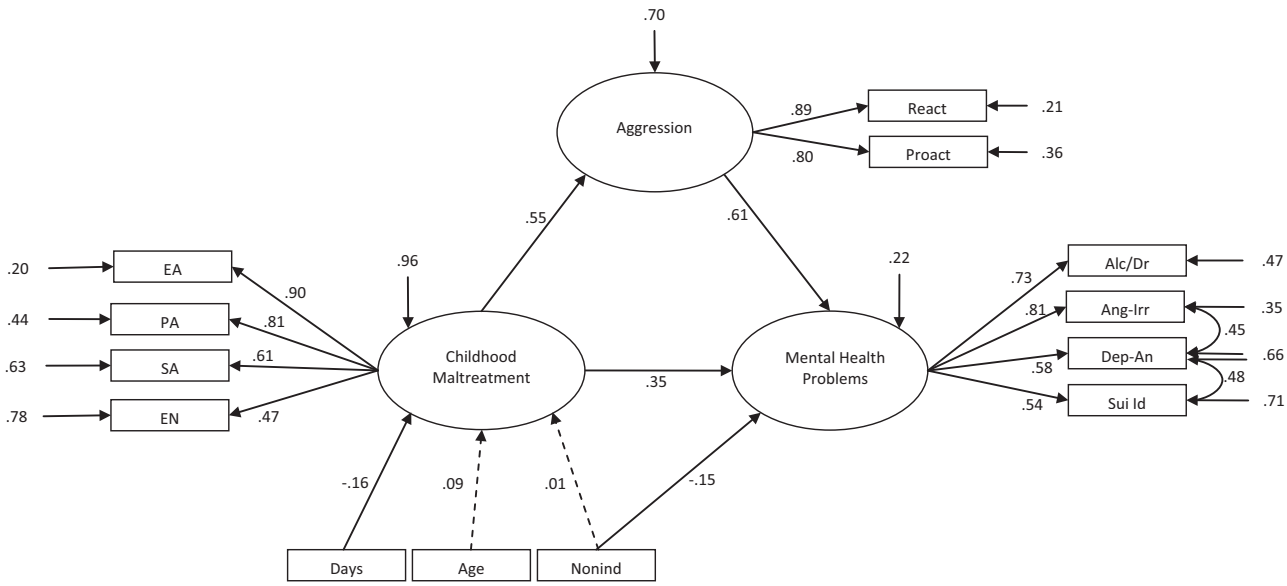

Fig. 3. Structural equation model of mediation effects of aggression (standardized parameter estimates). *Note*. Nonind, Nonindigenous; Days, Number of days in facility before assessment; EA, Emotional abuse; PA, Physical abuse; SA, Sexual abuse, EN, Emotional neglect; Alc/Dr, Alcohol/drug use; Ang-Irr, Angry-Irritable; Dep-An, Depression-anxious; Sui Id, Suicide ideation; React, Reactive aggression; Proact, Proactive aggression. Dashed lines indicate non-significant path estimates ($P > .05$).

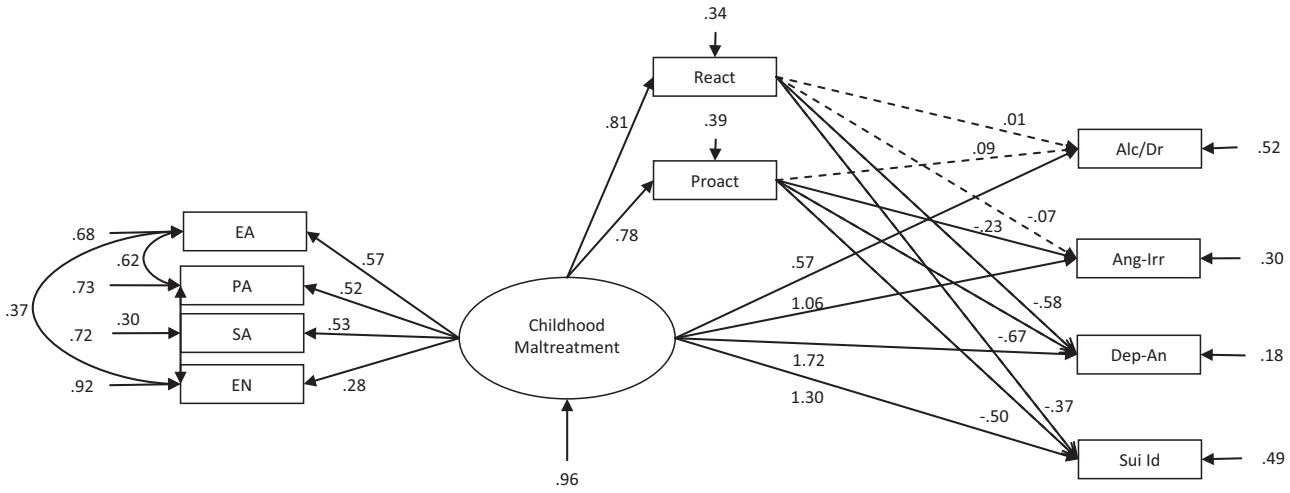

Fig. 4. Structural equation model with observed mental health problems and types of aggression (standardized parameter estimates). *Note*. EA, Emotional abuse; PA, Physical abuse; SA, Sexual abuse; EN, Emotional neglect; Alc/Dr, Alcohol/drug use; Ang-Irr, Angry-Irritable; Dep-An, Depression-anxious; Sui Id, Suicide ideation; React, Reactive aggression; Proact, Proactive aggression. Covariates are not presented in the figure: Childhood Maltreatment was regressed on Age ($\beta = .02$, $P = .57$), on Nonidigenous ($\beta = -.21$, $P < .001$), and Number of days in facility before assessment ($\beta = -.00$, $P = .96$), Alc/Dr was regressed on Nonindigenous ($\beta = .20$, $P < .001$). Dashed lines indicate non-significant path estimates ($P > .05$).

Alcohol/Drug Use was regressed on Age, $\Delta\chi^2(1) = 31.7$, $P < .001$. The final model provided an acceptable fit to the data, $\chi^2(50,\ N = 767) = 129.6$, $P < .001$, RMSEA = .046, 90%CI [.036, .055], CFI = .954 and model fit was significantly better than the fit of the initial model, $\Delta\chi^2(4) = 179.8$, $P < .001$. The direct associations between childhood maltreatment and mental health problems were all significant (see Fig. 5). Indirect paths via Reactive ($\beta = .01$, $P = .87$) and Proactive ($\beta = .07$, $P = .16$) Aggression to Alcohol/Drug Use were non-significant (Table II). One significant indirect path was found to Angry-Irritableness via Proactive Aggression ($\beta = -.18$,$P = .01$); the path via Reactive Aggression was non-significant ($\beta = -.06$,$P = .43$). Indirect paths to Depression-Anxious via Reactive Aggression ($\beta = -.47$,$P < .001$) and Proactive Aggression were both significant ($\beta = -.52$,$P < .001$). The indirect path to Suicide Ideation via Reactive Aggression ($\beta = -.30$, $P < .001$) and Proactive Aggression were both significant ($\beta = -.40$,$P < .001$) were significant, too. Thus, findings indicate that the association between maltreatment and depression-anxiety and suicide ideation were partially mediated by both reactive and proactive aggression. Further, the maltreatment-angry/irritableness link was partially mediated by proactive aggression alone, and the maltreatment-alcohol/drug use link was not mediated by either reactive or proactive aggression.

DISCUSSION

Ample research has found evidence for the cycle of violence, indicating that childhood maltreatment increases the risk for later offending (Widom, 1989; Widom, 2014). The processes explaining the cycle of violence are less clear and research in juvenile justice samples in particular is scarce. Given the burden of problems related to child abuse and aggressiveness in justice-involved youths, it is important to clarify paths from childhood maltreatment to adolescent mental health problems and aggression because this knowledge can be used to develop early detection strategies and interventions for those at risk for later violence and aggression. In the present study, we examined the contribution of mental health problems to the association between childhood maltreatment and adolescent aggression in a sample of juvenile justice boys. We found different pathways depending on the type of aggression. The association between childhood maltreatment and reactive aggression was fully mediated by various types of mental health problems. For proactive aggression, the association was partially mediated by mental health problems. In addition, we found several reverse pathways from maltreatment to aggression and subsequently mental health problems. The association between childhood maltreatment and internalizing problems was partly mediated by reactive and proactive aggression. The path from maltreatment to angry-irritableness was partly mediated by proactive aggression only.

Differences Between Reactive and Proactive Aggression

The findings for proactive and reactive aggression differed in three ways. First, higher levels of reactive

than proactive aggression were found, which is consistent with findings in previous studies (e.g., Raine et al., 2006). Second, we found that associations between childhood maltreatment and proactive aggression were statistically significant—mental health problems (except alcohol and drug use) were more strongly linked to proactive than reactive aggression. This suggests that boys with high levels of proactive aggression are characterized by high rates of childhood abuse and mental health problems. This is inconsistent with findings of an earlier study of emotionally disturbed children (Ford et al., 2009), which relied on official medical records. However, our findings are in line with research on callous–unemotional traits and maltreatment.

This research is relevant, as proactive aggression has been found to be linked to callous–unemotional traits (Cima et al., 2013; Raine et al., 2006). In a study of incarcerated boys (Kimonis et al., 2013), it was found that callous–unemotional traits were associated with childhood maltreatment. Specifically, those with high levels of callous–unemotional traits showed higher rates of child abuse and neglect than those low on these traits.

Third, findings for reactive and proactive aggression were different regarding the role of mental health problems. We found that mental health problems fully explained the association between maltreatment and reactive aggression—maltreatment was related to mental health problems, which in turn were related to reactive aggression. We also found a reverse path for internalizing problems. Maltreatment was related to reactive aggression, which in turn was related to internalizing problems, such as depression-anxiety and suicide ideation. These findings suggest that for reactive aggression, childhood abuse might result in reactive aggression and (internalizing) mental health problems, which are likely to interact in two directions. This is consistent with earlier findings showing that mental health problems result in aggression (Ford et al., 2006), but also that aggression precedes mental health problems (Fite et al., 2013; Underwood et al., 2011; Vaillancourt et al., 2014).

We found that maltreatment was directly associated with proactive aggression and unlike reactive aggression, was not fully mediated by mental health problems. Although it is not completely clear *how* childhood maltreatment is associated with proactive aggression in children, Porter (1996) suggested that severe childhood abuse may lead to deficits in emotional functioning and moral development, which in turn may increase the risk for later callous–unemotional traits. That is, these children do not experience emotion in order to cope with overwhelming stress resulting from trauma (Porter, 1996). Support for this assumption was found by recent research on juvenile justice youth showing that the association between trauma and callous–unemotional traits was mediated by emotional numbing (Kerig, Bennett, Thompson, & Becker, 2012). This mechanism might explain why the association between trauma and proactive aggression is not fully mediated by mental health problems. However, we also found a reverse pathway from maltreatment to mental health problems via proactive aggression. Childhood maltreatment was related to proactive aggression, which in turn was related to both angry-irritableness and internalizing problems such as depression-anxiety and suicide ideation. Thus, although the maltreatment-proactive aggression link may not be explained by mental health problems, proactive aggression may lead to mental health problems.

These findings suggest that for reactive aggression, a transactional model might apply in which associations in two directions are possible, as we found pathways from mental health problems to reactive aggression and vice versa. For proactive aggression, a different trajectory may exist, as we found a direct path from maltreatment to proactive aggression (not via mental health problems) and paths from proactive aggression to mental health problems. It can, therefore, be concluded that the present study's findings add to the existing evidence that aggression is a heterogeneous concept and that reactive and proactive aggression are meaningfully distinct concepts with different etiological pathways.

Types of Mental Health Problems

In both subtypes of aggression, we found significant indirect paths via alcohol and drug use, and angriness and irritability. Fite and colleagues (Fite, Colder, Lochman, & Wells, 2007; Fite, Raine, Stouthamer-Loeber, Loeber, & Pardini, 2009) found that both subtypes of aggression are linked to substance use and suggested that different explanations may account for these links to alcohol and drug problems. Reactive aggression might be related to substance use for self-medicating purposes, for example, as a way to cope with negative emotions. Conversely, proactive aggression could be associated with alcohol and drug use due to a developmental progression of deviant behavior. One problem behavior, such as aggression, may increase the likelihood of another problem behavior, such as substance use, due to similar explanatory mechanisms (see also, Jessor, 1991). In addition, proactively aggressive youths may have a stronger focus on the positive outcomes and ignore the negative consequences of their deviant behavior, including early substance use, consistent with research showing that proactively aggressive youths are more likely to anticipate positive outcomes of their behavior (Dodge et al., 1997).

We found various paths from childhood maltreatment to various types of mental health problems to reactive and proactive aggression. Different routes may exist from childhood maltreatment to adolescent reactive aggression via particular types of mental health problems, such as alcohol and drug use, or angry-irritability, but also via comorbid conditions. Given that comorbidity is high among juvenile justice youths (e.g., Abram, Teplin, McClelland, & Dulcan, 2003; Colins, Vermeiren, Schuyten, & Broekaert, 2009a), boys with a history of abuse and neglect are likely to suffer from comorbid conditions, such as co-occurring depression-anxiety and angry-irritability. Interestingly, we found a *positive* correlation between all types of mental health problems, including depression-anxiety and the two types of aggression. However, we found a *negative* indirect effect via depression-anxiety, which means that maltreatment was related to higher levels of depression-anxiety, but higher levels of depression-anxiety were related to lower levels of aggression (Fig. 2). Also, strong associations were found between depression-anxiety and the externalizing mental health problems, angry-irritability in particular. This pattern has been identified as net suppression (e.g., MacKinnon, Krull, & Lockwood, 2000). In this case, higher levels of depression-anxiety are associated with higher levels of aggression, but this can be explained by a high correlation between depression-anxiety and angry-irritability. Child maltreatment that leads to depression-anxiety is associated with *lower* levels of aggression, only when adjusting for externalizing mental health problems, such as angry-irritability.

Strengths and Limitations

The strengths of the present study 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. Second, the sample consisted of a large, ethnically-diverse group of justice-involved boys, which is a population with a high burden of destructive behavior and mental health problems. Also, we used standardized questionnaires and structured diagnostic interviews that have been well validated and are commonly used with youth in juvenile justice settings.

Despite these strengths, several limitations should be noted. First, we do not know whether or not mental health problems preceded aggression or vice versa. We found full mediation of mental health problems (maltreatment → mental health problems → aggression; Fig. 1), but only partial mediation for the reverse causal path (maltreatment → aggression → mental health problems; Fig. 3). However, the present study's design was cross-sectional and, therefore, our findings are not conclusive regarding the temporal order of mental health problems and aggression. Future studies should investigate links between mental health problems and aggression longitudinally in youths in juvenile justice facilities and after release into the community in order to be able to test how mental health problems and aggression interact over time. Second, the present study relied on self-reported data and, therefore, associations might be inflated due to shared method variance. In addition, the reliability of one of the subscales (depressed-anxious of the Maysi-2) was questionable and, therefore, the effects may be biased. This bias was likely removed in the latent variables models (Figs. 1 and 3), but the path from depression-anxiousness to aggression may be have been underestimated and the path from child abuse to aggression may have been overestimated (Fig. 2). Further, childhood maltreatment was measured retrospectively. Future studies would benefit from involving multiple informants and official data 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 may not be able to report on mental health problems right after the boys have entered the facility. Third, nonindigenous boys were over-represented in the juvenile justice system and consequently, the majority of the participants had a non-Dutch ethnic background. Nonindigenous youths have been found to have a tendency to underreport mental health problems for various reasons (Colins et al., 2013; Zwirs et al., 2007) that are out of the scope of the present study. However, a study on the Dutch version of the MAYSI-2 revealed that Moroccan juveniles indeed reported fewer mental health problems, but this could not be explained by differences in measurement reliability, as the MAYSI-2 was found to be a reliable instrument across ethnic groups (Colins et al., 2014). Moreover, a recent systematic review showed that self-report instruments have been found to be most reliable among ethnic minority youths compared to instruments for other informants, such as parents (Paalman, Terwee, Jansma, & Jansen, 2013). Finally, given that findings regarding rates of child abuse and mental health problems in western countries are relatively similar, the results are likely to be generalizable to western but perhaps not to non-western countries.

Implications for Policy and Practice

The current investigation has several implications for policy and practice. First, we showed that the maltreatment-reactive aggression link was mediated by

mental health problems, possibly by combinations of different types of problems, including disruptive behavior, internalizing, and substance use problems. Research on mental health problems and (re) offending showed that co-occurring internalizing and externalizing disorder has been found to be linked to offending in (young) adulthood (Copeland, Miller-Johnson, Keeler, Angold, & Costello, 2007b; Harrington, Fudge, Rutter, Pickles, & Hill, 1991; Hodgins, De Brito, Chhabra, & Coté, 2010; Hoeve, McReynolds, & Wasserman, 2013). Given that depression and anxiety were strongly related to externalizing problems in the present sample, practitioners should be keen to screen for traumatic stress and internalizing problems and provide adequate treatment for these and other mental health problems. Justice-involved youths with internalizing problems are less likely to be referred to mental health services relative to those without internalizing problems (Hoeve, McReynolds, & Wasserman, 2014), implying that access to mental health services for these youths with internalizing problems can be improved. Second, our finding of different paths to reactive and proactive aggression suggests that juvenile delinquents with high scores on reactive aggression might benefit from different interventions than from those used for delinquents with mainly high scores on proactive aggression. For example, reactively aggressive youths might benefit from interventions that focus on mental health problems, trauma-related stress and symptoms, impulse control, and anger management. Youths who report high levels of proactive regression might benefit from early interventions, as research on callous–unemotional traits and psychopathy have shown some positive effects of early family programs and cognitive behavior treatment with motivationally based strategies (Ribeiro da Silva, Rijo, & Salekin, 2013). Third, given that alcohol and substance abuse mediated childhood maltreatment and both types of aggression, juvenile justice facilities should identify those with substance use problems and provide evidence-based treatment for these problems. Adequate assessment and treatment of trauma-related externalizing and internalizing mental health problems in juvenile justice boys is important and might play an important role in breaking the cycle of violence.

REFERENCES

Abram, K. M., Teplin, L. A., Charles, D. R. & Longwordth, S. L. (2004). Posttraumatic stress disorder and trauma in youth in juvenile detention. *Archives of General Psychiatry*, *61*, 403–410. doi: 10.1001/archpsyc.61.4.403

Abram, K. M., Teplin, L. A., McClelland, G. M. & Dulcan, M. K. (2003). Comorbid psychiatric disorders in youth in juvenile detention. *Archives of General Psychiatry*, *60*, 1097–1108. doi: 10.1001/archpsyc.60.11.1097

Anda, R. F., Felitti, V. J., Bremmer, J. D., Walker, J. D., Whitfield, C., Perry, B. D. & Giles, W. H. (2006). The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry and Clinical Neuroscience*, *256*, 174–186. doi: 10.1007/s00406-005-0624-4

Asparouhov, T. & Muthén, B. O. (2006). Robust chi square difference testing with mean and variance adjusted test statistics, Mplus Web Notes: No. 10. Retrieved from http://www.statmodel.com/download/webnotes/webnote10.pdf.

Baron, R. M. & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, *107*, 238–246.

Bernstein, D. P. & Fink, L. (1998). *Childhood trauma questionnaire: A retrospective self-report manual*. San Antonio, TX: The Psychological Corporation.

Bernstein, D. P., Stein, J. A., Newcomb, M. D., Walker, E., Pogge, D., Ahluvalia, T. & Zule, W. (2003). Development and validation of a brief screening version of the childhood trauma questionnaire. *Child Abuse and Neglect*, *27*, 169–190.

Brown, D. S., Fang, X. & Florence, C. S. (2011). Medical costs attributable to child maltreatment: A systematic review of short- and long-term effects. *American Journal of Preventive Medicine*, *42*, 627–635. doi: 10.1016/j.amepre.2011.08.013

Card, N. A. & Little, T. D. (2006). Proactive and reactive aggression in childhood and adolescence: A meta-analysis of differential relations with psychosocial adjustment. *International Journal of Behavioral Development*, *30*, 466–480. doi: 10.1177/0165025406071904

Cima, M., Raine, A., Meesters, C. & Popma, A. (2013). Validation of the dutch reactive proactive questionnaire (RPQ): Differential correlates of reactive and proactive aggression from childhood to adulthood. *Aggressive Behavior*, *39*, 99–113. doi: 10.1002/ab.21458

Colins, O. F. (2014). Assessing reactive and proactive aggression in detained adolescents outside a research context. Manuscript submitted for publication.

Colins, O. F., Boonman, C., Veenstra, J., Van Domburgh, L., Buffing, F., Doreleijers, T. A. H., & Vermeiren, R. R. J. M. (2013). Mental health problems and recidivism among detained male adolescents from various ethnic origins. *European Child & Adolescent Psychiatry*, *22*, 481–490. doi: 0.1007/s00787-013-0384-z

Colins, O. F., Grisso, T., Vahl, P., Guy, L., Hornby, N., Pronk, C. … Vermeiren, R. R. J. M. (2014). Standardized screening for mental health needs of detained youths from various ethnic origins: The dutch massachusetts youth screening instrument-second version (MAYSI-2). Manuscript submitted for publication.

Colins, O. F., Vermeiren, R. R. J. M., Schuyten, G., Broekaert, E. & Soyez, V. (2008). Informant agreement in the assessment of disruptive behavior disorders in detained minors in belgium: A diagnosis-level and symptom-level examination. *Journal of Clinical Psychiatry*, *69*, 141–148. doi: 10.4088/JCP.v69n0119

Colins, O. F., Vermeiren, R. R. J. M., Schuyten, G. & Broekaert, E. (2009a). Psychiatric disorders in property, violent, and versatile offending detained male adolescents. *American Journal of Orthopsychiatry*, *79*, 31–38. doi: 10.1037/a0015337

Colins, O. F., Vermeiren, R. R. J. M., Vreugdenhil, C., Schuyten, G., Broekaert, E. & Krabbendam, A. (2009b). Are psychotic experiences among detained juvenile offenders explained by trauma and substance use? *Drug and Alcohol Dependence*, *100*, 39–46. doi: 10.1016/j.drugalcdep.2008.08.013

Copeland, W. E., Keeler, G., Angold, A. & Costello, E. J. (2007a). Traumatic events and posttraumatic stress in childhood. *Archives of General Psychiatry*, *64*, 577–584.

Copeland, W. E., Miller-Johnson, S., Keeler, G., Angold, A. & Costello, E. J. (2007b). Childhood psychiatric disorders and young adult crime: A prospective, population-based study. *American Journal of Psychiatry*, *164*, 1668–1675.

Dodge, K. A., Bates, J. E. & Pettit, G. S. (1990). Mechanisms in the cycle of violence. *Science*, *250*, 1678–1683.

Dodge, K. A., Lochman, J. E., Harnish, J. D., Bates, J. E. & Pettit, G. S. (1997). Reactive and proactive aggression in school children and psychiatrically impaired chronically assaultive youth. *Journal of Abnormal Psychology*, *106*, 37–51.

English, D. J., Widom, C. S. & Brandford, C. (2001). *Childhood victimization and delinquency, adult criminality, and violent criminal behavior: A replication and extension (No. NCJ192291)*. Rockville, MD: National Institute of Justice.

Fite, P. J., Colder, C. R., Lochman, J. E. & Wells, K. C. (2007). Pathways from proactive and reactive aggression to substance use. *Psychology of Addictive Behaviors*, *21*, 355–364. doi: 10.1037/0893-164X.21.3.355

Fite, P. J., Raine, A., Stouthamer-Loeber, M., Loeber, R. & Pardini, D. A. (2009). Reactive and proactive aggression in adolescent males: Examining differential outcomes 10 years later in early adulthood. *Criminal Justice and Behavior*, *37*, 141–157. doi: 10.1177/0093854809353051

Fite, P. J., Rubens, S. L., Preddy, T. M., Raine, A. & Pardini, D. A. (2013). Reactive/proactive aggression and the development of internalizing problems in males: The moderating effect of parent and peer relationships. *Aggressive Behavior*, *9999*, 1–10. doi: 10.1002/ab.21498

Ford, J. D., Chapman, J., Connor, D. F. & Cruise, K. R. (2012). Complex trauma and aggression in secure juvenile justice settings. *Criminal Justice and Behavior*, *39*, 694–724.

Ford, J. D., Chapman, J., Mack, J. M. & Pearson, G. (2006). Pathways from traumatic child victimization to delinquency: Implications for juvenile and permanency court proceedings and decisions. *Juvenile and Family Court Journal*, *57*, 13–26.

Ford, J. D., Fraleigh, L. A. & Connor, D. F. (2009). Child abuse and aggression among seriously emotionally disturbed children. *Journal of Clinical Child & Adolescent Psychology*, *39*, 25–34. doi: 10.1080/15374410903401104

Ford, J. D., Hartman, K., Hawke, J. & Chapman, J. F. (2008). Traumatic victimization, posttraumatic stress disorder, suicidal ideation, and substance abuse risk among juvenile justice-involved youth. *Journal of Child & Adolescent Trauma*, *1*, 75–92.

Gelfand, L. A., Mensinger, J. L., & Tenhave, T. (2009). Mediation analysis: A retrospective snapshot of practice and more recent directions. *Journal of General Psychology*, *136*, 153–176.

Grisso, T., Barnum, R., Fletcher, K. E., Cauffman, E. & Peuschold, D. (2001). Massachusetts youth screening instrument for mental health needs of juvenile justice youths. *Journal of the American Academy of Child and Adolescent Psychiatry*, *40*, 541–548.

Harrington, R., Fudge, H., Rutter, M., Pickles, A. & Hill, J. (1991). Adult outcomes of childhood and adolescent depression: II. links with antisocial disorders. *Journal of the American Academy of Child and Adolescence Psychiatry*, *30*, 434–439.

Hayes, M. A., McReynolds, L. S. & Wasserman, G. A. (2005). Paper and voice MAYSI-2: Format comparability and concordance with the voice DISC-IV. *Assessment*, *12*, 395–403. doi: 10.1177/1073191105280359

Hodgins, S., De Brito, S., Chhabra, P. & Coté, G. (2010). Anxiety disorders among offenders with antisocial personality disorders: A distinct subtype? *Canadian Journal of Psychiatry*, *55*, 784–791.

Hoeve, M., McReynolds, L. S. & Wasserman, G. A. (2013). The influence of adolescent psychiatric disorder on young adult recidivism. *Criminal Justice and Behavior*, *40*, 1462–1476. doi: 10.1177/0093854813488106

Hoeve, M., McReynolds, L. S. & Wasserman, G. A. (2014). Service referral for juvenile justice youths: Associations with psychiatric disorder and recidivism. *Administration and Policy in Mental Health and Mental Health Services Research*, *41*, 379–389. doi: 10.1007/s10488-013-0472-x

Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional versus new alternatives. *Structural Equation Modeling*, *6*, 1–55.

Jessor, R. (1991). Risk behavior in adolescence: A psychosocial framework for understanding and action. *Journal of Adolescent Health*, *12*, 597–605.

Kerig, P. K., Bennett, D. C., Thompson, M. & Becker, S. P. (2012). "Nothing really matters": Emotional numbing as a link between trauma exposure and callousness in delinquent youth. *Journal of Traumatic Stress*, *25*, 272–279. doi: 10.1002/jts.21700

Kerig, P. K., Ward, R. M., Vanderzee, K. L. & Moeddel, M. A. (2009). Posttraumatic stress as a mediator of the relationship between trauma and mental health problems among juvenile delinquents. *Journal of Youth Adolescence*, *38*, 1214–1225. doi: 10.1007/s10964-008-9332-5

Kimonis, E. R., Fanti, K. A., Isoma, Z. & Donoghue, K. (2013). Maltreatment profiles among incarcerated boys with callous-unemotional traits. *Child Maltreatment*, *18*, 108–121. doi: 10.1177/1077559513483002

Li, S. D. (2011). Testing mediation using multiple regression and structural equation modeling analyses in secondary data. *Evaluation Review*, *35*, 240–268. doi: 10.1177/0193841(11412069

MacKinnon, D. P., Krull, J. L. & Lockwood, C. M. (2000). Equivalence of the ,mediation, confounding and suppression effect. *Prevention Science*, *1*, 173.

Maxfield, M. G. & Widom, C. S. (1996). The cycle of violence: Revisited 6 years later. *Archives of Pediatrics and Adolescent Medicine*, *150*, 390–395.

Muthén, L. K. & Muthén, B. O. (2007). *Mplus users guide (5th ed.)*. Los Angeles, CA: Muthén & Muthén.

Paalman, C. H., Terwee, C. B., Jansma, E. P. & Jansen, L. M. C. (2013). Instruments measuring externalizing mental health problems in immigrant ethnic minority youths: A systematic review of measurement properties. *PLoS ONE*, *8*, e63109. doi: 10.1371/journal.pone.0063109

Porter, S. (1996). Without conscience or without active conscience? The etiology of psychopathy revisited. *Aggression and Violent Behavior*, *1*, 179–189.

Raine, A., Dodge, K., Loeber, R., Gatzke-Kopp, L., Lynam, D., Reynolds, C., & Liu, J. (2006). The Reactive-Proactive aggression questionnaire: Differential correlates of reactive and proactive aggression in adolescent boys. *Aggressive Behavior*, *32*, 159–171.

Ribeiro da Silva, D., Rijo, D., & Salekin, R. T. (2013). Child and adolescent psychopathy: Assessment issues and treatment needs. *Aggression and Violent Behavior*, 71–78. doi: 10.1016/j.avb.2012.10.003

Statistics Netherlands. (2015). Definitions. Retrieved from http://www.cbs.nl/en-GB/menu/methoden/begrippen/default.htm?Languages-witch= on&ConceptID=37.

Steiger, J. H., & Lind, J. C. (1980). Statistically based tests for the number of common factors. Paper Presented at the Annual Meeting of the Psychometric Society, Iowa City, IA.

Steiner, H., Silverman, M., Karnik, N. S., Huemer, J., Plattner, B., Clark, C. E. & Haapanen, R. (2011). Psychopathology, trauma and delinquency: Subtypes of aggression and their relevance for

understanding young offenders. *Child and Adolescent Psychiatry and Mental Health*, *5*, 21. doi: 10.1186/1753-2000-5-21

Stimmel, M. A., Cruise, K. R., Ford, J. D. & Weiss, R. A. (2014). Trauma exposure, posttraumatic stress disorder symptomatology, and aggression in male juvenile offenders. *Psychological Trauma: Theory, Research, Practice, and Policy*, *6*, 184–191. doi: 10.1037/a0032509

Stouthamer-Loeber, M., Loeber, R., Homish, D. L. & Wei, E. H. (2001). Maltreatment of boys and the development of disruptive and delinquent behavior. *Development and Psychopathology*, *13*(4), 941–955.

Thombs, B. T., Bernstein, D. P., Lobbestael, J. & Arntz, A. (2009). Validation study of the dutch childhood trauma questionnaire-short form: Factor structure, reliability, and know-groups validity. *Child Abuse and Neglect*, *33*, 518–523.

Tobin, J. (1958). Estimation of relationships for limited dependent variables. *Econometrica*, *26*, 24–36.

Twardosz, S. & Lutzker, J. R. (2010). Child maltreatment and the developing brain: A review of neuroscience perspectives. *Aggression and Violent Behavior*, *15*, 59–68. doi: 10.1016/j.avb.2009.08.003

Underwood, M. K., Beron, K. J. & Rosen, L. H. (2011). Joint trajectories for social and physical aggression as predictors of adolescent maladjustment: Internalizing symptoms, rule-breaking behaviors, and borderline and narcissistic personality features. *Development and Psychopathology*, *23*, 659–678. doi: 10.1017/S095457941100023X

Vaillancourt, T., Brittain, H. L., McDougall, P., Krygsman, A., Boylan, K., Duku, E. & Hymel, S. (2014). Predicting borderline personality disorder symptoms in adolescents from childhood physical and relational aggression, depression, and attention-deficit/hyperactivity disorder. *Development and Psychopathology*, *26*, 817–830. doi: 10.1017/S0954579414000418

Wasserman, G. A., McReynolds, L. S., Ko, S. J., Katz, L. M., Cauffman, E., Haxton, W. & Lucas, C. P. (2004). Screening for emergent risk and service needs among incarcerated youth: Comparing MAYSI-2 and voice DISC-IV. *Journal of the American Academy of Child and Adolescent Psychiatry*, *43*, 629–639. doi: 10.1097/00004583-200405000-00017

Widom, C. S. (1989). The cycle of violence. *Science*, *244*, 160–166.

Widom, C. S. (2014). Varieties of violent behavior. *Criminology*, *52*, 313–344. doi: 10.1111/ 1745-9125. 12046

Wilson, H. W., Stover, C. S. & Berkowitz, S. J. (2009). The relationship between childhood violence exposure and juvenile antisocial behavior: A meta-analytic review. *Journal of Child Psychology and Psychiatry*, *50*, 769–779. doi: 10.1111/j. 1469-7610. 2008.01974.x

Zwirs, B. W. C., Burger, H., Schulpen, T. W. J., Wiznitzer, M., Fedder, H. & Buitelaar, J. K. (2007). Prevalence of psychiatric disorders among children of different ethnic origin. *Journal of Abnormal Child Psychology*, *35*, 556–566.