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Violence Exposure Subtypes Differentially Mediate the Relation between Callous-Unemotional Traits and Adolescent Delinquency

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Abstract Research with children and adolescents has established a link between callous-unemotional (CU) traits and delinquency, as well as a link between violence exposure (witnessing and direct victimization) and diverse negative and antisocial outcomes. Little attention has been paid to investigating the association among CU traits, violence exposure, and various forms of delinquency. Using a sample of 753 adolescents (male =58%; African American =46%), the current study aimed to elucidate the mediating role of violence exposure (measured in grades 7, 8, 10, 11) on the relationship between CU traits measured in grade 7 and later delinquency (i.e., property, violent, drug, and sexual) assessed in grade 12. Total violence exposure (witnessing and direct victimization) mediated the association between CU traits and all forms of delinquency. When looking at witnessing and direct victimization separately, however, only witnessing violence mediated the relationship between CU traits and all forms of delinquency. These results highlight the importance of violence exposure in the CU-delinquency link, and showed the differential roles of indirect and direct forms of violence exposure on the association. Witnessing and direct victimization may involve different underlying mechanisms influencing developmental outcomes in youth. These findings have important implications for understanding developmental models of violence exposure, CU traits, and delinquency, as well as interventions for youth who have experienced both indirect and direct forms of violence.

Keywords Callous-unemotional traits · Violence exposure · Victimization · Property offenses · Violence · Drug delinquency · Sexual delinquency

Conduct problems account for a large proportion of psychopathology in children and adolescents, and predict long-term consequences including substance use, impaired psychosocial functioning, and adult criminality (Kimonis et al. 2014). These antisocial behaviors are often stable over time and interventions are only moderately successful (Kazdin 1995). Studies have shown that there exists a subgroup of youth with conduct problems and callous-unemotional (CU) traits, characterized by a lack of guilt, absence of empathy and remorse, and shallow and constricted affect (Frick et al. 2013). CU traits represent certain affective features typically associated with adult psychopathy (Kimonis et al. 2014), sensation-seeking (Frick et al. 1994), a reward-oriented response style (O'Brien and Frick 1996), and fearlessness (Barry et al. 2000). Children and adolescents with high levels of CU traits also exhibit a neurocognitive profile indicative of defects in affect processing (Blair et al. 2006). These temperamental and neurobiological characteristics may partly explain why children and adolescents with high levels of CU traits are at increased risk for following a particularly severe and stable trajectory of diverse antisocial behaviour (for a comprehensive review, see Frick et al. 2013), including property delinquency (Kimonis et al. 2013a, b), recurrent and severe substance use and substance-related delinquency (Wymbs et al. 2012), sexual offense planning and sexual delinquency (Frick and White 2008; Lawing et al. 2010), and more instrumental and premeditated forms of violence (Kruh et al. 2005).

While CU traits are an important dispositional factor associated with delinquency, multiple environmental factors also contribute to the development and exacerbation of various forms of

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delinquency. One such factor is violence exposure (both direct victimization experiences and witnessing violence perpetrated by others onto others). Studies using large nationally representative samples in the U.S. have found that approximately 60% of children and adolescents age 17 and younger have experienced at least one direct or witnessed victimization in the past year, with physical assault with and without a weapon, maltreatment, and sexual victimization among the most common experiences (Finkelhor et al. 2009). Exposure to community violence is associated with lower cognitive functioning in youth (Kimonis et al. 2011). Additionally, witnessing severe domestic violence is related to aggression and future violent and sexual delinquency (Caputo et al. 1999; Chen et al. 2016). Experiences of violence exposure have also been associated with significant levels of distress and psychopathology such as depression, anxiety, and posttraumatic stress disorder (PTSD) (see Reijntjes et al. 2010 for a review).

Despite generally finding positive associations between violence exposure and various types of delinquency, previous studies have typically measured violence exposure in home, school, and community settings, and have often included both witnessing violence and direct victimization together as a single aggregated measure (e.g., Chen et al. 2016). Recent research, however, suggests that different subtypes of violence exposure may contribute differentially to negative developmental outcomes, such as internalizing and externalizing symptoms (Howard et al. 2002). Some studies have shown that direct victimization is more strongly associated with internalizing problems than witnessing violence (e.g., Fitzpatrick and Boldizar 1993; Martinez and Richters 1993), whereas witnessing violence is more strongly associated with externalizing problems than is direct victimization (e.g., Boxer et al. 2008). Furthermore, other research points to the methodological difficulties of disentangling the effects of victimization and witnessing violence, emphasizing that the negative developmental outcomes of witnessing violence above and beyond the effects of direct victimization are uncertain (Edelson 1999). Using longitudinal data, Farrell et al. (2014) examined the influence of witnessing violence and direct victimization in the development of physical aggression in a sample of 1156 high-risk sixth graders. They found that witnessing violence (but not direct victimization) predicted increases in physical aggression over time. Additionally, levels of physical aggression predicted changes in the levels of witnessing violence 1 year later, supporting a bidirectional relationship between physical aggression and witnessing violence (but not direct victimization). Other inconsistent findings exist with respect to the influence of peer victimization, whereby some studies have found that victimization leads to increases in aggression (e.g., Hodges et al. 1999; see Reijntjes et al. 2011 for a review), while not in others (e.g., Fanti et al. 2009; Khatri et al. 2000). Therefore, further research that investigates the associations between subtypes of violence exposure and aggression, and to a broader range of delinquency (e.g., sexual and substance-related delinquency), is warranted.

While previous research has examined the association between CU traits or violence exposure with delinquency, relatively little research has focused on the associations among these constructs. Particularly, few studies have examined violence exposure as a potential underlying mechanism that moderates or mediates the association between CU traits and delinquency. Using a small sample of 88 ethnically diverse male adolescents (age 13–18 years) in a juvenile detention center, Kimonis et al. (2008) found that youth with high levels of CU traits were exposed to higher levels of self-reported lifetime community violence (defined as "deliberate acts intended to cause physical harm against a person or persons in the community;" Cooley-Quille et al. 2001, p. 576) than youth with lower levels of CU traits. However, this study specifically looked at lifetime total exposure to community violence, and did not distinguish between witnessing violence and direct victimization. Schraft et al. (2013) examined both community and home violence using a sample of incarcerated youth offenders (86.5% male, ages 11–17 years) and found that higher levels of violence exposure were associated with higher levels of psychopathic traits as measured by the Psychopathy Checklist: Youth Version (PCL: YV; Forth et al. 2003). Additionally, community violence accounted for additional variance in psychopathy above and beyond violence exposure in the home (Schraft et al. 2013). Similar to Kimonis et al. (2008), however, this study measured direct victimization and witnessing violence as a single aggregated construct.

In a study using the same sample from the Kimonis et al. (2008) study, Howard et al. (2012) examined the mediating role of violence exposure on the relation between CU traits and different types of delinquency (i.e., property, violent, drug, and sexual delinquency). They found that witnessed violence (but not victimization) mediated the association between CU traits and violent and sexual delinquency. Both direct and witnessed forms of violence exposure also mediated the relationship between CU traits and drug delinquency. Additionally, in an attempt to ascertain the direction of the association between CU traits and violence exposure, the authors found that CU traits did *not* mediate the association between violence exposure and delinquency. The cross-sectional nature of the Howard et al. study, however, precluded any firm conclusions about the direction of this association.

The progression from CU traits to delinquency through violence exposure may be explained by certain neurobiological and temperamental characteristics indicative of children and adolescents with high levels of CU traits, such as a thrill-seeking tendency, fearlessness (Frick et al. 1999), and diminished trait anxiety (Andershed et al. 2002) that are more likely to put them in situations whereby dangerous or violent acts could take place (Kimonis et al. 2008).

Additionally, due to deficits in empathy and emotional processing, youth with high levels of CU traits may be less likely to understand the negative consequences and moral implications of such violence (Pardini et al. 2007). Over time, as youth are exposed to violence (either directly or indirectly), they may come to "adapt" by normalizing violence, ultimately viewing it as a means to an end or as a way to interact with others (Gaylord-Harden et al. 2015). Furthermore, these behaviors may be rooted in more negatively biased social-cognitive factors, such as hypersensitivity to cues of threat and the interpretation of ambiguous behaviors as hostile, which could increase the likelihood of engaging in diverse forms of delinquency (Bradshaw et al. 2009). As noted above, research remains inconsistent with respect to the different outcomes associated with witnessing violence versus direct victimization. Normalizing violence and violent behaviors may be more likely with repeated witnessed exposures, while victimization relates more to personal and traumatic experience which is often associated with later internalizing symptoms (Reijntjes et al. 2010; Schwartz et al. 2005). Therefore, it is possible that witnessing violence, as opposed to direct victimization, may be more likely to mediate the association between CU traits and various forms of delinquency through normalization processes.

The Current Study

Using a large and ethnically diverse community sample of male and female adolescents, the current study aimed to further investigate the potential mediating role of violence exposure on the association between CU traits measured at grade 7 and different forms of delinquency (property offenses, assault/violence, drug delinquency, and sexual delinquency) in grade 12. Particularly, due to inconsistent findings in prior research, the current study examined the potential mediating role of witnessing violence and direct victimization both jointly and separately. Violence exposure was measured in grades 7, 8, 10, and 11 to provide a more extensive assessment of participants' violence exposure experience. The longitudinal nature of the data and the temporal sequential order of measuring CU traits and violence exposure also provide an opportunity to better elucidate the mediating role of violence exposure on the association among CU traits and different types of delinquency. Based on previous research, we expected that 1) total violence exposure would mediate the association between CU traits and the four types of delinquency, and 2) witnessing violence would mediate the relationship between CU traits and the four types of delinquency. Because some prior research has shown inconsistent findings with respect to the relationship between direct victimization and delinquency, we did not propose a specific hypothesis on the potential mediating role of direct victimization.

Method

Participants and Procedures

Participants in the study came from a community-based sample of children from the Fast Track project, a longitudinal multisite investigation of the development and prevention of child conduct problems (Conduct Problems Prevention Research Group [CPPRG] 1992; 2000). Participants were recruited from four different school sites (Durham, North Carolina; Nashville, Tennessee; Seattle, Washington; and rural Pennsylvania) selected based on relevant neighborhood crime and poverty statistics. In 1991–1993, 9594 kindergarteners across three cohorts were screened for classroom conduct problems by teachers using the Teacher Observation of Child Adjustment-Revised Authority Acceptance Score (Werthamer-Larsson et al. 1991), and a subset of these participants were then screened for home behavior problems by parents using a 22-item instrument based on the Child Behavior Checklist (CBCL; Achenbach 1991). After the multiple-gating screening procedure, children were selected for the high-risk sample (control =446 and intervention =445) and the normative sample (n = 387). The current study used data from the high-risk control group (65% male; 49% African American, 48% European American, 3% other race) and normative sample (51% male; 43% African American, 52% European American, 5% other race). With 79 of those recruited for the high-risk control group included as part of the normative sample, the final sample includes 753 participants (1 participant was excluded from analyses because of a missing weighting value). Informed consent was obtained from all participants and/or legal guardian(s). Parent(s) were compensated with $75 for completing each of the summer interviews, while teachers were compensated $10/child each year for completing all classroom measures. The age range of the current sample was based on the time data collection took place for the relevant measures of this particular study: CU traits were measured only once in grade 7, and correspondingly the violence exposure measure was only available in grades 7, 8, 10, and 11 (not in grade 9 or after grade 11).

Measures

Covariates The covariates include sex (1 = male, 58%), ethnicity (1 = African American, 46%; 0 = non-African American), severity-of-risk score summed from standardized

teacher and parent screening scores during kindergarten (M = 1.01, SD = 1.64), age at the start of the Fast Track Project (M = 6.54, SD = 0.58), and socioeconomic status (SES; Hollingshead 1975) measured in the summer following kindergarten (M = 25.66, SD = 12.90).

Callous-Unemotional Traits The 20-item Antisocial Process Screening Device (APSD; Frick and Hare 2001) was used to assess antisocial behaviors and psychopathic traits in youth ages 6–13 on a 3-point scale (0 = *not at all true*; 1 = *sometimes true*; 2 = *definitely true*). The caregiver report was administered during the summer after the participants completed grade 7. The scale includes three dimensions: CU traits, narcissism, and impulsivity; this study used only the CU subscale (α = 0.65), which included six items about concern for school or work, keeping promises, feeling bad or guilty after doing something wrong, concern about the feelings of others, showing feelings or emotions, and maintaining the same friends over time. Previous research has shown that the CU subscale demonstrates acceptable reliability and validity (McMahon et al. 2010).

Violence Exposure During grades 7, 8, 10, and 11, My Exposure to Violence (Buka et al. 1996) was used to collect information about the participants' exposure to five types of violent events in the past year: beating, attack with a weapon, gun shot, accident or other event resulting in death or serious injury, and threat by another person with serious injury. For each type of event, the individual was asked five questions: whether it happened; whether the event occurred more than once; and whether the event occurred at home, at school, or in the community. Responses for occurrence and setting (home, school, community) questions (four questions for each type of event) were "yes" (1) or "no" (0). For the question about frequency, responses were "once" (1) or "more than once" (2). The measure had three scales including witnessing violent events, victimization, and total exposure to violence. For the witnessing and victimization subscales, the questions were the same (e.g., "Have you seen others be beaten?" versus "Have you been beaten?"). The total exposure scale was the sum of the witnessing and victimization subscales. For each of the three subscales, the number of violent events and the location(s) of such events all contributed to the total score. The potential score range for witnessing and victimization subscales (each with 20 occurrence and 5 frequency questions) was 0–30, and 0–60 for the total exposure to violence scale. The 1-year stability of violence exposure across the 4 years was generally moderate. For witnessing violence, it ranged between 0.41 and 0.58 (ps < 0.001). For victimization, it ranged between 0.36 and 0.47 (ps < 0.001). For total violence exposure, it ranged between 0.44 and 0.59 (ps < 0.001).

An average score over the four waves was created for the two subscales and total exposure to violence, respectively, to indicate the general levels of violence exposure participants had during the assessed period (grades 7, 8, 10, 11). The αs for the witnessing and victimization subscales, and total exposure to violence, across the four waves ranged between 0.89–0.90, 0.85–0.88, and 0.91–0.93, respectively.

Delinquency In grade 12, the Self-Reported Delinquency (SRD; Elliott et al. 1985) measure asked youth about the number and types of criminal offenses committed within the past year. There were 34 questions tapping into different offenses including property damage, theft, assault, and substance use. Offenses ranged from lying about one's age to attacking someone. Response options were "yes" (1) or "no" (0). Consistent with Howard et al. (2012), the current study used the subscale of property delinquency (13 items; e.g., "In the past year, have you damaged/destroyed someone's property?"), violent delinquency (5 items; e.g., "In the past year, have you attacked someone with the intent to hurt/kill him/her?"), drug delinquency (3 items; e.g., "In the past year, have you sold heroin, cocaine, and/or LSD?"), and sexual delinquency (2 items; e.g., "In the past year, have you had sex with someone against his/her will?"). A sum score was created for each subscale. Due to only two items for sexual delinquency, as well as its extremely low prevalence (only 1.1% endorsed any sexual delinquency), a dichotomous score was computed (1 = *present*, 0 = *absent*). For the subscales of property, violent, and drug delinquency, the αs were 0.86, 0.63, and 0.67, respectively.

Analytic Strategy

Descriptive statistics were calculated using SPSS 23.0 and path analyses were conducted in a Structural Equation Modeling (SEM) framework using Mplus 7.31 (Muthén and Muthén 1998–2015). Witnessing, victimization, and total violence exposure were generally normally distributed (skewness between 0.97 and 1.94) and were estimated with multiple linear regressions. Separate negative binomial regressions with a dispersion parameter were estimated for property, violent, and drug delinquency to account for the nature of count outcomes with inflated zeros. A binary logistical regression was estimated for sexual delinquency. A maximum likelihood estimator with robust standard error (MLR) was used in conjunction with Monte Carlo integration and logit link function (Atkins et al. 2013). For all analyses, a probability weight was used to account for the oversampling of high-risk participants and to approximate a community normative sample (Jones et al. 2002). The retention rate over time was generally high (> 82% for CU traits and violence exposure from grade 7 to grade 11; > 73% for delinquency at grade 12) with low percentage of missing data. Those who had missing values on delinquency at grade 12 had higher levels of CU traits, Ms = 0.71 vs. 0.61, $t(616) = -2.44$, p = 0.015, Cohen's

d = 0.272; higher levels of witnessing, Ms = 6.84 vs. 5.56, $t(613) = -2.88$, p = 0.004, Cohen's d = 0.315; and higher levels of victimization, Ms = 2.69 vs. 1.69, $t(100.72) = -3.10$, p = 0.003, Cohen's d = 0.394. Those participants who had missing values on witnessing and victimization had higher levels of CU traits, Ms = 0.80 vs. 0.62, $t(616) = -2.58$, p = 0.010, Cohen's d = 0.513. No other difference was found among other covariates (severity-of-risk score, sex, ethnicity, age, and SES). Therefore, it seems that those participants who had higher levels of CU traits and/or violence exposure were more likely to drop out of the study. Full-information likelihood (FIML) was used to handle missing data (Rubin and Little 2002). The indirect effects between CU traits and various types of delinquency through witnessing, victimization, and total violence exposure were estimated using the MODEL INDIRECT command in Mplus, together with their 95% confidence intervals (CIs). All path analyses were first fit without any covariates and then with all covariates included.

Results

Descriptive Statistics and Correlations

Descriptive statistics and correlations are shown in Table 1. With respect to violence exposure, the levels across waves were generally low. For witnessing, M = 5.74 (ranging from 0 to 20.75 out of a potential 0–30 range). For victimization, M = 1.83 (ranging from 0 to 13.25 out of a potential 0–30 range). For total violence exposure, M = 7.60 (ranging from 0 to 32 out of a potential 0–60 range). CU traits were significantly positively correlated with witnessed, victimization, and total violence exposure, rs = 0.20–0.27, ps < 0.001. However, once controlling for the other violence exposure subtype, CU traits were significantly correlated with witnessed exposure, r = 0.19, p < 0.010, but not victimization, r = 0.06, *ns*. CU traits were also significantly positively correlated with drug and violent delinquency, r = 0.10, p < 0.050, and r = 0.12, p < 0.001, respectively, but not with property or sexual delinquency. Witnessing was significantly positively correlated with all types of delinquency, rs = 0.14–0.35, ps < 0.001. Victimization was significantly positively correlated with drug, violent, and sexual delinquency, rs = 0.12–0.22, ps < 0.010, but not with property delinquency. Total violence exposure was significantly positively correlated with all types of delinquency, rs = 0.14–0.33, ps < 0.010.

Total Violence Exposure as Mediator

Figure 1 shows the path model with CU traits predicting property, drug, violent, and sexual delinquency, with total exposure to violence as a mediator. Higher levels of CU traits were associated with more total exposure to violence, B = 2.78, SE = 0.84, p = 0.001 (see Model 1 in Table 2). More total violence exposure was associated with higher levels or odds of all four types

Table 1 Descriptive statistics and correlations among main study variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. CU traits	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Victimization	0.20** (.06)	-	-	-	-	-	-	-	-	-	-	-	-
3. Witnessing	0.26** (.19**)	0.57**	-	-	-	-	-	-	-	-	-	-	-
4. Total violence exposure	0.27**	0.81**	0.94**	-	-	-	-	-	-	-	-	-	-
5. Property delinquency	0.08	0.08	0.15**	0.14**	-	-	-	-	-	-	-	-	-
6. Drug delinquency	0.10*	0.14**	0.21**	0.20**	0.40**	-	-	-	-	-	-	-	-
7. Violent delinquency	0.12**	0.22**	0.35**	0.33**	0.54**	0.45**	-	-	-	-	-	-	-
8. Sexual delinquency	0.06	0.12**	0.14**	0.15**	0.28**	0.23**	0.31**	-	-	-	-	-	-
9. Age	0.10*	0.04	0.05	0.05	-0.01	-0.02	-0.01	0.02	-	-	-	-	-
10. Sex (1 = male)	0.13**	0.19**	0.15**	0.18**	0.14**	0.15**	0.17**	0.02	-0.02	-	-	-	-
11. Ethnicity (1 = AA)	0.16**	0.04	0.31**	0.23**	0.04	-0.05	0.12**	0.06	-0.02	-0.02	-	-	-
12. Severity-of-risk score	0.32**	0.24**	0.13**	0.19**	0.05	0.12**	0.05	0.03	-0.01	0.26**	-0.02	-	-
13. SES	-0.29**	-0.16**	-0.21**	-0.22**	-0.00	0.03	-0.05	-0.09*	-0.12**	0.04	-0.15**	-0.13**	-
M	0.63	1.83	5.74	7.60	0.38	0.21	0.17	0.01	6.54	0.58	0.46	1.01	25.65
SD	0.37	2.24	3.84	5.44	1.31	0.56	0.56	0.12	0.58	0.49	0.49	1.6	12.9
Range	0–1.67	0–13.25	0–20.75	0–32	0–13	0–3	0–5	0–1	4–9	0–1	0–1	-3–5	4.5–66

Partial correlations between CU traits and violence exposure while controlling for the other exposure type provided in parentheses

CU traits callous-unemotional traits, *AA* African American, *SES* socioeconomic status

* $p < 0.05$. ** $p < 0.01$

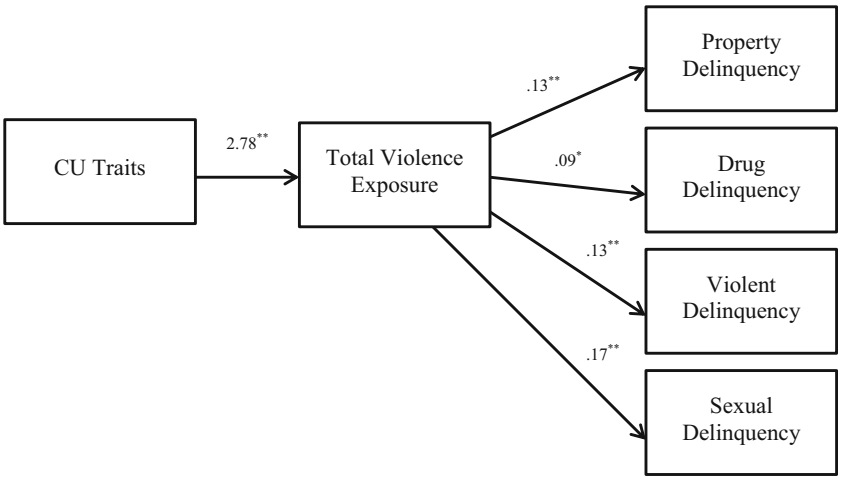

Fig. 1 Path model of callous-unemotional (CU) traits predicting delinquency with total violence exposure as mediator. Covariates included in analyses but omitted from the figure. * $p < 0.05$. ** $p < 0.01$

of delinquency, *B*s = 0.09–0.17 (see Model 1 in Table 3). According to rate ratios (RRs; e^B), a 1-unit increase in the total violence exposure was associated with 14%, 11%, and 14% increases in property, drug, and violent delinquency, respectively. Using odds ratios (ORs), a 1-unit increase in total violence exposure was associated with a 19% increase in the odds of engaging in any sexual delinquency. CU traits were not significantly associated with any type of delinquency. The indirect effects of CU traits on all types of delinquency through total violence exposure were significant. Specifically, there was a significant indirect effect between CU traits, through total violence exposure, and property delinquency, indirect effect = 0.37, 95% CI [0.08, 0.65]; drug delinquency, indirect effect = 0.24, 95% CI [0.03, 0.46]; violent delinquency, indirect effect = 0.37, 95% CI [0.11, 0.62]; and sexual delinquency, indirect effect = 0.48, 95% CI [0.04, 0.92].

With regard to covariates, a higher level of risk score for externalizing problems at kindergarten, $B = 0.48$, $SE = 0.14$, $p = 0.001$, and being African American, $B = 1.88$, $SE = 0.53$, $p = 0.000$, were associated with greater total violence exposure. Being male was associated with higher levels or odds of all types of delinquency, *B*s ranged between 1.07 and 2.17. Lower SES was associated with higher odds of engaging in any sexual delinquency, $B = -0.06$, $SE = 0.02$, $p = 0.010$. All findings remained the same after including the covariates.

Witnessing and Victimization as Separate Mediators

The next research aim was to explore the relative contributions of different types of violence exposure to the link between CU traits and different types of delinquency. Figure 2 shows the path model with CU traits predicting property, drug, violent, and sexual delinquency, with witnessing and victimization as mediators. Higher levels of CU traits were associated with more witnessed violence, $B = 2.19$, $SE = 0.58$, $p = 0.000$, but not victimization, $B = 0.60$, $SE = 0.35$, $p = 0.080$ (see Model 2 in Table 2). Higher levels of witnessing violence were associated with higher levels or odds of all types of delinquency, *B*s ranged between 0.19 and 0.37 (see Model 2 in Table 3). According to RRs, a 1-unit increase in witnessed violence was associated with 30%, 21%, and 22% increases in property, drug, and violence delinquency, respectively. Using

Table 2 Estimates from multiple linear regression predicting violence exposure

	Model 1		Model 2			
	Total exposure		Witnessing		Victimization	
	B (SE)	β	B (SE)	β	B (SE)	β
Age	-0.11 (0.42)	-0.01	-0.16 (0.31)	-0.03	0.05 (0.16)	0.02
Sex (1 = male)	1.02 (0.54)	0.21	0.54 (0.38)	0.16	0.45 (0.22)	0.24
Ethnicity (1 = AA)	1.88** (0.52)	0.39**	1.80** (0.39)	0.50**	0.12 (0.20)	0.06
SES	-0.03 (0.02)	-0.10	-0.02 (0.01)	-0.07	-0.01 (0.01)	-0.08
Severity-of-risk Score	0.48** (0.14	0.15**	0.20 (0.11)	0.09	0.29** (0.05)	0.23**
CU traits	2.78** (0.84)	0.20**	2.19** (0.58)	0.22**	0.60 (0.35)	0.11

AA African American, *SES* socioeconomic status, *CU traits* callous-unemotional traits

** $p < 0.01$

Table 3 Estimates from negative binomial and binary logistic regressions predicting delinquency

	Property delinquency		Drug delinquency		Violent delinquency		Sexual delinquency	
	B (SE)	RR	B (SE)	RR	B (SE)	RR	B (SE)	OR
Model 1								
Age	0.45 (0.45)	1.57	0.40 (0.30)	1.49	0.10 (0.37)	1.11	0.52 (0.5)	1.69
Sex (male)	1.22** (0.442)	3.40	1.10** (0.50)	3.0	1.40** (0.49)	4.10	2.17** (0.98)	8.75
Ethnicity (AA)	-0.61 (0.40)	0.54	-0.61 (0.37)	0.54	0.65 (0.50)	1.92	1.10 (1.13)	2.94
SES	-0.01 (0.02)	1.00	0.00 (0.01)	1.00	-0.01 (0.02)	1.00	-0.06** (0.02)	0.94
Severity-of-risk score	0.05 (0.12)	1.05	-0.10 (0.14)	0.90	0.14 (0.09)	1.15	0.03 (0.19)	1.03
CU traits	-0.60 (0.60)	0.55	0.60 (0.60)	0.55	0.12 (0.58)	1.13	0.13 (1.8)	1.14
Total violence exposure	0.13** (0.04)	1.14	0.09* (0.04)	1.11	0.13** (0.03)	1.14	0.17** (0.06)	1.19
Model 2								
Age	0.40 (0.42)	1.49	0.39 (0.29)	1.50	0.10 (0.37)	1.12	0.79 (0.58)	2.20
Sex (male)	1.31** (0.45)	3.71	1.14** (0.47)	3.13	1.38** (0.48)	3.97	2.5** (1.3)	12.43
Ethnicity (AA)	-0.68 (0.43)	0.51	-0.75 (0.39)	0.47	0.59 (0.51)	1.80	0.76 (1.05)	2.14
SES	-0.00 (0.02)	1.00	0.01 (0.01)	1.00	-0.00 (0.02)	1.00	-0.07** (0.02)	0.93
Severity-of-risk score	0.09 (0.12)	1.10	-0.02 (0.16)	0.98	0.15 (0.10)	1.16	0.06 (0.20)	1.07
CU traits	-0.89 (0.55)	0.41	0.45 (0.54)	1.57	0.00 (0.54)	1.0	0.01 (1.87)	1.01
Witnessing	0.26** (0.07)	1.30	0.19* (0.08)	1.21	0.20** (0.10)	1.22	0.37** (0.12)	1.45
Victimization	-0.14 (0.13)	0.90	-0.14 (0.11)	0.87	0.03 (0.09)	1.03	-0.17 (0.30)	0.84

RR rate ratio, *OR* odds ratio, *AA* African American, *SES* socioeconomic status, *CU traits* callous-unemotional traits

* $p < 0.05$. ** $p < 0.01$

ORs, a 1-unit increase in witnessed violence was associated with a 45% increase in the odds of engaging in any sexual delinquency. None of the paths between victimization and delinquency were significant. The indirect effects of CU traits on all types of delinquency through witnessing violence, but not victimization, were all significant. Specifically, there was a significant indirect effect between CU traits, through witnessed violence, and property delinquency, indirect effect = 0.56, 95% CI [0.15, 0.97]; drug delinquency, indirect effect = 0.41, 95% CI [0.04, .77]; violent delinquency, indirect effect = 0.45, 95% CI [0.06, 0.79]; and sexual delinquency, indirect effect = 0.82, 95% CI [0.18, 1.46].

With regard to covariates, similarly, children with higher risk scores for externalizing problems at kindergarten were more likely to experience victimization, $B = 0.29$, $SE = 0.05$, $p = 0.000$. Being African American was associated with more witnessed violence, $B = 1.76$, $SE = 0.39$, $p = 0.000$. Being male was associated with higher levels or likelihood of all types of delinquency, Bs ranged from 1.14 to 2.50. Lower SES was associated with higher odds of engaging in any sexual delinquency, $B = -0.07$, $SE = 0.02$, $p = 0.000$. All conclusions remained the same after including the covariates, except for the association between CU traits and victimization, which changed from significant, $B = 1.10$, $SE = 0.34$, $p = 0.001$ to nonsignificant, $B = 0.60$, $SE = 0.35$, $p = 0.080$.

Discussion

Leveraging longitudinal data from a large community sample, the current study aimed to elucidate the mediating role of violence exposure subtypes (direct victimization and witnessing)

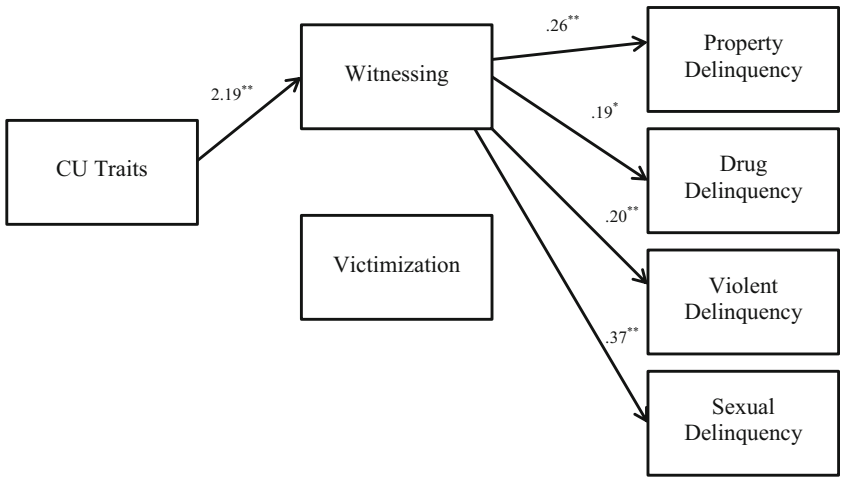

Fig. 2 Path model of callous-unemotional (CU) traits predicting delinquency with witnessing violence and victimization as mediators. Covariates included in analyses but omitted from the figure. * $p < 0.05$. ** $p < 0.01$

during grades 7, 8, 10, and 11 on the relationship between CU traits at grade 7 and different types of delinquency (i.e., property, violent, drug, and sexual delinquency) in male and female adolescents at grade 12. We found that witnessing violence, but not direct victimization, mediated the relationship between CU traits and all types of delinquency.

Numerous studies have shown a link between CU traits and delinquency (Frick et al. 2013). Consistent with previous studies, the current findings showed significant positive correlations between CU traits and violent and drug delinquency. We did not find an association between CU traits and property delinquency, though very limited research has reported this link. Similarly, we did not find a significant correlation between CU traits and sexual delinquency; this may be explained by the extremely low prevalence of sexual delinquency in the sample.

As noted above, CU traits were associated with witnessing violence but not direct victimization. There are a number of potential mechanisms and/or developmental pathways that may account for these findings. Children and adolescents with CU traits exhibit fearlessness and an under-stimulated temperament that may make them less sensitive to disciplinary cues given by parents and other authority figures (Pardini et al. 2007). CU traits are also associated with impulsivity, disinhibited behaviors (Frick and White 2008), delinquent peer affiliation and dangerous activities (Kimonis et al. 2004). Proneness to boredom and sensation-seeking tendencies linked with high levels of CU traits may predispose youth to seek out more novel and dangerous situations, thereby putting them at risk for exposure to potentially harmful environments, and witnessing more violence in the school and community (Blonigen et al. 2012). Additionally, CU traits are associated with increased parenting distress, harsh and inconsistent discipline (Hawes et al. 2011), low maternal care (Kimonis et al. 2013a, b), and decreased parental involvement (Fanti and Muñoz Centifanti 2014), all of which may increase the likelihood of experiencing indirect and direct forms of violence exposure in the home (Howard et al. 2012). Through increased exposure to indirect violence, children and adolescents may come to engage in this behavior, and understand it to be a mechanism by which to function and interact in a variety of contexts. Additionally, because these individuals have high levels of CU traits, the explicit wrongdoing of such violence may not be readily apparent due to deficits in empathy and emotional processing. It may be more difficult for these children and adolescents to recognize others' cues of distress and the negative consequences of violent acts (Pardini et al. 2003).

By examining different types of delinquency, our findings support the well-established link between CU traits and more diverse and severe patterns of offending. Particularly, although the bivariate association between CU traits and delinquency was only significant for violent and drug subtypes, witnessing violence significantly mediated the links between CU traits and all forms of delinquency. Adolescents with higher levels of CU traits are more likely to witness violence and come to learn that violent behavior is an appropriate response (reactive aggression) as well as a means to an end (instrumental aggression; Frick and White 2008). In addition to this normalization process, these adolescents may also be less responsive to the emotional distress of victims, therefore increasing their likelihood of engaging in violent offending (Marsh and Blair 2008). Previous research has identified drug delinquency and substance use as by-products of the reward-sensitivity exhibited by youth with CU traits (Frick et al. 1999), as well as a means to relieve or cope with trauma-related symptoms associated with violence exposure (self-medication; Khantzian 1997; Stewart 1996). Although Howard et al. (2012) found that both witnessing violence and direct victimization mediated the link between CU traits and drug delinquency, their measure of drug delinquency tapped more into substance use. Substance use is a separate construct from drug delinquency, which typically involves drug-related offenses (e.g., selling drugs). The current study looked exclusively at drug-related offenses; therefore, the self-medication hypothesis is not relevant. Rather, adolescents who witness more violence may be in situations involving substances (e.g., drug dealing), and their disregard for consequences may contribute to later drug delinquency. Property delinquency may be facilitated by adolescents' focus on reward and disregard for consequences (Blair 2013). Witnessing violence may reinforce the belief that others' property may be violated in various contexts, thereby contributing to adolescents engaging in theft and destruction of property. Lastly, adolescents who witness more violence, especially domestic violence, may fail to develop prosocial attitudes and interpersonal boundaries, thereby putting them at risk for later sexual offending (Spaccarelli et al. 1995).

As noted above, the link between CU traits and delinquency was mediated by witnessing violence, but not direct victimization. This finding was somewhat surprising, but to a certain degree consistent with previous research. Witnessing violence and direct victimization are often considered collectively as "violence exposure"; however, given that each of these constructs represent unique aspects of violence exposure, it is important to separate them to understand their relative contributions to antisocial outcomes. For example, studies have found that witnessing violence, but not direct victimization, predicts later aggression and delinquency (Farrell et al. 2014). Interpersonal and peer victimization during childhood have been shown to predict internalizing problems, such as anxiety and depression, in late adolescence (Reijntjes et al. 2010; Schwartz et al. 2005). The nature and severity of this form of violence exposure may put children and adolescents at greater risk for developing trauma-related symptoms and associated disorders, compared to indirect violence exposure like witnessing, which may be more associated with later

externalizing symptoms. Additionally, unlike witnessing violence, victims have experienced the negative consequences of violence first-hand, and may be less likely to engage in these behaviors in the future. It is important to note that the severity-of-risk score, which measured early externalizing/conduct problems, showed significant associations with subsequent victimization, but not witnessing, which might partly reflect the evocative cycle of aggressive behavior and victimization, and further emphasize the different developmental mechanisms underlying witnessing violence and direct victimization.

The current study has several notable strengths. Unlike previous research, which was retrospective, cross-sectional, and focused on incarcerated male adolescents, our findings were based on a large-scale community longitudinal sample that captured the temporal ordering of CU traits, violence exposure, and delinquency. Strengths in mind, the current findings should also be considered in the context of a few limitations. First, an extremely small number of participants endorsed any sexual offending, as would be expected in a community sample. This probably led to the nonsignificant correlation between CU traits and sexual delinquency. Second, we were not able to distinguish between the nature and type of violence exposure with respect to domestic, community, and school violence, nor were we able to determine proximity to such violence. It would also be important to look more specifically at the nature and type of such violence exposure, and its relative contributions to the link between CU traits and delinquency. Third, the CU subscale of the APSD only has six items and demonstrates relatively low internal consistency ($\alpha = 0.65$). Future research should consider using alternative measures (e.g., Inventory of Callous-Unemotional Traits [ICU]; Frick 2004) to avoid these psychometric limitations of the CU subscale of the APSD. Furthermore, due to the temporal order of the measures, we were unable to test the potential alternative directionality of CU traits mediating the associations between violence exposure and delinquency. Future research could measure both CU traits and violence exposure prospectively and test both directions in the same model (e.g., cross-lagged model). Lastly, because individuals with higher levels of CU traits were more likely to drop out of the study, our results may not directly apply to this subset of individuals, as they may show a stronger or different pattern of associations. Additional research is needed to further replicate and test the findings of this study.

The current results further emphasize the importance of environmental factors associated with CU traits and diverse forms of delinquency. Adolescents exhibiting restricted affect and a lack of remorse and empathy engage in more severe and varied forms of antisocial behavior, which can be partially explained by a history of witnessing violence. Due to certain temperamental characteristics, these adolescents may actively seek out dangerous situations and activities, and experience more indirect violence. In turn, these experiences may augment the antisocial tendencies exhibited by adolescents with CU traits, who may come to exhibit violence through diverse destructive and illegal acts. Our findings emphasize the differential developmental mechanisms of violence exposure subtypes (i.e., witnessing and direct victimization), which have important implications for clinical intervention. This developmental model suggests that adolescents with high levels of CU traits may form a subgroup that is at risk for experiencing more indirect forms of violence, which in turn increases their risk for varied forms of delinquency. These adolescents may benefit from behavioral interventions encouraging non-violent and non-destructive coping mechanisms, and enhancing prosocial behaviors that negate the normalization of violence. In contrast, experiences of direct victimization may require different forms of intervention, rooted in trauma-informed care and modalities addressing internalizing, rather than externalizing, symptoms. Future research should continue to investigate this developmental model, and the developmental mechanisms underlying the risk for witnessing violence and later delinquency.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964

Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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