

POSTTRAUMATIC OVERMODULATION, CALLOUS TRAITS,  
AND OFFENDING AMONG JUSTICE-INVOLVED YOUTH

by

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## ABSTRACT

Research has demonstrated an association between childhood trauma exposure and juvenile delinquency. This association may be explained by callous traits, defined as a lack of empathy or guilt. Callous traits may stem from trauma exposure and are often associated with the most severe offending patterns. Therefore, it is important to investigate whether specific posttraumatic reactions may explain the relation between trauma exposure and callous traits, as well as severe and consistent offending patterns. Research has not yet investigated the role of posttraumatic overmodulation (emotional numbing, avoidance, and dissociation) in the relation between trauma exposure and callous traits and offending patterns. Therefore, this study sought to investigate the role of overmodulation in the association between trauma exposure and callous traits and whether overmodulation would be associated with more severe offending patterns. Participants included 363 detained youth (94 girls, 269 boys) who completed self-report measures of trauma exposure, PTSS, and callous traits. Youth charge data were obtained from the juvenile detention facility and coded for severity of offending, prior charges, and recidivism. Results of mediation demonstrated that the relation between trauma exposure and callous traits exhibited an indirect effect through overmodulation. Results also indicated that callous traits were significantly related to greater recidivism. In contrast, overmodulation was significantly related to decreased recidivism. Results suggest that interventions aimed to treat callous traits may benefit from considering

youths' symptoms of overmodulation and interventions aimed to decrease recidivism may benefit from targeting youths' callous traits.

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## INTRODUCTION

An ample amount of research has explored the underlying mechanisms that contribute to youths' involvement in delinquent behavior. Understanding the root of juvenile delinquency is an essential step in the prevention of youth offending as well as the lessening of juvenile recidivism. These concepts are best understood through a combined environmental and psychological perspective. One environmental factor that is particularly important when investigating the source of juvenile delinquency is youths' exposure to traumatic experiences. The purpose of the present study is to investigate how specific posttraumatic reactions associated with posttraumatic stress disorder (PTSD) may be related to callous traits and juvenile delinquency. First, we review literature on the strong relation between trauma exposure and juvenile delinquency. Next, callous-unemotional (CU) traits are discussed as a possible intervening mechanism between trauma exposure and delinquency. Finally, further investigation of the development of these traits will focus on a specific posttraumatic reaction associated with PTSD, posttraumatic overmodulation, and its potential role in explaining how trauma exposure is related to callous traits and behavioral outcomes associated with callous traits including severe offending, recidivism, and the number of prior charges youth have committed.

A large body of research confirms that exposure to traumatic events is associated with delinquency and recidivism for youth (Kerig & Becker, 2010). Evidence of this association has been established by the wealth of research confirming the high prevalence

of trauma exposure and PTSD in samples of detained youth (Ford, Kerig, Desai, & Feierman, 2016). For example, Abram and colleagues (2013) found that, in a state-wide sample of youth in detention, 92.5% had experienced at least one traumatic event, 84% had undergone more than one traumatic experience, and 56.8% had experienced six or more traumatic events. Furthermore, justice-involved youth often report experiencing multiple types of trauma exposure (Ford, Grasso, Chapman, & Hawke, 2013; Kerig, Chaplo, Bennett, & Modrowski, 2016; Modrowski, Bennett, Chaplo, & Kerig, 2016). Additionally, research has shown that compared to youth not involved in delinquency, youth involved in delinquency not only report experiencing more traumatic events (Adams et al., 2013), but are also more likely to meet criteria for a diagnosis of PTSD in the past year, with one study showing as many as 23.6 % of traumatized detained youth met criteria for PTSD (Dierkhising et al., 2013). Although there clearly is an association between trauma exposure and delinquency, research to date has not fully explicated the intervening mechanisms that account for this association (Kerig & Becker, 2010).

One promising mechanism that might explain the pathway between trauma exposure and delinquency is that of CU traits. CU traits are characterized by a lack of empathy and guilt and at times by the manipulation of other people (Roose, Bijttebier, Decoene, Claes, & Frick, 2010). Research has shown that these traits are consistently associated with the most severe and stable juvenile offending (Frick & White, 2008; Pardini & Fite, 2010). The presence of CU traits has also been shown to be a predictor of both juvenile and adult arrests, as well as the development of antisocial personality disorder in adulthood (Frick, Stickle, Dandreaux, Farrell, & Kimonis, 2005; McMahon, Witkiewitz, & Kotler, 2010). Furthermore, youth with both conduct problems and CU



traits are more likely to be involved in aggressive behavior, particularly proactive aggression, and also exhibit a greater amount of conduct problems overall when compared to youth who exhibit conduct problems alone (Frick, Cornell, Barry, Bodin, & Dane, 2003). The high rates of aggression in youth with CU traits have been attributed to the fact that these youth are more likely than other adolescents to focus on the positive aspects of aggression and less likely to attend to the negative aspects of hostility (Pardini, 2003). Given the relation between CU traits and negative behavioral outcomes for adolescents, further investigation of what underlies these traits is needed.

Although CU traits generally are viewed as representing an inherent tendency, an alternative trauma-focused theory posits the construct of secondary callousness (Karpman, 1941). Secondary callousness is thought to be a product of youths' experiences and emotional processing, whereas primary callousness is thought to be a stable and inherent characteristic. Porter (1996) suggested that trauma exposure may play a role in the development of CU traits and more recent research has begun investigating the possible relation between trauma exposure and secondary (Karpman, 1941), or acquired (Kerig & Becker, 2010), callousness. For example, researchers have established the existence of two distinct groups of youth high on CU traits who differ based on levels of anxiety, with the secondary callous group exhibiting heightened levels of anxiety and reporting more trauma exposure than the primary callous group (Blair, Peschardt, Budhani, Mitchell, & Pine, 2006; Kahn et al., 2013). Likewise, two distinct groups of youth high on CU traits can also be differentiated based on varying levels of posttraumatic stress symptoms (PTSS), with secondary callous youth exhibiting greater levels of PTSD and PTSS when compared to youth with primary CU (Bennett & Kerig,

2014; Sharf, Kimonis, & Howard 2014). These findings align with the concept that youth may develop the secondary subtype of callousness through trauma exposure. Whereas there is clear evidence for a distinction between primary and secondary callousness, recent research supports the notion that the role of trauma exposure in the development of CU traits should be explored further.

Given the disproportionate rates of PTSD in detained youth (Dierkhising et al., 2013), specific posttraumatic symptoms associated with PTSD are particularly important to consider when investigating the relation between trauma exposure and CU traits. Recent advances in research on PTSD have demonstrated an overarching theoretical framework that could clarify what we know about this relation. The theoretical framework proposed by Frewen and Lanius (2006) posits the existence of two PTSD subtypes: one involving the overmodulation of emotions and the other involving the undermodulation of emotions (Lanius et al., 2010). Overmodulation of emotions is characterized by an excessive attempt to repress or control unwanted emotions, such as through dissociation, numbing, or avoidance (Frewen & Lanius, 2006; Lanius et al., 2010). In contrast, undermodulation represents experiences of heightened emotional reactivity after trauma exposure, as evidenced in experiences of hyperarousal or symptoms of intrusion (Frewen & Lanius, 2006; Lanius et al., 2010). Recent research has demonstrated consistent evidence for these two distinct posttraumatic reactions. For example, a growing body of neuroimaging and fMRI studies have found that, in response to trauma scripts, two groups of people with PTSD emerge who can be distinguished by opposing levels of brain activation indicative of either hypoarousal or hyperarousal, which is consistent with the conceptualizations of overmodulation and undermodulation

(Frewen & Lanius, 2006; Hopper, Frewen, Van der Kolk, & Lanius, 2007; Lanius et al., 2010; Lanius, Bluhm, Lanius, & Pain, 2006). Scholars propose that some people may engage in overmodulation or undermodulation for a variety of reasons. For example, in an investigation of the neuropsychology underlying the overmodulation subtype, Felmingham and colleagues (2008) found that those who exhibit PTSD symptoms consistent with overmodulation show increased prefrontal activity in response to fear-invoking stimuli. From this study, Felmingham and colleagues (2008) conclude that overmodulation may be a strategy used by some people with PTSD to cope with and regulate the extreme arousal associated with PTSD (Felmingham et al., 2008). On the other side of the coin, scholars have also conceptualized that posttraumatic reactions involving overmodulation, such as emotional numbing, are a natural result of the chronic hyperarousal associated with PTSD, which essentially results in the exhaustion of a person's emotional resources (Flack, Litz, Hsieh, Kaloupek, & Keane, 2000; Litz et al., 1997; Nugent, Christopher, & Delahanty, 2006). In contrast, undermodulation may occur as a protective factor against new traumatic experiences by causing the overactivation of emotional stress responses when one encounters a new stressful situation after being traumatized (Kendall-Tackett, 2000; Schwarz & Perry, 1994). Research to date on the brain activation patterns associated with over- and undermodulation is consistent with these conceptualizations that overmodulation occurs as an attempt to avoid posttraumatic hyperarousal while undermodulation occurs as a highly emotional response to stress. Indeed, those with posttraumatic overmodulation show brain activation consistent with the repression of emotions, whereas those with posttraumatic undermodulation show brain activation consistent with the activation of emotions (Frewen & Lanius, 2006;

Hopper, Frewen, Van der Kolk, & Lanius, 2007; Lanius et al., 2010; Lanius, Bluhm, Lanius, & Pain, 2006). Given the established relation between posttraumatic overmodulation and depressed emotional responsiveness, this specific posttraumatic reaction may be key in investigating how trauma exposure relates to CU traits and offending.

The potential role of posttraumatic overmodulation in clarifying how trauma exposure may put some youth at risk for the development of acquired CU traits and severe offending is supported by the fact that a prominent component of posttraumatic overmodulation is the repression of emotions. In support of this theoretical trajectory, Bennett and Kerig (2014) found that detained youth categorized as having acquired CU traits exhibited more general numbing of emotions, numbing of sadness, and nonacceptance of emotions when compared to youth characterized as evidencing primary CU traits. Additionally, research has shown that in detained youth, a general numbing of emotions, as well as the numbing of sadness, has explained the relation between trauma exposure and CU traits (Kerig, Bennett, Thompson, & Becker, 2012). In addition to CU traits, several studies have also shown posttraumatic emotional numbing to be associated with increased violent behavior (Allwood, Bell, & Horan, 2011; Kimonis, Frick, Munoz, & Aucoin, 2007; Mrug, Madan, & Windle, 2016). Overall, emotional numbing may play an important role in both CU traits and adolescent offending. Therefore, investigating how posttraumatic overmodulation, or the repression of emotions in response to trauma, may relate to CU traits and adolescent offending would refine what we know about how trauma exposure contributes to delinquency.

### The Current Study

To date, research has not yet investigated the theorized links among delinquency, CU traits, and posttraumatic over- versus undermodulation. Therefore, the goal of the present study was to advance research by investigating the associations among trauma exposure, PTSD symptoms of over- and undermodulation, callous traits, and offending, including measures of severity of, recidivism, and the number of prior charges, in a sample of detained adolescents. This study was the first known to utilize an adolescent sample in the investigation of posttraumatic overmodulation and undermodulation, given that all of the published research on this topic to date has focused on adult samples. For this study, I hypothesized the following: 1) Posttraumatic overmodulation would be more strongly correlated with callous traits, severity of charges, recidivism over the course of a year, and prior charges committed by youth in comparison to posttraumatic undermodulation; 2) Posttraumatic overmodulation would account for the relation between trauma exposure and callous traits; 3) Posttraumatic overmodulation would uniquely explain variance in severity of charges, recidivism, and prior charges over and above callousness; 4) To test a competing hypothesis to Hypothesis 3 regarding how overmodulation would contribute to the offending patterns of youth, moderated mediation models were run. Given the predicted contribution overmodulation would play in the presence of callous traits after trauma exposure, heightened levels of overmodulation would be expected to strengthen the relation between trauma exposure and callous traits. Therefore, for these models, it is hypothesized that callous traits would explain the relation between trauma exposure and severity of charges, recidivism, and prior charges, but only at heightened levels of overmodulation. This hypothesis also

provides an alternative way overmodulation may contribute to the offending patterns of youth by interacting with callous traits, instead of directly predicting offending patterns over and above callousness, as stated in Hypothesis 3.

## METHOD

### Participants

The participants for this study included 363 youth (94 girls, 269 boys) recruited from a juvenile detention center in the western United States. Youth were between the ages of 12 to 19 years old ( $M = 15.96$ ,  $SD = 1.29$ ). Consistent with the demographics of detention centers in this geographic region, 49.3% of the sample identified as White, 29.2% as Latino(a)/Hispanic, 6.3% as Biracial/Multiracial, 5.2% as African American, 5% identified as Native American, 3% as Pacific Islander, 1.7% as an Other race, and 0.3% as Asian.

### Measures

Posttraumatic overmodulation/undermodulation and cumulative trauma exposure. The University of California at Los Angeles Posttraumatic Stress Disorder Reaction Index for DSM-IV—Adolescent Version was used to assess trauma exposure and symptoms of over- versus undermodulation. (PTSD-RI; Pynoos, Rodriguez, Steinberg, & Stuber, 1998; Steinberg, Brymer, Decker, & Pynoos, 2004). The PTSD-RI is a well-validated brief screening measure used to assess exposure to traumatic events and symptoms of PTSD. In the first part, the PTSD-RI screens for exposure to 26 traumatic events. Added questions reflect attachment trauma, frequency of traumatic experiences, and age ranges in which the traumatic events occurred (0-5 years, 6-11 years, and 12

years or older). The number of traumatic events at each age range was summed to create a cumulative trauma exposure variable. Next, an identified event is used to assess for the subjective and objective criteria for PTSD from the *Diagnostic and Statistical Manual of Mental Disorders* (APA, 2000). Lastly, the PTSD symptoms in the month prior to the interview are assessed on a Likert scale (0 = *none of the time* to 4 = *most of the time*), and criteria for both partial and full PTSD are scored. The PTSD-RI has demonstrated good convergent validity with other diagnostic measures, high internal consistency (alphas in the range of .90), and high test-retest reliability (Steinberg, Brymer, Decker, & Pynoos, 2004). Following Frewen and Lanius (2006), the variable for posttraumatic undermodulation was created using items associated with intrusion and hyperarousal. The variable for posttraumatic overmodulation was created using items associated with avoidance, numbing, and dissociation (see Table 1). The alpha for the overmodulation variable was .85 and the alpha for the undermodulation variable was .85.

Callous traits. The Inventory of Callous-Unemotional Traits was used to assess callous traits (ICU; Frick, 2004). The ICU is a 24-item self-report measure that was developed to provide an efficient, reliable, and valid assessment of callous-unemotional traits in samples of youth. Confirmatory factor analyses show the presence of three independent factors (i.e., Uncaring, Callous, and Unemotional) that relate to a higher-order callous-unemotional dimension. Each item is answered using a 4-point Likert scale from “*not at all true*” to “*definitely true.*” For the purposes of this study, only the Callous subscale was utilized in order to explicate the specific role posttraumatic overmodulation may have in callous traits (i.e., lack of guilt) and because studies have shown the Callous subscale to be one of the most stable and valid of the three (Kimonis et al., 2008; Roose



et al., 2010). The alpha for the Callous subscale was .68. The Callous subscale includes nine items such as, “I do not care who I hurt to get what I want,” and “The feelings of others are unimportant to me.”

Youth offending. Youths’ Juvenile Justice Records were used to determine youth offending. The Juvenile Justice Records regarding youths’ charges were obtained from the juvenile detention center and coded to assess the severity of charges, recidivism over the course of the year after youth participated in the study, and prior charges youth committed before their participation in the study.

### Procedure

All study procedures were approved by the institutional review boards of the University of Utah and the Utah Department of Human Services. Consent for youth participation was obtained from youths’ legal guardians during visiting hours at the detention center by research assistants. No compensation was offered to the youth to avoid any coercion and assent was obtained from the youth by research assistants during a professional visit at the detention center. Individual interviews were then conducted with each youth in a private visiting room at the detention center.

### Analytic Plan

Two variables were created to represent PTSD symptoms characterized by undermodulation and overmodulation based on scores on the UCLA PTSD-Reaction Index. Following Frewen and Lanius (2006), the variable for posttraumatic undermodulation was created using items for the PTSD-RI associated with intrusion and

hyperarousal. The variable for posttraumatic overmodulation was created using items from the PTSD-RI associated with avoidance, numbing, and dissociation. First, the data were checked for outliers using scatter and box plots as well as investigating statistics that quantify leverage and discrepancy. One extreme outlier was identified (a youth who reported over 3 hundred million traumatic events) and including this outlier affected the results of the study; therefore, this outlier was removed. Additionally, histograms were examined to identify any non-normal distributions. Overmodulation and cumulative trauma exposure were both positively skewed, and therefore, a square root transformation for overmodulation and a log<sub>10</sub> transformation for cumulative trauma exposure were completed in SPSS in order to meet the assumption of normality of residuals. All predictor variables were centered before conducting analyses. *T*-tests were run to assess overall patterns of differences related to gender and ethnicity (White versus ethnic minority) for the variables of trauma exposure, callousness, over- and undermodulation, severity of charges, recidivism, and prior charges. Any significant differences were investigated in post hoc analyses. Finally, 7.14% of the charge data were missing (26 youth) as were 2.47% of the missing over- and undermodulation data (9 youth). Missing data were assumed to be missing at random and handled using multiple imputation in SPSS.

To test Hypothesis 1, the strengths of correlations between over- versus undermodulation and callousness, severity of charges, recidivism, and prior charges were compared using a Fisher's *r*-to-*z* transformation (Cohen, Cohen, West, & Aiken, 2003). This transformation transformed the correlation values of over- and undermodulation and the four dependent variables into *z* values, which could be used to

test whether the correlations between over- and undermodulation and the four dependent variables were significantly different from each other.

To test Hypothesis 2, using Hayes' (2013) PROCESS Macro in SPSS, a mediation model was used to examine the role of posttraumatic overmodulation in the association between trauma exposure and callous traits.

To test Hypothesis 3, three hierarchical regressions were run. First, a hierarchical regression was run to examine the unique impact of overmodulation on severity of charges over and above callousness. Second, a hierarchical Poisson regression for constant exposure was run to test the unique impact of overmodulation on recidivism over and above callousness. Third, a hierarchical Poisson regression for variable exposure was run to test the unique impact of overmodulation on prior charges over and above callousness.

Lastly, to test Hypothesis 4, a competing model to Hypothesis 3 that provided an alternative way in which overmodulation would contribute to the offending patterns of youth by interacting with callous traits, moderated mediation models were run. These models investigated whether heightened levels of overmodulation would strengthen the relation between trauma exposure and callous traits, which would in turn contribute to the likelihood that callous traits could explain the relation between trauma exposure and offending. These models also test the hypothesis that overmodulation would interact with callous traits to predict offending, rather than overmodulation alone predicting offending patterns over and above callousness, as is predicted in Hypothesis 3. First, a moderated mediation model in Hayes' (2013) PROCESS Macro was used to investigate the role of callous traits in the relation between trauma exposure and severity of charges, and to test

whether this association differed at various levels of overmodulation. Next, because Hayes' (2013) PROCESS Macro does not have the capacity to investigate moderated mediation for count variables as dependent variables, RMediation, an R package for mediation analyses (Tofighi & MacKinnon, 2011), was used to investigate the role of callous traits in the relations between trauma exposure and recidivism and prior charges, and to test whether this association was moderated by overmodulation. All of these analyses tested for mediation and moderation through direct and indirect effects and provided bootstrapped estimates of the confidence interval (CI) around the indirect effect. To investigate the moderational effect of overmodulation on the indirect effect of callous traits, scores for overmodulation were defined as low, moderate, and high. Low scores were defined as one standard deviation below the mean of overmodulation, moderate scores were defined as at the mean of overmodulation, and high scores were defined as one standard deviation above the mean of overmodulation.

Finally, all of these analyses were run a second time with undermodulation in place of overmodulation to further test the hypothesis that overmodulation, but not undermodulation, is specifically related to callousness, severe offending, recidivism, and prior charges. For all analyses age, ethnicity, and gender were controlled for.

Table 1.

Items Associated With Overmodulation and Undermodulation on the UCLA PTSD-RI

## Overmodulation

*Dissociation*

I feel spacey or like I had gone away in my mind.

I feel like strange things were going on and I did not know if they were real or not.

I feel like I was not in my body but was watching myself from outside my body.

*Emotional Numbing*

I feel like staying by myself and not being with any friends.

I feel alone inside and not really close to other people.

I have trouble remembering important parts of what happened.

I have trouble feeling happiness or love.

I have trouble feeling sadness or anger.

I think I will not live a long life.

I feel pessimistic or negative about my future

*Avoidance*

I try not to talk about, think about, or have feelings about what happened.

I try to stay away from people, places, or things that make me remember what happened.

## Undermodulation

*Hyperarousal*

I watch out for danger or things I'm afraid of.

I feel grouchy, angry, or mad.

Table 1 continued

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I have arguments or physical fights.

I feel jumpy or startle easily, like when I hear a loud noise or when something surprises me.

I have trouble concentrating or paying attention.

I have trouble going to sleep or I wake up often during the night.

*Intrusion*

When something reminds me of what happened, I get very upset, afraid, or sad.

I have upsetting thoughts, pictures, or sounds of what happened come in to my head when I do not want them to.

I have dreams about what happened or other bad dreams.

I feel like I'm back at the time when one of the bad things happened, living through it again.

When something reminds me of what happened, I have strong feelings in my body, like my heart beats fast, my head aches, or my stomach aches.

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## RESULTS

### Descriptive Statistics

All youth in the current sample endorsed at least one traumatic event. Most youth in this sample had committed less severe offenses, with the majority,  $n = 147$ , 40.5%, committing a misdemeanor offense such as vandalism, eluding, or trespassing. Only 5.5% of youth,  $n = 20$ , committed the two most severe charges of either a violent criminal offense or a sex offense. Means, standard deviations, and intercorrelations for all study variables are presented in Table 2.

### T-tests

To investigate whether there were differences in the study variables related to gender or ethnicity, independent samples *t*-tests were run. *T*-tests showed no significant differences between White youth and ethnic minority youth for callous traits, overmodulation, undermodulation, cumulative trauma exposure, recidivism, or severity of charges. However, results indicated that ethnic minority youth,  $M = 11.19$ ,  $SD = 7.48$ , had significantly more charges prior to study participation than White youth,  $M = 9.47$ ,  $SD = 6.40$ ),  $t(361) = 2.36$ ,  $p = .02$ .

Additionally, there were no differences between boys and girls for callous traits or recidivism. However, results indicated significant mean differences between boys and girls for all other variables. Results indicated that girls endorsed more symptoms of

overmodulation,  $M = 15.76$ ,  $SD = 9.85$ , than boys,  $M = 12.01$ ,  $SD = 8.54$ ,  $t(361) = -3.52$ ,  $p < .001$ . Additionally, girls also endorsed more symptoms of undermodulation,  $M = 20.48$ ,  $SD = 9.95$ , than boys,  $M = 17.59$ ,  $SD = 9.48$ ,  $t(361) = -2.51$ ,  $p = .013$ . Girls also endorsed greater cumulative trauma exposure,  $M = 386.27$ ,  $SD = 999.45$ , than boys,  $M = 173.89$ ,  $SD = 538.10$ ,  $t(361) = -2.58$ ,  $p = .01$ . In turn, boys,  $M = 10.85$ ,  $SD = 7.11$ , had significantly more charges prior to participating in the study than girls,  $M = 8.90$ ,  $SD = 6.54$ ,  $t(361) = 2.33$ ,  $p = .02$ . Finally, boys,  $M = 2.77$ ,  $SD = 1.25$ , had committed significantly more severe charges than girls,  $M = 2.39$ ,  $SD = 1.08$ ,  $t(361) = 2.62$ ,  $p = .009$ . Therefore, all analyses involving cumulative trauma exposure, overmodulation, undermodulation, and severity of charges were run separately for boys and girls in order to investigate possible gender differences in post hoc analyses. Additionally, each model including the variable of total charges prior to participating in the study was run separately for boys and girls and Whites and ethnic minorities in order to investigate possible gender and ethnic differences in post hoc analyses.

#### Fisher's r-to-z Transformation

To determine whether overmodulation would be significantly more correlated with callous traits, severity of charges, recidivism, and prior charges than undermodulation, correlations between over- versus undermodulation and these four variables were run and compared using a Fisher's r-to-z transformation. Unexpectedly, there were no significant differences in the correlations of over- and undermodulation for severity of charges, charges prior to study participation, or recidivism. However, consistent with our hypotheses, overmodulation,  $r = .25$ ,  $p < .001$ , was more highly



correlated with callous traits than was undermodulation,  $r = .09$ ,  $p = .103$ ,  $z = 2.2$ ,  $p = .01$ .

### Mediation Analyses

We ran a mediational model to determine whether overmodulation would explain the relation between trauma exposure and callous traits. Results of mediation analyses demonstrated that, consistent with our hypotheses, there was a significant indirect effect between trauma exposure and callous traits through posttraumatic overmodulation, 95% CI = [0.249, 0.676]. However, the direct effect between trauma exposure and callous traits was not significant, CI = [-0.612, 0.463] (see Figure 1). Next, we tested for moderation by gender for this model. For boys, there was a significant indirect effect between trauma exposure and callous traits through posttraumatic overmodulation, CI = [0.246, 0.804], but the direct effect between trauma exposure and callous traits was not significant, CI = [-0.850, 0.460]. For girls, there were no significant indirect or direct effects.

In contrast, results of mediation analyses demonstrated that, also consistent with our hypotheses, there was no significant indirect effect between trauma exposure and callous traits through posttraumatic undermodulation, CI = [-0.017, 0.402]. The direct effect between trauma exposure and callous traits was also not significant, CI = [-0.367, 0.755]. No evidence of moderation by gender was found in this model in that there were no significant indirect or direct effects for either boys or girls.

### Hierarchical Regression Analyses

We ran hierarchical regression models to determine whether posttraumatic overmodulation and undermodulation uniquely explained variance in severity of charges after controlling for callous traits. In model 1, severity of charges was regressed onto callous traits. Inconsistent with our hypotheses, callous traits were not significantly related to severity of charges. In model 2, severity of charges was regressed onto both callous traits and overmodulation. Additionally, inconsistent with our hypotheses, overmodulation and callous traits were not significantly associated with severity of charges. The addition of overmodulation did not explain unique variance in severity of charges above and beyond callous traits. In model 3, severity of charges was regressed onto both callous traits and undermodulation. Undermodulation and callous traits were not significantly associated with severity of charges. The addition of undermodulation did not explain unique variance in severity of charges above and beyond callous traits. These analyses were also checked for moderation by gender and there was no evidence of moderation by gender in these models.

Next, we ran a hierarchical Poisson regression model to determine whether posttraumatic overmodulation and undermodulation uniquely explained variance in recidivism after controlling for callous traits. In model 1, recidivism was regressed onto callous traits. Consistent with hypotheses, callous traits were significantly related to recidivism,  $B = 0.06$ ,  $\text{Exp}(B) = 1.06$ ,  $p < .001$ . For every one unit increase in callous traits, the likelihood of youth recidivism increased by 6%. Callous traits explained 2.4% of the variance in recidivism. In model 2, recidivism was regressed onto both callous traits and overmodulation. Additionally, consistent with our hypotheses, overmodulation

was significantly associated with recidivism,  $B = -1.17$ ,  $\text{Exp}(B) = 0.85$ ,  $p < .001$ .

However, inconsistent with our hypotheses, this effect indicated that for every one unit increase in overmodulation, the likelihood of recidivism for youth decreased by 15%.

Callous traits also were significantly associated with recidivism in this model,  $B = 0.07$ ,  $\text{Exp}(B) = 1.07$ ,  $p < .001$ . In model 2, callous traits and overmodulation explained 5.5% of the variance in recidivism. The addition of overmodulation explained unique variance in recidivism above and beyond callous traits. In model 3, recidivism was regressed onto both callous traits and undermodulation. Undermodulation was significantly associated with recidivism,  $B = -0.02$ ,  $\text{Exp}(B) = 0.98$ ,  $p < .001$ . This effect indicates that for every one unit increase in undermodulation, the likelihood of recidivism decreased by 2%.

Callous traits were also significantly associated with recidivism,  $B = 0.06$ ,  $\text{Exp}(B) = 1.06$ ,  $p < .001$ . In model 3, callous traits and undermodulation explained 3.7% of the variance in recidivism. The addition of undermodulation explained unique variance in recidivism above and beyond callous traits. These analyses were also checked for moderation by gender. Results indicated that there was evidence of moderation by gender for both callous traits and overmodulation predicting recidivism. There was a significant decrease in the likelihood of recidivism as overmodulation increased for girls,  $p = .007$ , but not for boys,  $p = .079$ . Additionally, both girls,  $p = .017$ , and boys,  $p = .02$ , showed a significant increase in the likelihood of recidivism as callous traits increased, and this relation was stronger for girls,  $B = 0.08$ ,  $p = .017$ , than boys,  $B = 0.05$ ,  $p = .02$ . There was no evidence of moderation by gender for undermodulation in predicting recidivism.

Finally, we ran a hierarchical Poisson regression model to determine whether posttraumatic overmodulation and undermodulation uniquely explained variance in

number of prior charges after controlling for callous traits. In model 1, prior charges were regressed onto callous traits. Inconsistent with our hypotheses, callous traits were not significantly related to prior charges. In model 2, prior charges were regressed onto both callous traits and overmodulation. Additionally, inconsistent with our hypotheses, neither callous traits nor overmodulation were significantly associated with prior charges. The addition of overmodulation did not explain unique variance in prior charges above and beyond callous traits. In model 3, prior charges were regressed onto both callous traits and undermodulation. Neither callous traits nor undermodulation were significantly associated with prior charges. The addition of undermodulation did not explain unique variance in prior charges above and beyond callous traits. These analyses were also checked for moderation by gender and ethnicity. Results indicated that there was moderation by gender for callous traits predicting prior charges. While the relation between callous traits and prior charges was not significant for either boys,  $p = .134$ , or girls,  $p = .225$ , there was a significant difference in the amount of prior charges between boys and girls, in that a change from being a girl to a boy was related to a significant increase in prior charges. There was no evidence of moderation by gender for overmodulation or undermodulation in predicting prior charges. There was also no evidence of moderation by ethnicity in these models.

The Poisson regression models were also run as Negative Binomial regressions because of possible overdispersion. These showed that the direction, magnitude, and significance were substantially the same as the Poisson models, and so only the results of the Poisson regressions were reported.

### Moderated Mediation Analyses

Moderated mediation models were run to determine whether callous traits would explain the relation between trauma exposure and offending, and whether this association was strongest at heightened levels of overmodulation. Results of moderated mediation analyses demonstrated that callous traits did not explain the relation between trauma exposure and severity of charges, prior charges, or recidivism at any level of overmodulation or undermodulation. These findings were inconsistent with our hypotheses. The direct effect between trauma exposure and severity of charges,  $CI = [-0.286, 0.089]$ , was not significant (see Figure 2). However, the direct effect between trauma exposure and recidivism,  $CI = [-0.192, -0.015]$ , was significant (see Figure 3). Finally, the direct effect between trauma exposure and prior charges  $CI = [-0.015, 0.078]$ , was also not significant (see Figure 4). These models were also checked for moderation by gender and ethnicity. There was no evidence of moderation by gender in the severity of charges model, the prior charges model, or the recidivism model, in that none of the indirect or direct effects were significant for boys or girls. There was also no evidence of moderation by ethnicity for the prior charges model, in that none of the indirect or direct effects were significant for White or ethnic minority youth.

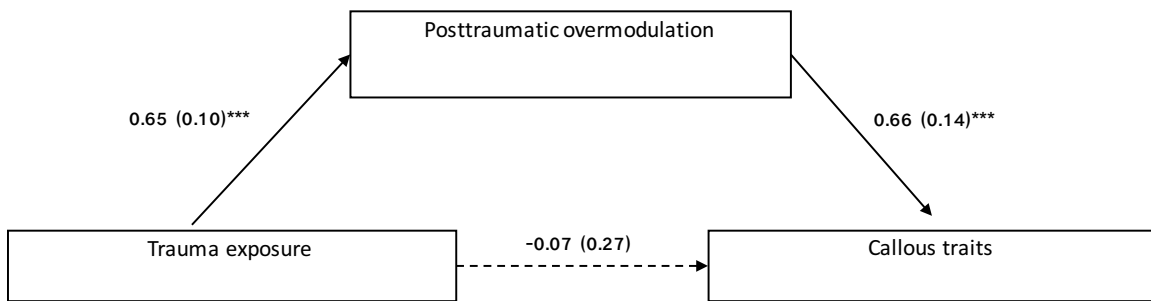
Table 2.

*Means, Standard Deviations, and Intercorrelations*

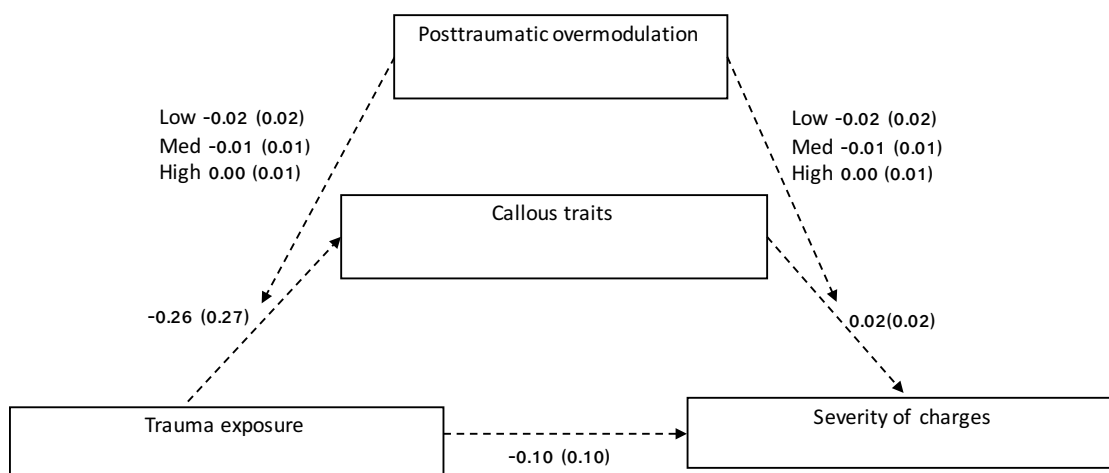
Variable	1	2	3	4	5	6	7
1. Trauma Exposure	-	-	-	-	-	-	-
2. Overmod	.18**	-	-	-	-	-	-
3. Undermod	.20**	.76**	-	-	-	-	-
4. Callousness	.01	.25**	.09	-	-	-	-
5. Severity	-.02	-.04	-.02	.04	-	-	-
6. Prior	-.03	-.01	.02	.02	-.02	-	-
7. Recidivism	-.05	-.10	-.09	.14**	.21**	.06	-
<i>M</i>	288.88	12.98	18.34	7.91	2.67	10.34	2.74
<i>SD</i>	693.10	9.03	9.67	3.53	1.22	7.01	3.99
Range	1-7,941	-	-	-	-	1-49	0-27

*Note.* Trauma Exposure = Cumulative trauma exposure; Overmod = Posttraumatic overmodulation; Undermod = Posttraumatic undermodulation; Callousness = Callous traits, Severity = Severity of charges; Prior = Total charges prior to study participation; Recidivism = Total charges 1 year post study participation.

\* $p < .05$ . \*\* $p < .01$ .

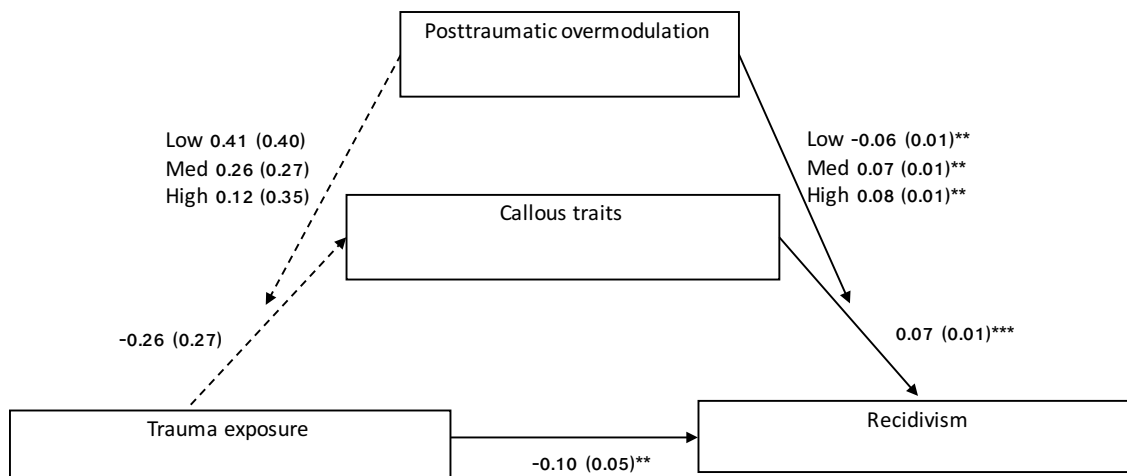


*Figure 1.* The role of posttraumatic overmodulation in the relation between trauma exposure and callous traits.

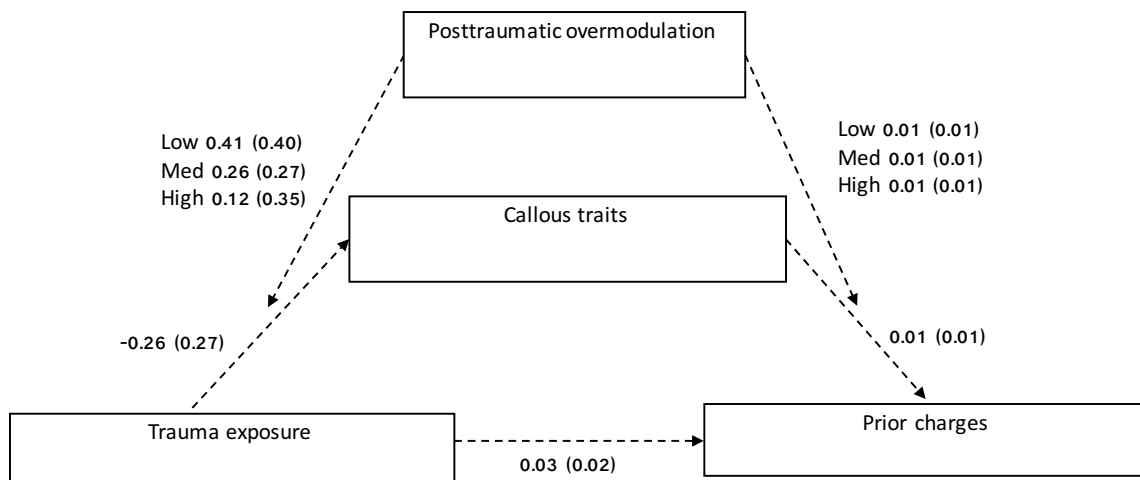


*Figure 2.* The role of callous traits in the relation between trauma exposure and severity of charges at various levels of overmodulation. *Note.* Low, med, and high refer to levels of overmodulation one SD below the mean, at the mean, and one SD above the mean, respectively.





*Figure 3.* The role of callous traits in the relation between trauma exposure and recidivism at various levels of overmodulation. *Note.* Low, med, and high refer to levels of overmodulation one SD below the mean, at the mean, and one SD above the mean, respectively.



*Figure 4.* The role of callous traits in the relation between trauma exposure and prior charges at various levels of overmodulation. *Note.* Low, med, and high refer to levels of overmodulation one SD below the mean, at the mean, and one SD above the mean, respectively.

## DISCUSSION

The goal of the current study was to investigate the roles of posttraumatic overmodulation and undermodulation in the relation between trauma exposure and callous traits as well as how these posttraumatic reactions are related to severity of charges, recidivism, and prior charges in a sample of justice-involved youth. The first aim of the study was to investigate whether posttraumatic overmodulation and undermodulation may be differentially related to callous traits, severity of charges, recidivism, and prior charges. The results indicated that there were no significant differences in the correlations between overmodulation and undermodulation for severity of charges, recidivism, and prior charges. This finding indicates that these two posttraumatic reactions may both play similar roles in the offending patterns of youth. This finding is supported by the wealth of research that has indicated a strong relation between trauma exposure and delinquency, indicating that both of these posttraumatic reactions may contribute to offending (Ford, Kerig, Desai, & Feierman, 2016). In contrast, the results indicated that posttraumatic overmodulation was more highly correlated with callous traits in comparison to undermodulation. This is consistent with research that has demonstrated trauma exposure to be related to callous traits, or the tendency to be unsympathetic towards others (Blair, Peschardt, Budhani, Mitchell, & Pine, 2006; Kahn et al., 2013; Kerig, Bennett, Thompson, & Becker, 2012). Additionally, this finding is consistent with our hypothesis that overmodulation, or the repression of

emotions after trauma exposure, may specifically put youth at risk for heightened callous traits.

The second aim of the study was to investigate whether posttraumatic overmodulation would explain the relation between trauma exposure and callous traits. The results indicated that posttraumatic overmodulation, but not undermodulation, accounted for the relation between trauma exposure and callous traits. This finding was expected given the predicted relation between decreased emotionality after trauma exposure and callous traits, or a lack of empathy or guilt (Frewen & Lanius, 2006; Hopper, Frewen, Van der Kolk, & Lanius, 2007; Lanius et al., 2010; Lanius, Bluhm, Lanius, & Pain, 2006; Kerig, Bennett, Thompson, & Becker, 2012). The finding that posttraumatic undermodulation did not explain the relation between trauma exposure and callous traits was also expected, given that undermodulation is less likely to be associated with emotional numbing than overmodulation.

The third aim of the study was to investigate whether overmodulation would be related to severity of charges, recidivism, and prior charges, over and above callousness. Results indicated that callousness, overmodulation, and undermodulation were not significantly related to severity of charges or prior charges. This may be because in our sample of youth, the majority of youth did not commit severe charges, therefore limiting the extent to which callousness, overmodulation, or undermodulation could be related to more severe offending in this sample. Additionally, current levels of overmodulation, undermodulation, and callousness may not have been able to predict youths' past offending behavior. This may be because callous traits develop over time and youth may not necessarily have been exhibiting callous traits or have been experiencing PTSS when

they first began offending before participation in the study. In contrast, results indicated that overmodulation, undermodulation, and callousness were significantly related to recidivism. Callous traits were related to increased recidivism for both boys and girls. This finding indicates that callous traits may play an important role in determining whether youth are likely to reoffend. This is consistent with previous literature that has found callous traits to be associated with the most consistent offending patterns (Frick & White, 2008; Corrado, Vincent, Hart, & Cohen, 2004). Unexpectedly, overmodulation and undermodulation were related to less recidivism the year after study participation. Specifically, overmodulation was especially related to less likelihood of recidivism for girls, which may be because girls were more prone to experience symptoms of overmodulation than boys and that they were also less likely to recidivate when experiencing overmodulation. Although these symptoms of PTSD were not related to repeat offending, these symptoms, as well as detainment, could still negatively affect the youths' development in other ways. For example, PTSD symptoms have been shown to be related to numerous other mental health problems for detained youth in the face of trauma exposure, including depression, anxiety, and suicidal ideation (Kerig, Ward, Vanderzee, & Moeddel, 2009). This indicates that although overmodulation and undermodulation were not related to recidivism, it would still be important to consider how these posttraumatic reactions may impact youth after release. Additionally, time spent in a juvenile detention center in general is often associated with negative outcomes. For example, detainment in a secure facility is associated with decreased levels of responsibility and self-control after release and detainment in a residential facility has been shown to negatively impact youths' developmental maturity (Dmitrieva, Monahan,

Cauffman, & Steinberg, 2012). Therefore, support for youth after their release would still be relevant in reducing the likelihood of negative outcomes. Finally, the finding that overmodulation alone was related to a lower likelihood of recidivism may indicate that overmodulation may be associated with repeat offending only if it is also associated with increased callous traits, given that these traits were predictive of greater recidivism. Therefore, future research may benefit from assessing how various degrees of overmodulation may be related to the offending patterns of youth.

Finally, the study sought to investigate whether callous traits would explain the relations between trauma exposure and severity of charges, recidivism, and prior charges, at heightened levels of overmodulation. Callous traits did not explain the relation between trauma exposure and severity of charges, prior charges, or recidivism at any level of overmodulation or undermodulation. This may be because in our sample of youth, the majority of youth did not commit severe charges, therefore limiting the range of scores on the offending variable. Additionally, unexpectedly, trauma exposure was not related to callous traits in our sample, which limited the extent to which callous traits could explain the relation between trauma exposure and the offending patterns of youth. Therefore, it may be important for future research to consider callous traits as a moderator between trauma exposure and offending, given that these traits may still strengthen the relation between trauma exposure and offending.

### Strengths and Limitations

The current study adds to the literature on the development of callous traits and has a number of strengths. First, this study adds to a growing body of research

demonstrating that trauma exposure may play an important role in callous traits (Bennett & Kerig, 2014; Kerig, Bennett, Thompson, & Becker, 2012) and offending (Ford, Kerig, Desai, & Feierman, 2016; Kerig & Becker, 2010). The current study contributes to research surrounding this topic by providing evidence that there may be specific posttraumatic reactions, such as numbing, avoidance, and dissociation, that are more likely to put youth at risk for heightened levels of callousness (Bennett & Kerig, 2014; Kerig, Bennett, Thompson, & Becker, 2012). Additionally, this study replicated past findings that have found callousness to be related to more consistent offending patterns.

Despite this study's strengths, some limitations should be noted. First, the sample was drawn from only one juvenile facility, which may limit the generalizability of our results. Additionally, data were cross-sectional in nature, thereby limiting our ability to make causal inferences regarding the associations among the variables measured. Future research should investigate the roles of over- and undermodulation in callous traits as well as in the offending patterns of traumatized youth using longitudinal data. Additionally, trauma exposure, PTSD symptoms, and callous trait data used for this study were self-reports, and so these data could have been biased. Finally, all three offending variables were not self-report, therefore they may have not shown the full range of delinquent behavior youth engage in since they could only account for the activities for which youth have been arrested.

### Clinical Implications

The results of the current study have a number of clinical implications related to the treatment of callous traits and delinquent behavior. First, given that trauma exposure

has been shown to be associated with callous traits through overmodulation, trauma-focused treatments may be specifically helpful in lessening the prevalence of callous traits and the delinquent behavior of justice-involved youth. Moreover, interventions aimed at decreasing callous traits may benefit from considering a youth's level of posttraumatic symptoms associated with overmodulation (emotional numbing, avoidance, and dissociation) given that these PTSD symptoms were the most strongly related to callous traits. Additionally, although overmodulation was related to less recidivism in the current study, interventions focused on reducing recidivism may still benefit from considering youths' symptoms of overmodulation, since these were related to callous traits, which in turn were predictive of a higher likelihood of recidivism.

In conclusion, using a sample of justice-involved youth, the current study found that PTSD symptoms of overmodulation, including emotional numbing, dissociation, and avoidance, may be implicated in the presence of callous traits after trauma exposure. Additionally, PTSD symptoms of undermodulation, including hyperarousal and intrusion, were not found to be associated with callous traits. The current study also found that, as expected, callous traits were associated with increased recidivism. However, unexpectedly, overmodulation and undermodulation were each associated with decreased recidivism. Overall, the current study supports the notion that trauma exposure has implications in callous traits and that interventions that take into account youths' specific reactions to trauma may be better able to decrease both callous traits and delinquency for justice-involved youth.



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