

# Trauma and Aggression: Investigating the Mediating Role of Mentalizing in Female and Male Inpatient Adolescents

Anna Abate<sup>1</sup> · Kaisa Marshall<sup>1</sup> · Carla Sharp<sup>2</sup> · Amanda Venta<sup>1</sup>

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**Abstract** High rates of posttraumatic stress disorder (PTSD) symptoms and elevated levels of aggression are common among youth in inpatient psychiatric settings. Several models link trauma exposure to aggression through anomalous mental state reasoning. Some theoretical frameworks linking trauma to aggression specify that the over-attribution of hostile mental states contributes to the development of aggressive behavior whereas other theories suggest that an inhibition of mental state reasoning leads to aggressive behavior. Using a sample of inpatient adolescents, the current study examined relations between PTSD symptoms and four forms of aggression, exploring the role of both over- and under-mentalizing (i.e., hypo- and hyper-mentalizing) as mediators and gender as a moderator. The results suggest that hypermentalizing, but not hypomentalizing, mediates the relation between trauma and aggression, extending prior research related to inpatient adolescents for the first time. Evidence of moderated mediation was noted, such that this mediational relation was evident for females but not males. The current study offers support for differential underlying causes of aggression among males and females with PTSD symptoms.

**Keywords** Inpatient adolescents · Trauma · Aggression · Mentalizing · Gender differences

## Introduction

A traumatic experience is characterized by actual or threatened death, serious injury, or sexual violence [1] through direct exposure, witnessing the event, or hearing about the event happening to a loved one. In addition, traumatic exposure may also occur through repeated or extreme indirect exposure to aversive details of a traumatic event [1]. Trauma is widespread among youth, with adolescents making up a sizable portion of the traumatized population. Indeed, the Office of Juvenile Justice and Delinquency Prevention estimates that about 60 percent of children, ages 1 month to 17 years, experience an event that would qualify as traumatic [2] and almost 36% of those victims are adolescents, ages 12–17 [3]. The National Comorbidity Survey Replication-Adolescent Supplement, a nationally representative sample of over 10,000 adolescents, indicates that 5% of adolescents, aged 13–18, have met criteria for PTSD in their lifetime [4]. Rates of trauma symptoms are even higher among adolescents in inpatient psychiatric facilities, of whom 41.5% report clinically elevated symptoms of Posttraumatic Stress Disorder (PTSD) [5]. The public health relevance of adolescent trauma is compounded by documented links between posttraumatic stress symptoms and aggression/violence. The broad aim of this study is to explore the relation between trauma symptoms and aggression, specifically examining the role that mental state reasoning plays in a sample of inpatient adolescents.

Accumulating research has shown that trauma symptoms can lead to aggression in teenagers [6–8], compounding the personal consequences and public health impact of trauma. For example, Greenwald [9] noted that resulting trauma symptoms, such as heightened alertness and increased sensitivity to danger, could lead to aggression in adolescents. In addition, one study that compared adolescents with

✉ Anna Abate  
aventa@shsu.edu

<sup>1</sup> Department of Psychology, Sam Houston State University, Huntsville, TX 77341, USA

<sup>2</sup> Department of Psychology, University of Houston, Houston, TX, USA

conduct disorder and adolescents with PTSD symptomology found both groups to have equally severe behavioral symptoms [10], indicating that trauma symptoms may be related to aggressive behaviors. Furthermore, in a study of male adolescent offenders, researchers found that PTSD symptoms significantly predicted reactive aggression and that the significant relation between multiple maltreatment and reactive aggression was partially mediated by PTSD symptoms [11]. Moreover, inpatients with mental illness, who tend to have higher rates of trauma, are at an increased risk of committing acts of aggression [12]. In particular, one study of hospitalized adolescents found that those who committed physical violence were significantly more likely to have been a victim and/or witness to violence than their non-violent counterparts, and their PTSD symptoms significantly contributed to the prediction of violence risk [13]. Existing theoretical models suggest that exposure to trauma may confer risk for later aggression through anomalous mental state reasoning—specifically via either the over-attribution of threatening intentions to others or the absence of adequate mental state reasoning in response to social stimuli—though this question is understudied in adolescents, generally, and inpatient adolescents, specifically.

Numerous theories have suggested that trauma alters social cognition, including the ability to interpret social signals [14], which may thereby contribute to aggressive behavior. In fact, Greenwald [9] noted that trauma symptoms could lead to aggression in adolescents by way of misinterpreting stimuli as threatening. Here, the central construct is that of mentalizing, which refers to the cognitive processes of understanding, comprehending, explaining, predicting, and communicating behavior in terms of underlying mental states and emotions in the self and others [14–16]. Mentalizing can be disrupted due to the over-attribution of mental states or due to the under-attribution of mental states [17]. Theoretical models point to both hyper-, the over-attribution of mental states, and hypomentalizing, the under-attribution of mental states, (in separate studies) as mechanisms that explain links between trauma and subsequent aggression. For instance, Fonagy [18] as well as Luyten and colleagues [19] posited that trauma might lead individuals who experience abuse to inhibit mentalization about their caregivers' mental states as a defensive mechanism and, paradoxically, also lead these abused individuals to become hypersensitive to the mental states of others. Several additional theories suggest that the risk of aggression in maltreated youth may be due to anomalous mentalizing, such as misinterpretations of peers' intentions [20], or the child's limited capacity to envision mental states in others [21].

Empirical research also links trauma to aggression through various over attribution errors (i.e., hypermentalizing). In particular, the Social Information Processing (SIP)

model and related studies [22] link trauma to aggression through negative biases in the processing of social stimuli in children and adolescents [23, 24]. This model describes the phases that an individual undergoes when interacting in social situations, such as perceiving and interpreting social cues, selecting a target outcome, and reacting with an appropriate response [20]. The model suggests that a deficit at any one of these phases could lead to an increased risk of aggressive behavior [25]. For instance, Lochman and Dodge [26] showed that aggressive children exhibit errors in attribution, processing of social cues, and outcome expectations. Additional research has noted that aggressive children are more likely to focus on aggressively relevant stimuli and perceive more aggression in others [26, 27]. Critically, these social-cognitive biases mediate the pathway between exposure to violence or trauma and aggressive behavior in adolescents [28]; such that, experiencing violence predisposes adolescents to have heightened perceptions of threat and evaluate aggressive responses as appropriate [25, 29, 30]. Moreover, Ziv and colleagues found that adolescents who have been victimized interpret ambiguous social situations as more hostile and report that they would have a desire to retaliate in an aggressive manner, linking these variables to aggression towards peers [31]. This model has also been supported in several studies with community dwelling [28, 32] and justice-involved adolescents [30, 33], with studies showing that youth exposed to a range of trauma, including maltreatment, family and school violence, and community violence, are at a greater risk for over attribution errors, which mediate the pathway from trauma to aggression. While the SIP model and the aforementioned research suggest that trauma exposure can lead to anomalous social cognition (e.g., over-attribution of threat) contributing to aggressive behavior, no study has directly evaluated links between trauma symptoms and aggression nor the links between these three constructs in inpatient adolescents to date.

Contrastingly, several other studies that link trauma to aggression through social cognition in youth have suggested that the social cognitive mechanisms at play relate to the under-attribution of mental states (i.e., hypomentalizing). Prior research suggests that witnessing violence negatively impacts social cognition in children, which thereby confers risk for aggressive behavior [28, 34]; additionally, delays in the development of mentalizing, or hypomentalizing, have been found in maltreated children [35, 36]. Likewise, Stein and colleagues [37] found that the association between childhood maltreatment and deficits in interpersonal functioning was fully accounted for by an impaired ability to mentalize, or hypomentalizing. These findings echo Bateman and Fonagy's [38] theory that childhood maltreatment may lead to aggression due to the absence of interpersonal understanding via hypomentalizing.

Likewise, aggression has been associated with hypomentalizing in violent male adolescent offenders [39], though no study, to our knowledge, has examined these links in clinical sample of adolescents. In a group of adolescents recruited from the community, Taubner and Curth [40], using the Reflective Functioning Scale on the Adult Attachment Interview, found that hypomentalizing mediated the relation between early physical or sexual abuse and aggressive behavior, such that an inhibition of mentalization (linked to prior abuse) led to more aggressive behavior. Despite these studies suggesting that hypomentalizing may be a critical variable in the relation between trauma and aggression, there is a lack of empirical studies examining mentalizing (either hyper- or hypomentalizing) as it relates to trauma symptoms and aggression. More specifically, no research investigates these constructs in adolescents with psychopathology, particularly inpatient samples, in whom traumatic symptoms are prevalent. Overall, there is a lack of empirical literature examining the role of both hyper- and hypomentalizing in the relation between posttraumatic stress symptoms and aggression in inpatient adolescents.

Against this background, the broad aim of this study was to explore the relation between trauma symptoms and aggression, examining the role that social cognition plays in a sample of inpatient adolescents. Most studies investigating the impact of trauma on aggression have analyzed trauma exposure and few studies have examined trauma symptoms, indicating a need for further exploration. An inpatient sample was sought for this study due to the high rates of trauma and aggression noted in this group and the lack of research on the role of social cognition in the relation between trauma symptoms and aggression in this population. Indeed, to our knowledge hypo- and hypermentalizing have not been previously studied together nor in connection with trauma and aggression among inpatient adolescents. In the present study, we opted for a broad conceptualization of aggression including proactive overt aggression (unprovoked aggression that damages another's physical well-being), reactive overt aggression (provoked aggression that damages another's physical well-being), proactive relational aggression (unprovoked aggression that damages relationships), and reactive relational aggression (provoked aggression that damages relationships) [41] in order to examine differential relations between mentalizing, trauma, and varied forms of aggression. Given previous findings and theories suggesting that both the *over* and *under* attribution of mental states may be consequences of trauma and mechanisms of subsequent aggression, we considered both hypo- and hypermentalizing as possible mediators of the relation between trauma and aggression. Overall, we hypothesized that: (1) The presence of trauma would be related to increased levels of aggression (as in [42]), and (2) Anomalous mentalizing would mediate the

relation between trauma and aggression, though specific hypotheses regarding hypo- and hypermentalizing were not made a priori due to the lack of studies investigating both constructs.

## Methods

### Participants

The sample included 374 adolescents, ages 12–17, admitted to a private psychiatric hospital. Of these 63.1% ( $n=236$ ) were female and the average age was 15.38 years ( $SD=1.44$ ). While the average annual household income ranges from less than \$10,000–\$200,000 or more, nearly 50% of the sample (51.5%) reported an annual household income of \$125,000 or more. The racial breakdown was as follows: 78.1% Caucasian, 3.2% Asian, 2.4% African-American, and 5.3% Multiracial or other. The remaining 11.2% did not report race.

### Measures

#### *Trauma Symptoms*

In order to measure trauma, participants completed the Trauma Symptom Checklist. The Trauma Symptom Checklist for children (TSCC) [43] is a 54-item self-report measure that evaluates posttraumatic symptoms in children and adolescents and has demonstrated reasonable convergent, discriminant, and predictive validity in normative and clinical samples according to the test manual. This assessment measures potential pathological reactions to trauma instead of whether actual trauma has occurred. A 4-point rating scale ranging from 0 ('never') to 3 ('almost all of the time') is used to measure the frequency of each symptom. The measure yields two validity scales and six clinical scales. The posttraumatic stress subscale was used in this study in order to measure PTSD as a continuous construct. In this study, Cronbach's alpha for the posttraumatic stress subscale of the TSCC was 0.88. The average PTSD score was 52.82 ( $SD=10.80$ ), with higher scores indicating higher levels of posttraumatic stress symptoms.

#### *Mentalizing*

Hypo- and hypermentalizing were measured using the Movie for the Assessment of Social Cognition (MASC) [44]. This computer-based experimental task is designed to measure social cognitive abilities needed to navigate social situations in daily life. Each adolescent is asked to watch a 15-minute film that depicts four characters planning and getting together for a dinner party.

The experience is designed to mirror real social interactions and therefore elicits emotions and mental states including anger, affection, gratefulness, jealousy, fear, ambition, embarrassment, and disgust from the characters. Throughout the film (45 times) the interviewer stops to ask questions regarding the characters' mental states (e.g., "What is Betty feeling?" "What is Cliff thinking?"). Each correct response is scored as one point and added to result in an overall mentalizing score that reflects the adolescent's social cognitive capacity. Psychometric data for this measure has been previously documented in adults [44], young adults [45], and inpatient groups [46]. The average hypomentalizing score for this sample was 3.20 ( $SD=2.27$ ) while the average hypermentalizing score was 7.87 ( $SD=3.76$ ). Higher scores indicated higher levels of hypomentalizing and hypermentalizing, both.

### Aggression

Aggression was assessed using the Peer Conflict Scale (PCS; [41]), a 40-item youth self-report measure that assesses aggression in children and adolescents. It uses a four-factor structure to measure proactive overt, proactive relational, reactive overt, and reactive relational aggression. Participants rate items using a 4-point scale from 0 ("not at all true") to 3 ("definitely true"). The PCS has been shown to have good internal consistency, reliability, and validity across all four scales [47]. In this study, Cronbach's alpha ranged from 0.85 to 0.93 across the four scales. Additionally, it has been found that the four-factor model fits well for both males and females [47]. Higher scores on the PCS indicate higher levels of proactive overt ( $M=2.02$ ,  $SD=3.53$ ), proactive relational ( $M=2.23$ ,  $SD=3.86$ ), reactive overt ( $M=4.32$ ,  $SD=5.43$ ), and reactive relational ( $M=3.84$ ,  $SD=4.57$ ) aggression.

### Procedures

This study was approved by the appropriate institutional review boards. On the day of admission to an adolescent inpatient unit at a private-pay psychiatric hospital, 407 adolescents and their families were approached for consent. Parental consent was obtained first, followed by adolescent assent. Of those approached, 22 declined, ten were excluded from the study, and one began assessments and then revoked consent. Adolescents met the inclusion criteria if they were between the ages of 12 and 17 and fluent in English. If clinicians conducting intake evaluations noted intellectual disability or psychosis upon admission, adolescents were excluded from this study. The resulting sample consisted of 374 adolescents. Adolescents were assessed individually by trained research assistants within the first week of admission.

### Results

Preliminary analyses examined relations between key study variables and potentially confounding demographic variables. In particular, gender based differences were examined based on previous research showing relations between aggression and gender [48] and social cognition and gender [49, 50]. Analyses revealed males and females did not differ in their level of hypomentalizing ( $t(372)=-0.91$ ,  $p=.36$ ), proactive overt aggression ( $t(372)=-0.84$ ,  $p=.40$ ), proactive relational aggression ( $t(372)=1.77$ ,  $p=.08$ ), nor reactive overt aggression ( $t(372)=-0.91$ ,  $p=.36$ ). However, analyses also revealed males and females did differ in their level of hypermentalizing ( $t(372)=-2.33$ ,  $p=.02$ ) and reactive relational aggression ( $t(372)=3.50$ ,  $p=.001$ ). Next, bivariate correlations between PTSD symptoms, hypomentalizing, hypermentalizing, and aggression were conducted (Table 1), split by gender in light of the aforementioned relations between gender and other variables of interest. Correlations indicated positive

**Table 1** Correlations between key study variables separately for females and males

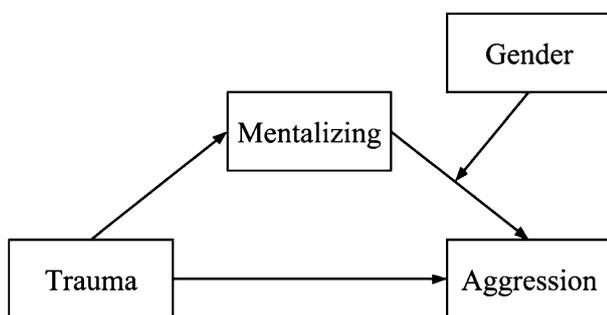
Measure	1	2	3	4	5	6	7
1. Hypermentalizing	–	–0.04	0.03	0.13	0.02	0.11	0.11
2. Hypomentalizing	0.03	–	–0.10	–0.13	–0.01	–0.10	–0.10
3. Proactive overt aggression	0.31**	–0.04	–	0.71**	0.74**	0.61**	0.22**
4. Proactive relational aggression	0.32**	–0.10	0.79**	–	0.45**	0.77**	0.20*
5. Reactive overt aggression	0.23**	0.01	0.76**	0.54**	–	0.54**	0.12
6. Reactive relational aggression	0.30**	–0.02	0.70**	0.84**	0.59**	–	0.24**
7. Posttraumatic stress score	0.23**	–0.10	0.13	0.18**	0.23**	0.25**	–

Correlations for females ( $n=236$ ) are presented below the diagonal, and correlations for males ( $n=138$ ) are presented above the diagonal

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

relations between hypermentalizing, aggression, and PTSD symptoms in females (with the exception of PTSD symptoms and proactive overt aggression relation). Only significant correlations between PTSD symptoms and proactive overt, proactive relational, and reactive relational aggressions were noted in males. Likewise, hypomentalizing was not significantly associated with aggression or trauma at the bivariate level in either gender. In light of significant bivariate relations between gender and other key study variables and evidence of differential relations between variables of interest based upon gender, the moderating role of gender was explored.

In order to examine the relations between PTSD symptoms and aggression, taking into consideration the role of mentalizing (i.e., hypo- and hypermentalizing) as mediators and the potential role of gender as a moderator (given significant differences at the bivariate level), a series of four moderated-mediation models were explored. Each model differed only with regard to the aggression outcome variable: reactive relational, reactive overt, proactive relational, and proactive overt. The PROCESS SPSS (Model 14) computational tool [51, 52] using bootstrapping (samples=1000) procedures was used to examine both hyper- and hypomentalizing (entered simultaneously) as mediators at different values of the moderator variable (gender). This model examined whether (1) the association between hypo- and hypermentalizing and aggression is moderated by gender, (2) if hypo- and/or hypermentalizing mediate the relation between trauma and aggression and, (3) whether the strength of the hypothesized indirect (mediation) effect is conditional on the moderator (gender), also known as conditional indirect effects. These models are presented graphically in Fig. 1. Across all four models, PTSD symptoms was significantly, positively associated with hypermentalizing ( $b=0.06$ ,  $SE=0.02$ ,  $p<.001$ ), and a non-significant, negative association between PTSD symptoms and hypomentalizing ( $b=-0.02$ ,  $SE=0.01$ ,  $p=.05$ ) was noted.



**Fig. 1** Hypothesized model of moderated mediation. Model of mentalizing as a mediator of trauma and aggression with gender moderating the relation between mentalizing and aggression

In the first model, PTSD symptoms served as the independent variable, reactive relational aggression served as the dependent variable, and hypo- and hypermentalizing were explored as mediators, with gender serving as a moderator of the relation between mentalizing and reactive relational aggression. Reactive relational aggression was significantly associated with increased hypermentalizing ( $b=0.34$ ,  $SE=0.07$ ,  $p<.01$ ) and increased PTSD symptoms ( $b=0.08$ ,  $SE=0.02$ ,  $p<.01$ ). A significant interaction between hypermentalizing and gender ( $b=-0.26$ ,  $SE=0.13$ ,  $p<.05$ ) was noted, such that reactive relational aggression was positively correlated with hypermentalizing in females only ( $r=0.30$ ,  $p<.01$ ). Additionally, conditional indirect effects of PTSD symptoms on reactive relational aggression revealed that the indirect and positive effect of PTSD symptoms on reactive relational aggression through hypermentalizing was moderated by gender, such that it was observed in females ( $b=0.02$ ,  $SE=0.01$ ,  $CI_{95}$ : 0.0078–0.0485), but not in males ( $b=0.01$ ,  $SE=0.01$ ,  $CI_{95}$ : -0.0051–0.0202), indicating a significant moderated mediation with regard to hypermentalizing for reactive relational aggression. There was no significant relation between reactive relational aggression and hypomentalizing, nor was evidence of a significant mediation (nor moderated mediation) of hypomentalizing between PTSD symptoms and reactive relational aggression noted.

In the second model, PTSD symptoms served as the independent variable, reactive overt aggression served as the dependent variable, and hypo- and hypermentalizing were explored as mediators, with gender serving as a moderator of the relation between mentalizing and reactive overt aggression. Reactive overt aggression was significantly associated with increased hypermentalizing ( $b=0.27$ ,  $SE=0.09$ ,  $p<.01$ ) and increased PTSD symptoms ( $b=0.08$ ,  $SE=0.03$ ,  $p<.01$ ). Hypermentalizing was correlated with reactive overt aggression in females only ( $r=0.23$ ,  $p<.01$ ) and the indirect and positive effect of PTSD symptoms on reactive overt aggression through hypermentalizing was observed in females ( $b=0.02$ ,  $SE=0.01$ ,  $CI_{95}$ : 0.0052–0.0345), but not in males, ( $b=0.0001$ ,  $SE=0.01$ ,  $CI_{95}$ : -0.0179–0.0202), indicating a significant moderated mediation with regard to hypermentalizing for reactive overt aggression. There was no significant relation between reactive overt aggression and hypomentalizing nor was evidence of a significant mediation (nor moderated mediation) of hypomentalizing between PTSD symptoms and reactive overt aggression noted.

In the third model, PTSD symptoms served as the independent variable, proactive relational aggression served as the dependent variable, and hypo- and hypermentalizing were explored as mediators, with gender serving as a moderator of the relation between mentalizing and proactive

relational aggression. Proactive relational aggression was associated with increased hypermentalizing ( $b=0.33$ ,  $SE=0.06$ ,  $p<.001$ ), increased PTSD symptoms ( $b=0.05$ ,  $SE=0.02$ ,  $p<.05$ ), and the interaction between hypermentalizing and gender ( $b=-0.23$ ,  $SE=0.11$ ,  $p<.05$ ), such that proactive relational aggression was positively correlated with hypermentalizing in females only ( $r=0.32$ ,  $p<.01$ ). The indirect and positive effect of PTSD symptoms on proactive relational aggression through hypermentalizing was observed in females ( $b=0.02$ ,  $SE=0.01$ ,  $CI_{95}$ : 0.0070–0.0496), but not in males ( $b=0.01$ ,  $SE=0.01$ ,  $CI_{95}$ : -0.0009–0.0207), indicating a significant moderated mediation with regard to hypermentalizing for proactive relational aggression. No indirect effect of PTSD symptoms on proactive relational aggression through hypomentalizing in either gender was observed. There was no significant relation between proactive relational aggression and hypomentalizing nor was evidence of a significant mediation (nor moderated mediation) of hypomentalizing between PTSD symptoms and proactive relational aggression noted.

In the fourth model, PTSD symptoms served as the independent variable, proactive overt aggression served as the dependent variable, and hypo- and hypermentalizing were explored as mediators, with gender serving as a moderator of the relation between mentalizing and proactive overt aggression. Proactive overt aggression was associated with increased hypermentalizing ( $b=0.25$ ,  $SE=0.06$ ,  $p<.01$ ), increased PTSD symptoms ( $b=0.04$ ,  $SE=0.02$ ,  $p<.05$ ), and the interaction between hypermentalizing and gender ( $b=-0.23$ ,  $SE=0.10$ ,  $p<.05$ ), such that proactive overt aggression was positively correlated with hypermentalizing in females only ( $r=0.31$ ,  $p<.01$ ). The indirect and positive effect of PTSD symptoms on proactive overt aggression through hypermentalizing was observed in females ( $b=0.02$ ,  $SE=0.01$ ,  $CI_{95}$ : 0.0064–0.0316), but not in males ( $b=0.001$ ,  $SE=0.01$ ,  $CI_{95}$ : -0.0104–0.0150), indicating a moderated mediation with regard to hypermentalizing for proactive overt aggression. No indirect effect of PTSD symptoms on proactive overt aggression through hypomentalizing in either girls or boys was observed. There was no significant relation between proactive overt aggression and hypomentalizing nor was evidence of a significant mediation (nor moderated mediation) of hypomentalizing between PTSD symptoms and proactive overt aggression noted.

## Discussion

Overall, the aim of this study was to explore the relation between trauma symptoms and aggression, specifically examining the role that social cognition plays in a sample of inpatient adolescents. Particularly, because previous

research and theories on social cognition pointed to both the *over* attribution of hostile mental states and the *under* attribution of mental states as a consequence of trauma and a possible mechanism of subsequent aggression, we examined both hypo- and hypermentalizing as possible mediators of the relation between trauma and aggression. In addition, we sought to explore gender as a moderator of these relations in light of evidence suggesting significant gender differences in social cognition and aggression. Although specific hypotheses regarding hypo- and hypermentalizing were not made a priori, we expected: (1) The presence of trauma would be related to increased levels of aggression, and (2) Anomalous mentalizing, generally, would mediate the relation between trauma and aggression.

The findings of this study are largely echoed in previous research. Broadly, this study documented significant, positive links between trauma and all forms of aggression examined. Because the correlations between all forms of aggression were high, the findings suggest that broad links between trauma, mentalizing, and aggression that are not specific to one form of aggression. This finding is consistent with previous research that has found that aggression, delinquency, and conduct problems are common correlates of trauma exposure [34, 53–55]. Additionally, given the well-documented relations between gender and aggression [48] and gender and social cognition [49, 50] the findings of gender differences among the variables of interest are consistent with previous research. The findings of this study further suggest that hypermentalizing mediates the relation between trauma and aggression in females. Indeed, across all four forms of aggression examined, evidence of a significant moderated mediation was noted, such that hypermentalizing mediated the link between increased trauma and increased aggression in females but not males.

Prior research is mixed regarding the effect of anomalous mental state reasoning on the relation between trauma and aggression, with some previous studies and theories suggesting that the over-attribution of threat in social information processing leads to aggressive behavior in traumatized youth, while others suggest that an inhibition of mentalization leads to more aggressive behavior. This is the first study to examine both constructs together in the context of PTSD and aggression. In this study, hypermentalizing was identified as a mediator of the relation between PTSD and aggression (across four types of aggression) in females. Our results, which point to the *over* attribution of mental states as a mediator between trauma and aggression, echo Crick and Dodge's model [22], which considers aggressive behavior to be the result of six sequential steps, the first of which is selectively encoding signals associated with hostility. Prior research suggests that experiencing trauma predisposes adolescents to have heightened perceptions of threat and evaluate aggressive responses as appropriate

[25, 29, 30]. Our findings mirror this and other [e.g., 28] research by demonstrating the mediating role of over-attribution of mental states (i.e., hypermentalizing) in the pathway between trauma exposure and aggressive behavior in adolescents. The present study is the first to extend this research base to inpatient adolescents.

Our results do not provide support for the idea that hypomentalizing mediates the relation between trauma and aggression. Across four types of aggression and both genders, no significant relations between hypomentalizing with trauma symptoms or aggression were noted. This finding stands in contrast to Taubner and Curth's [40] study, which found that hypomentalizing mediated the relation between early traumatic experiences and aggressive behavior, and Taubner et al. [38], which found that hypomentalizing was associated with aggression in violent male adolescent offenders. The contrast between these studies and the present findings may be attributable to key differences in the measurement of both mentalizing and trauma across studies. First, the present study evaluated trauma symptoms, whereas Taubner and Curth [40] focus on the role of trauma exposure. Second, the present study assessed mentalizing capacity broadly, using an experimental task, whereas Taubner and Curth [40] and Taubner et al. [39] assessed mentalizing in an attachment context, using the Reflective Function scale of the Adult Attachment Interview. Third, these studies included markedly different samples: inpatient adolescents versus community dwelling adolescents and violent male adolescent offenders. Together, these three distinctions between the methodologies used in the current study and Taubner and colleagues [39, 40] may well explain discrepant findings; replication of both studies is a critical step in future research endeavoring to investigate relations between trauma, aggression, and mentalizing in greater depth.

Several limitations must be noted with regard to the results reported in the present study and represent important areas for future research. First, both the measures of trauma symptoms and of aggression were obtained using self-report on the first day of admission to the inpatient unit. As with all self-report measures, accuracy can be called into question due to the potential for response bias and shared method variance. Furthermore, trauma symptoms may be most severe on the day of admission, potentially impacting the accuracy of the reported symptoms and other study variables. Second, because our sample consisted of inpatient adolescents, it is possible that other psychiatric problems could be influencing the findings. For example, previous research suggests that there is a relation between borderline traits and hypermentalizing [56], internalizing disorders, such as anxiety, and hypermentalizing [57], and depression and hypomentalizing [38, 58, 59]. The present study evaluated a heterogeneous patient

group, focusing on PTSD symptoms as a cross-cutting factor in various diagnostic groups and, thus, the impact of co-occurring diagnosis remains an important area for future research. Furthermore, the present study did not assess whether participants actually experienced a traumatic event, rather it assessed trauma symptoms more generally. As a result, the construct validity of the measure assessing trauma symptoms may have been influenced. Third, the absence of evidence suggesting mediation of hypermentalizing or hypomentalizing in males suggests that other constructs must be evaluated in order to make sense of bivariate relations between trauma and aggression in males. For instance, emotion dysregulation is a known mediator of the relation between trauma and aggression [60, 61], and may explain the bivariate link noted among males in this study. Fourth, it is important to note that the present study assessed PTSD symptoms, and therefore, relations between characteristics of trauma and aggression and mentalizing were not evaluated. While males and females did not differ in their level of trauma ( $t(372) = -0.17, p = .86$ ), the types of trauma experienced may have differed and explained the moderation effect. Indeed, it has been theorized that different types of trauma have differential effects on development [20] and may therefore have distinct impacts on mentalizing, such as fostering hostile attribution biases and aggression. Fifth, the sample used cannot be generalized to the public, as it is a specific inpatient population that lacks diversity in ethnicity and socioeconomic status. Finally, the present study relied upon concurrent data, collected at one time point, and thus, cannot speak to potential causal links between PTSD symptoms, mentalizing, and aggression. All of the theoretical models posited in this regard suggest that it is the experience of trauma that confers risk for anomalous mental state reasoning and subsequent aggression; the causal aspect of these theories remains an important area of future research.

Notwithstanding these limitations, the present study provides important information regarding the relation between trauma and aggression, extending prior research to inpatient adolescents and providing the first analysis of a model examining both hyper- and hypomentalizing in the relation between trauma and aggression in the same sample. Additionally, the current study offers support for differential underlying causes of aggression among males and females. While trauma may lead to social cognitive impairment (i.e., hypermentalizing) in females, it may lead to other impairments in males that ultimately influence aggressive behavior. Moreover, the findings of this study suggest that the effect of trauma on aggression does not occur through diffuse impairments in mentalizing, but specifically through the over-attribution of mental states. The findings of this study suggest that the treatment of PTSD symptoms may need to be tailored to target gender-specific mechanisms;

whereas the treatment of inpatient adolescent females who have experienced trauma may warrant a focus on developing accurate social cognitions and reducing interpersonal sensitivities, different treatment targets may be more appropriate for males. Due to the high rates of trauma within inpatient populations and the numerous associated negative outcomes (e.g., aggression), tailoring interventions to gender-specific social-cognitive processes may prove critical in minimizing the effects of trauma on aggressive behavior. Moreover, the present study suggests that trauma symptoms are an important consideration in adolescents for whom aggression is a concern, such as justice-involved youth or teens with a history of relational or physical violence. Broad screening for trauma symptoms in these samples may assist in identifying appropriate interventions for violence reduction. In sum, the present study provided the first evidence that hypermentalizing, but not hypomentalizing, explains the link between PTSD symptoms and aggression (across four subscales) in females, but not males, through a series of moderated mediation models, pointing to hypermentalizing as an important mechanism for future research regarding the treatment of inpatient adolescents and the etiology of aggression in women.

## Summary

High rates of posttraumatic stress disorder (PTSD) symptoms and elevated levels of aggression are common among youth in inpatient psychiatric settings [2, 5, 12]. Several models linking trauma exposure to aggression through anomalous mental state reasoning have been posited. The Social Information Processing (SIP) model [22] posits that the over attribution of hostile mental states contributes to the development of aggressive behavior. However, some other theories of social cognition suggest that an inhibition of mental state reasoning leads to aggressive behavior among individuals with a history of trauma. Using a sample of inpatient adolescents, the current study examined relations between PTSD symptoms and four forms of aggression—overt proactive, overt reactive, relational proactive, and relational reactive—taking into consideration the role of both over- and under-mentalizing (i.e., hypo- and hypermentalizing) as mediators and gender as a moderator. The results suggest that hypermentalizing, rather than hypomentalizing, mediates the relation between trauma and all forms of aggression, extending prior research to inpatient adolescents for the first time. Evidence of moderated mediation was noted, such that this mediation relation was evident for females but not males. The current study offers support for differential underlying causes of aggression among males and females with severe psychopathology.

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