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The mediating role of anger in the relationship between PTSD symptoms and impulsivity

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Abstract

Research indicates a significant relationship between posttraumatic stress disorder (PTSD) and anger (Olatunji, Ciesielski, & Tolin, 2010; Orth & Wieland, 2006).

Individuals may seek urgent coping to deal with the distress of anger which is a mobilizing and action-oriented emotion (Novaco & Chemtob, 2002); possibly in the form of impulsive actions consistent with impulsivity's association with anger (Milligan & Waller, 2001; Whiteside & Lynam, 2001). This could be one of the explanations for the relationship between PTSD and impulsivity (Kotler, Julian, Efront, & Amir, 2001; Ledgerwood & Petry, 2006). The present study assessed the mediating role of anger between PTSD (overall scores and subscales of arousal and negative alterations in mood/cognitions) and impulsivity, using gender as a covariate of impulsivity. The PTSD Checklist for *DSM-5*, Dimensions of Anger Reaction scale-5, and the UPPS Impulsivity Scale were administered to a sample of 244 undergraduate students with a trauma history. Results based on 1000 bootstrapped samples indicated significant direct effects of PTSD (overall and two subscales) on anger, of anger on impulsivity, and of PTSD (overall and two subscales) on impulsivity. Further, anger significantly mediated the relationship between PTSD (overall and two subscales) and impulsivity, consistent with the hypothesized models. Results suggest that impulsivity aims at coping with distressing anger, possibly explaining the presence of substance usage, and other impulsive behaviors in people with PTSD. Further, anger probably serves as a mobilizing and action-oriented emotion coupled with PTSD symptoms.

Key words: posttraumatic stress disorder, anger, impulsivity, mediation, structural equation modeling.

Introduction

Posttraumatic stress disorder (PTSD) has a strong association with anger (Olatunji et al., 2010; Orth & Wieland, 2006) and impulsivity (Ledgerwood & Petry, 2006; Weiss, Tull, Viana, Anestis, & Gratz, 2012), which are also related to each other (Kotler et al., 2001; Ramírez & Andreu, 2006). However, to our knowledge no study has examined the mediating role of anger in the relationship between PTSD and impulsivity despite its important clinical and theoretical implications; this is the focus of the current study.

PTSD and Anger

There is a well-established empirical relationship between PTSD and anger (Kotler et al., 2001; Olatunji et al., 2010; Teten et al., 2010), with a critical study indicating greater anger severity among veterans with PTSD compared to veterans without PTSD unrelated to combat exposure (Chemtob, Hamada, Roitblat, & Muraoka, 1994). Trauma victims with PTSD mainly have difficulties suppressing and inhibiting anger, expressing anger appropriately (Olatunji et al., 2010; Orth & Wieland, 2006), and regulating feelings of anger (Olatunji et al., 2010; Orth & Wieland, 2006; Teten et al., 2010). The effect size for the relationship between PTSD and anger is substantially large (Orth & Wieland, 2006) and significantly the greatest among all primary anxiety disorders (Olatunji et al., 2010). It is not surprising that anger/irritability have been included as a PTSD arousal criterion in the *DSM-IV* and *DSM-5*. It is important to note though that the correlation between PTSD symptoms and anger as an external measure is not just accounted for by anger's inclusion as a PTSD symptom (Novaco & Chemtob, 2002; Orth, Cahill, Foa, & Maercker, 2008); rather several well-established theories account for anger's role in PTSD's symptomatology as discussed below.

One important theory explaining the PTSD-anger relationship is the “survival mode” theory which focuses on anger’s regulation deficits. This theory states that anger’s survival value in threatening situations such as trauma exposure becomes maladaptive when people later perceive threat in otherwise non-life threatening situations. Consequently, people react with hostile appraisal, physiological arousal, and aggressive and possibly harmful behaviors; thus failing to regulate their anger intensity and expression. Furthermore, a cycle emerges wherein people with PTSD are vulnerable to more perceived threat, leading to more anger, which in turn leads to greater readiness to perceive future threat (Chemtob, Novaco, Hamada, Gross, & Smith, 1997; Novaco & Chemtob, 2002). The relation between PTSD’s physiological arousal symptoms and violent behavior has empirical support as well (MacManus et al., 2013).

An alternative theory is the fear avoidance theory, stating that anger represents an avoidant coping mechanism to deal with the trauma-related emotion of fear (Foa, Riggs, Massie, & Yarczower, 1995). Thus, by expressing anger, a mobilizing emotion, one is able to handle the traumatic experience without processing more vulnerable emotions such as fear. This is consistent with data suggesting that anger impedes therapeutic progress in PTSD treatment (Foa et al., 1995; Forbes et al., 2008). This avoidant style ultimately could result in greater PTSD symptom severity (Pineles et al., 2011).

Both the aforementioned theories not only highlight the role of anger in PTSD’s symptomatology, they also indicate some specific relations between PTSD’s subscales and anger which is the focus of the current study. One could hypothesize anger’s relation with the specific *DSM-5* PTSD subscales (Friedman, Resick, Bryant, & Brewin, 2011) of physiological arousal (E1-E6) based on the “survival mode” theory, and negative alterations in mood/cognitions including negative emotional states such as fear (D1-D7) based on the fear avoidance theory.

PTSD and Impulsivity

Impulsivity defined as a predisposition to act in an unplanned manner without considering the negative consequences to oneself or others (reviewed in Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001) is also associated with PTSD (Kotler et al., 2001; Ledgerwood & Petry, 2006; Weiss et al., 2012). In fact, PTSD and impulsivity share some common psychopathology-related elements. Anger is related to both PTSD (Olatunji et al., 2010; Teten et al., 2010) and impulsivity (Kotler et al., 2001). Further, self-mutilative behaviors are associated with both PTSD and impulsivity (Sacks, Flood, Dennis, Hertzberg, & Beckham, 2008). Suicidal risk is associated with both PTSD (Kotler et al., 2001) and impulsivity (Pompili et al., 2009). Finally, substance use is related to both PTSD (Marshall-Berenz, Vujanovic, & MacPherson, 2011) and impulsivity (Moeller et al., 2001). These detrimental psychopathology-related elements common to PTSD and impulsivity further highlight the need to assess the mechanism of the relationship between these two constructs.

Several theories explain the relationship between PTSD and impulsivity. Consistent with the disinhibition view of impulsivity, individuals with PTSD symptoms have difficulty engaging in behavioral inhibition when they perceive a rewarding situation (reducing their experience of distress). Thus, being insensitive to signs of behavioral inhibition may lead to impulsive behaviors (Casada & Roache, 2005). Another viewpoint references possible “emotional dysregulation” associated with impulsivity; people with PTSD symptoms may have difficulty controlling impulsive tendencies when experiencing emotional distress (Weiss, Tull, Anestis, & Gratz, 2013; Weiss et al., 2012). To elaborate, a majority of the people with traumatic experiences have subjective distress (O’Hare, Sherrer, Yeaman, & Cutler, 2009) when experiencing negative emotions (Marshall-Berenz et al., 2011) and physiological reactivity to

traumatic re-exposure cues (Van der Kolk, Greenberg, Boyd, & Krystal, 1985). To cope with the aforementioned distress they may engage in impulsive maladaptive behaviors; these behaviors serve to reduce negative emotions or increase positive ones (Marshall-Berenz et al., 2011). Thus, when considering specific *DSM-5* PTSD subscales, one could see impulsivity's possible relation with PTSD's arousal and negative alterations in mood/cognitions subscales (comprising distress) based on the aforementioned theories.

PTSD, Anger, and Impulsivity

The current study thus proposes a hypothetical model of the mediating role of anger (see Figures 1, 2 and 3). People with PTSD symptoms experience anger as already described above (*path A*). However, with anger being a distressing and mobilizing negative affect state, it may predispose a person to engage in an urgent action-oriented coping response (Novaco & Chemtob, 2002); albeit with potentially reduced rational decision making, and thus with an impulsive quality (Cyders & Smith, 2008) (*path B*). Impulsive behaviors could be thus related to PTSD by an emotional dysregulation mechanism (Weiss et al., 2013; Weiss et al., 2012), in this case for the emotion of anger. These impulsive behaviors could be reinforcing by distracting from distress or gratifying needs (Cyders & Smith, 2008; Whiteside & Lynam, 2003).

Thus, it is hypothesized that anger will be a significant mediator in the relationship between PTSD (overall and PTSD subscales of alterations in mood/cognitions and arousal) and impulsivity. Given gender differences in several aspects of the multi-dimensional construct of impulsivity, gender is used as a covariate in the current study (meta-analyzed in Cross, Copping, & Campbell, 2011). A recent meta-analysis reflected more sensation seeking in males (moderate effect size), and more impulsive actions to cope with negative affect in females (small effect size), whereas no significant gender differences were found regarding impulsive behaviors

related to inability to resist boredom, and delaying action until deliberated (Cross et al., 2011). Given impulsivity's non-unitary construct, gender differences were contingent on the type of measure and the definition and theory behind the "impulsivity" construct (meta-analyzed in Cross et al., 2011).

Noteworthy is also that fewer trauma studies have focused on a trauma-exposed college student sample compared to other trauma-exposed samples such as veterans. There is evidence indicating substantial prevalence of traumatic events among college students, with estimates as high as 66% (Read, Ouimette, White, Colder, & Farrow, 2011), 67% (Bernat, Ronfeldt, Calhoun, & Arias, 1998), and 76% (Avant, Davis, & Cranston, 2011). Further, PTSD as a diagnosis is prevalent among trauma-exposed college students, some estimates being 9% (Read et al., 2011), 12% (Bernat et al., 1998) and 25% (Avant et al., 2011). Additionally, college students are usually affected by detrimental impulsivity-based behaviors such as substance usage (Magid & Colder, 2007), and risky sexual behaviors (Zapolski, Cyders, & Smith, 2009). Thus, the current study not only addresses an important topic related to trauma treatment, it also addresses a relevant and important sample.

Method

Participants and Procedure

The sample consisted of 251 trauma-exposed undergraduate psychology students from a medium-sized midwestern university. The sample was recruited during semesters within the fall of 2011 through to the fall of 2012, using a password protected university website requiring participants' university email addresses and personal passwords for access (through Sona systems software). Following their assent via an online informed consent statement, the measures

relevant to the present study were administered. Additionally, the current study received approval from the university's Institutional Review Board.

Measures

Demographic information. Information regarding gender, age, education, employment status, relationship status, ethnic and racial background, and socio-economic status was obtained.

Stressful Life Events Screening Questionnaire (SLESQ). The SLESQ is a 13-item self-report questionnaire assessing exposure to traumatic events per the definition of a Criterion A1 event of the *DSM-IV PTSD* diagnostic criteria. The test-retest reliability for a 2-week period at the item level ranged from .31 to 1.00 for the 11 *DSM-IV* based traumatic events, and the overall test-retest reliability of .89 between events was good. Further, it has good concurrent and convergent validity (Goodman, Corcoran, Turner, Yuan, & Green, 1998). For the current study, we retained 12 of the original questions, assessing just for the presence of each traumatic event. In addition, a probe regarding exposure to traumatic events via media was added to the question assessing for a witnessed traumatic event to be consistent with the proposed *DSM-5* criteria (Elhai et al., 2012). Additionally, a question referencing repeated exposure to details of a traumatic event, with additional probes of exposure through media or one's occupation was added. Lastly, a question asking participants to indicate their most distressing event (if they endorsed more than one event) and provide details on that event was added. Subsequently, participants were instructed to reference the indicated traumatic event or the most distressing traumatic event (if more than one was endorsed) while rating their PTSD symptoms.

PTSD Checklist for DSM-5 (PCL-5). The original PCL assesses the 17 *DSM-IV PTSD* items using distress ratings for each symptom on a five-point Likert-type scale (1= "not at all" to 5 = "extremely") (Weathers, Litz, Herman, Huska, & Keane, 1993). It has high internal

consistency (.94), good one-week test-retest reliability (.88), good convergent validity (>.75 correlations with other measures of PTSD), and good discriminant validity (Ruggiero, Del Ben, Scotti, & Rabalais, 2003). For the current study a 20-item PCL-5 (Weathers et al., 2010) was administered; this self-report is a lengthier measure mapping onto *DSM-5*'s PTSD criteria based on the psychometrically sound PCL. The total score ranges from 20 to 100. Normed on trauma-exposed college students, the PCL-5 has good internal consistency as reflected in an alpha coefficient of .94 (Blevins, Weathers, Witte, & Davis, November, 2012) and .95 in the current study, high item-total scale correlations, good convergent validity with other trauma measures, and good discriminant validity (Blevins et al., November, 2012). For the current study, subscale scores were computed for each of the four *DSM-5* subscales: intrusions (five items with the subscale score ranging from 5 to 25), avoidance (two items with the subscale score ranging from 2 to 10), negative alterations in mood/cognitions (seven items with subscale score ranging from 7 to 35), and arousal (six items with subscale score ranging from 6 to 30).

Dimensions of Anger Reaction Scale – 5 (DAR-5). The DAR-5 is a 5-item self-report questionnaire assessing for dimensions of anger reactions, mainly one's disposition towards anger in response to stressful situations (Forbes et al., 2004). The original DAR, a 7-item self-report measure using a 9-point Likert-type scale for each item (0 = "not at all" to 8 = "exactly so") (Novaco, 1975) had internal consistency ranging from .91 to .94 (Forbes et al., 2004), and good convergent and discriminant validity including a higher correlation with PTSD symptoms (Novaco, Swanson, Gonzalez, Gahm, & Reger, 2012). Subsequently, a modified briefer version of the DAR called the DAR-5 (excluding the original measure's items 5 and 7) with a 5-point Likert rating scale ranging from 1 ("none of the time") to 5 ("all of the time") was developed. With the total scale score ranging from 5 to 25, this unidimensional measure has good

convergent and discriminant validity (Forbes et al., 2013; Forbes et al., 2004), and adequate internal consistency of .89 in a study using a separate trauma-exposed student sample (Forbes et al., 2013) and that of .80 in the current study. Research has shown similar psychometric properties, convergent validity using other measures of anger, and no loss of sensitivity using the DAR-5 compared to the DAR. Thus, in terms of brevity, the DAR-5 was used in the current study (Hawthorne, Mouthaan, Forbes, & Novaco, 2006). Although anger is included in the PTSD criteria, research has shown that PTSD assessed by the PCL and anger assessed by the DAR-5 and the DAR are independent constructs (Forbes et al., 2004; Novaco et al., 2012).

UPPS Impulsivity Scale. The UPPS Impulsivity Scale is a 45-item self-report measure using a 4-point Likert-type scale with ratings from 1 (“agree strongly”) to 4 (“disagree strongly”). The items represent the four dimensions of impulsivity: lack of premeditation (11 items), urgency (12 items), sensation seeking (12 items), and perseverance (10 items). The total score can range from 45 to 180. The scale has good internal consistency coefficients, specifically .91, .86, .90, and .82 for lack of premeditation, urgency, sensation seeking and lack of perseverance scales, respectively (Whiteside & Lynam, 2001). The overall internal consistency coefficient in the current study was .86. Further, it has good convergent and divergent validity and is shown to effectively discriminate clinical groups from those without psychopathology (Smith et al., 2007; Whiteside, Lynam, Miller, & Reynolds, 2005). A modification was made for this study wherein the timeline for symptoms was anchored to the past month, to make it consistent with the timeline of inquiry of PTSD symptoms.

Exclusions and Treatment of Missing Data

Of 512 participants who completed the survey, only 244 subjects endorsed at least one traumatic event and nominated one event as their index/most distressing traumatic event. Of

these individuals, we estimated missing item-level data using maximum likelihood procedures on the primary measures for those subjects (about 10% across measures) missing fewer than 30% of items on a particular measure. We subsequently summed item-level responses (reverse scoring indicated items on the UPPS) to form total scale scores on the primary measures and additional subscale scores for the PCL-5 scale. We further estimated missing total scores for those subjects missing one primary measure.

Effective Sample Characteristics

The effective sample of 244 participants had a mean age of 20.30 years ($SD = 5.10$), with the majority being female ($n = 165, 74.7%$). Most respondents were single ($n = 198, 81.1%$), or living with a significant other ($n = 34, 13.9%$). Number of years of schooling ranged from 10 to 18 years ($M = 12.90, SD = 1.27$). Most respondents were unemployed as students ($n = 118, 48.6%$) or worked part-time ($n = 105, 43.2%$). Most participants had an income less than \$34,999, more specifically - less than \$15,000 ($n = 81, 33.9%$), \$15,000-\$24,999 ($n = 27, 11.3%$), and \$25,000-\$34,999 ($n = 27, 11.3%$). Further, most participants identified themselves as Caucasian ($n = 172, 70.5%$), or African American ($n = 66, 27.0%$). Fourteen participants reported their ethnicity as Hispanic/Latino (5.9%). The most prevalent worst traumatic events (upon which PTSD ratings were assigned) were unexpected death of a family member/close friend ($n = 114, 46.7%$), life-threatening accident ($n = 21, 8.6%$), and childhood sexual molestation ($n = 21, 8.6%$).

Statistical Analysis

Based on benchmarks of skewness > 2 and kurtosis > 7 (Curran, West, & Finch, 1996), all total scores were normally distributed. Mediation analysis to assess the proposed hypotheses was conducted as path analysis models using the Mplus 6.12 software. Total scores on the PCL-

5, DAR-5, and UPPS scales reflecting measures of PTSD symptoms, anger reactions and impulsivity, and the PCL-5 subscale scores were used as observed variables. Three mediation analyses were computed. The relationship between PTSD symptoms (overall and two subscale scores) and anger reactions, between anger reactions and impulsivity, and between PTSD (overall and two subscale scores) and impulsivity were direct effects, and the effect of PTSD symptoms (overall and two subscale scores) on impulsivity accounting for anger reactions was an indirect effect. Gender was used as a covariate of impulsivity in all mediation analyses. The approach to mediation analyses is the product of path coefficients approach estimating the indirect effect's standard error (MacKinnon, 2008) with the multivariate delta method through bootstrapping 1000 samples (MacKinnon, 2008).

Results

Total PCL-5 scores averaged 42.01 ($SD = 17.55$), DAR-5 scores averaged 12.67 ($SD = 4.37$) compared to an average score of 10.3 in a study with a similar trauma-exposed student sample (Forbes et al., 2013), and UPPS Impulsivity Scale scores averaged 103.95 ($SD = 15.16$). In the effective sample, 22% of participants would have a possible PTSD diagnosis per the *DSM-5* criteria (at least one re-experiencing symptom, at least one avoidance symptom, at least three mood/cognition symptom, and at least three arousal symptoms) using an item cutoff of "3" or higher (Cook, Thompson, Coyne, & Sheikh, 2003). The PTSD prevalence rates are consistent with several prior studies (e.g., Avant et al., 2011). Further, correlation results between anger, impulsivity and *DSM-5* PTSD subscales indicated impulsivity's significant relation with the negative alterations in mood/cognitions and arousal subscales and anger's significant relation with all PTSD subscales (Table 1). This further supports the current study's focus on the two PTSD subscales of arousal and negative alterations in mood/cognitions.

Using bootstrapping to estimate standard errors for the indirect effect, anger reactions significantly mediated the relationship between PTSD and impulsivity ($\beta = .06$, $SE = .03$, $p = .02$) (Figure 2). Results indicated significant direct effects of PTSD on anger reactions ($B = .11$, $SE = .01$, $\beta = .44$, $p < .001$), of anger reactions on impulsivity ($B = .60$, $SE = .26$, $\beta = .17$, $p = .02$), and of PTSD on impulsivity ($B = .16$, $SE = .07$, $\beta = .19$, $p = .02$). Lastly, gender was a significant covariate for its effects on impulsivity ($B = -3.87$, $SE = 1.96$, $\beta = -.11$, $p = .049$).

Anger reactions significantly mediated the relationship between PTSD's mood/cognitions subscale and impulsivity ($\beta = .07$, $SE = .03$, $p = .02$) (Figure 3). Results indicated significant direct effects of the PTSD mood/cognitions subscale on anger reactions ($B = .27$, $SE = .04$, $\beta = .42$, $p < .001$), of anger reactions on impulsivity ($B = .59$, $SE = .25$, $\beta = .17$, $p = .02$), and of the PTSD mood/cognitions subscale on impulsivity ($B = .44$, $SE = .18$, $\beta = .20$, $p = .01$). Gender was not a significant covariate in the model ($B = -3.46$, $SE = 2.10$, $\beta = -.10$, $p = .10$).

Lastly, anger reactions significantly mediated the relationship between the PTSD arousal subscale and impulsivity ($\beta = .06$, $SE = .03$, $p = .04$). Results indicated significant direct effects of the PTSD arousal subscale on anger reactions ($B = .22$, $SE = .09$, $\beta = .36$, $p = .02$), of anger reactions on impulsivity ($B = .60$, $SE = .25$, $\beta = .17$, $p = .02$), and of the PTSD arousal subscale on impulsivity ($B = .47$, $SE = .23$, $\beta = .22$, $p = .04$). Gender was not a significant covariate in this model ($B = -3.01$, $SE = 2.16$, $\beta = -.09$, $p = .16$).

Discussion

The present study aimed to assess the mediating role of anger in the relationship between PTSD symptoms (total score and subscales of arousal and negative alterations in mood/cognitions) and impulsivity. Results first and foremost substantiate PTSD's significant relation with anger reactions (Olatunji et al., 2010; Teten et al., 2010), and impulsivity (Kotler et

al., 2001; Ledgerwood & Petry, 2006; Weiss et al., 2012). Further, anger reactions had a significant correlation with all *DSM-5* PTSD subscales, not just overall PTSD severity as more frequently assessed in the existing literature. PTSD's relation with anger as proposed in the "survival mode theory" (Chemtob et al., 1997) or the "fear avoidance theory" (Foa et al., 1995) indicate that anger may serve as a coping mechanism to deal with distress related to PTSD symptoms via mobilizing impulsive behaviors.

Important to the literature are findings implying impulsivity's "emotional dysregulatory" tendency in PTSD symptomatology (Weiss et al., 2013; Weiss et al., 2012), mainly that of coping with distressing emotions (Cyders & Smith, 2008; Whiteside & Lynam, 2003) such as anger. One could further hypothesize impulsivity as being a common psychological mechanism between PTSD and disorders such as substance dependence, borderline personality disorder, and other impulse control disorders, mainly the latter developing during the process of coping with trauma-related distress. Future research could further explore this avenue.

In fact, the focus needs to be on the distress and affective states associated with the PTSD subscales of arousal and negative alteration in mood/cognitions. These subscales may play a role in PTSD's comorbidity with several impulse-related problems including substance usage (Drescher, Rosen, Burling, & Foy, 2003; Marshall-Berenz et al., 2011), violent offending (MacManus et al., 2013) and self-harm behaviors (Kotler et al., 2001; Sacks et al., 2008). Research has already indicated arousal as one of PTSD's symptom clusters associated with substance usage (Saladin, Brady, Dansky, & Kilpatrick, 1995) and with a strong association with PTSD-related distress (Shea, Vujanovic, Mansfield, Sevin, & Liu, 2010). Although the *DSM-5* negative alterations in mood/cognitions subscale has relatively sparse research, it does contain

some PTSD numbing symptoms per the *DSM-IV* criteria which have a significant association with PTSD-related problems in functioning (Shea et al., 2010). Thus, these two PTSD subscales may capture some of PTSD's non-specific distress associated with PTSD's comorbidity with other internalizing and externalizing disorders.

One could also look at anger as a mobilizing emotion in this mediation relationship. To elaborate, PTSD's arousal symptoms may prepare one for action, and PTSD's negative alteration in mood/cognitions symptoms may represent an increase in emotional distress. Both in turn coupled with anger feelings may propel an individual to engage in action-oriented impulsive behaviors (e.g., aggression-oriented behaviors).

Lastly, results also support studies indicating gender to have a significant effect on impulsivity scores (meta-analyzed in Cross et al., 2011) when using PTSD as an overall construct; supporting its conceptualization as a covariate in impulsivity studies. However, it was not a significant covariate when considering PTSD subscales, with differences in hypothesized mediation models possibly contributing to these discrepant findings. Future studies would benefit from assessing if the hypothesized mediation paths are different across genders.

Implications

The results have implications for psychological treatment and assessment. First, results highlight the importance of assessing for impulsivity diagnostically given its possible emotional dysregulation role in PTSD's symptomatology. There needs to be additional focus on assessing comorbid impulse-related problems as well. This adds to the significance of including the "reckless and self-harm behaviors" PTSD criterion as outlined in the *DSM-5* (Friedman et al., 2011). Second, results highlight the importance of addressing impulsivity in treatment, specifically to teach patients adaptive coping when experiencing distressing emotions like anger

(Cyders, Combs, Fried, Zapsolski, & Smith, 2009). Specifically, impulsivity's significant correlation with the mood/cognitions and arousal subscales indicate certain treatment pathways; appropriate therapeutic treatment of these PTSD symptom clusters may reduce impulsivity-based self and other-harm behaviors. This is consistent with treatment protocols such as Dialectical Behavior Therapy (DBT) aimed to address distress tolerance and emotional regulation skills in people with PTSD symptoms (Steil, Dyser, Priebe, Kleindienst, & Bohus, 2011).

Third, treatment could address the action-oriented and mobilizing force of anger in relation to PTSD symptoms. With prior research indicating that anger as an external construct is highly related to PTSD symptom severity (not just based on its inclusion as a PTSD symptom criterion), its significant mediating role in the PTSD-impulsivity relation makes it imperative to assess for anger tendencies and address its treatment after trauma exposure. Lastly, the significant mediation model may also explain the presence of impulsive aggression characterized by lack of careful thought compared to premeditated aggression in people with PTSD, with anger being a significant predictor of the former (Teten et al., 2010).

Limitations and future research

The study is not without limitations. First, given that we used cross-sectional data to assess mediation, we cannot make any conclusions regarding causation. However, the results justify the time and expense invested in conducting similar longitudinal causation studies (Cole & Maxwell, 2003). Second, given the nature of self-report assessments, there is a possibility of response bias and social desirability influencing the results. Of additional concern is the use of a single measure to assess multifaceted constructs of anger and impulsivity. Third, the results are obtained in a very restrictive (trauma-exposed and somewhat ethnically diverse) college student population, hence limiting the generalizability to clinical samples. That being said, the current

study's significant results indicate the importance of addressing anger and impulsivity among college students after trauma exposure as an early treatment approach, especially given the significant prevalence of traumatic event exposure, PTSD, impulsivity and anger tendencies in this sample. Additionally, results lay the statistical foundation to test the hypothesized mediation model in other trauma-exposed populations and in different cultural groups to assess the generalizability of results. Fourth, the current study's sample is comprised of fewer males (about 25%), paralleling the gender trend among college students; this could have influenced the results of the current study regarding the use of gender as a covariate. Lastly, we have used the concept of "emotional distress" in association with anger feelings and impulsivity; although have not assessed it independently. It would be helpful to measure "emotional distress" as a probable moderating variable in the anger-impulsivity pathway.

Future research can extend the hypothesized mediation model to include additional paths from impulsivity to impulse-based behaviors including substance usage, self-harm and aggressive acts to clarify the psychological mechanism underlying comorbid behaviors. Thus, an additional limitation of the current study is the lack of measures assessing these impulsive behaviors. Additionally, given the different pathways to impulsive behaviors (Whiteside & Lynam, 2001), and differential relations of PTSD with different impulsivity dimensions (Weiss et al., 2013) using impulsivity subscales in the hypothesized model would help identify the exact impulsivity factor playing a role in PTSD-impulsivity relationship.

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Table 1. Correlations between *DSM-5* PTSD subscales, anger and impulsivity.

	Impulsivity	Anger	Intrusions subscale	Avoidance subscale	Mood/cognitions subscale	Arousal subscale
Impulsivity		.26**	.09	.117	.25**	.32**
Anger			.34**	.29**	.41**	.46**

Note. * $p < .05$; ** $p < .001$

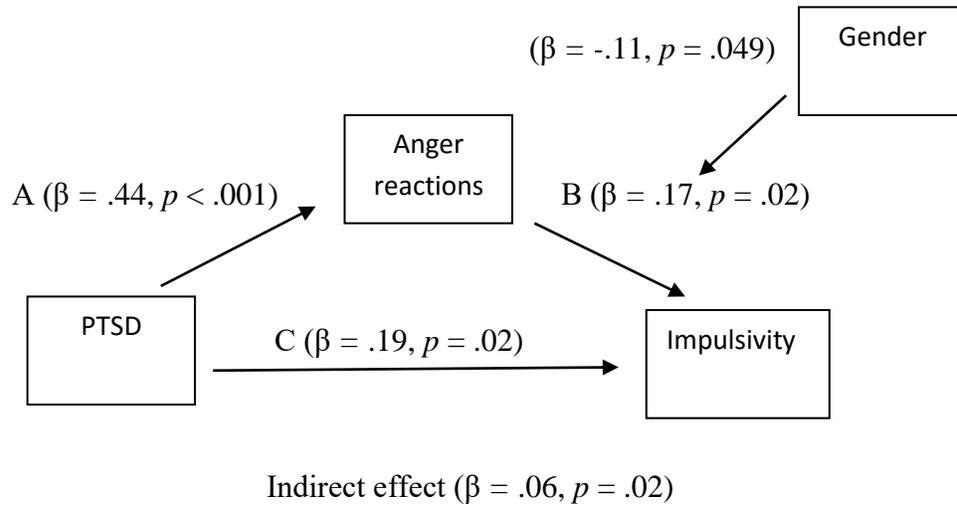


Figure 1. Mediating role of anger in the relationship between PTSD and impulsivity.

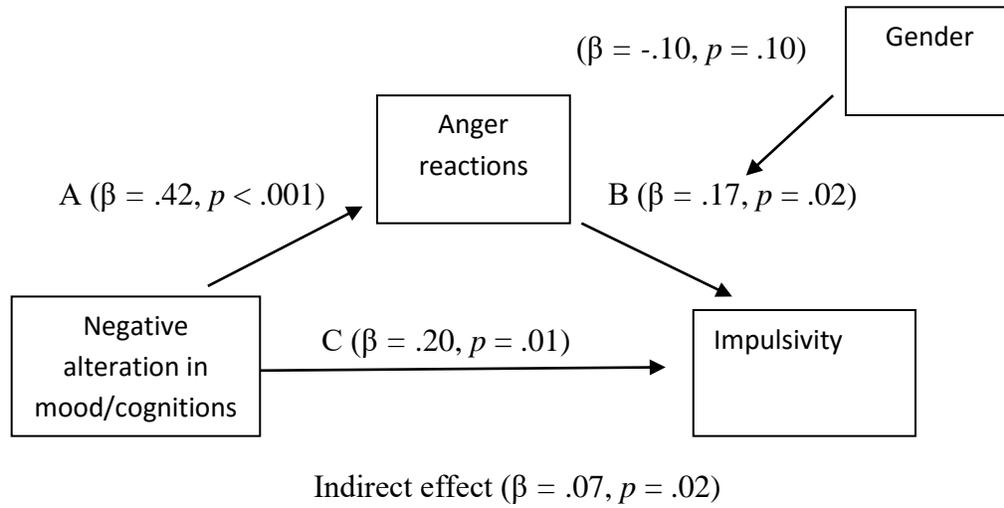


Figure 2. Mediating role of anger in the relationship between the *DSM-5* PTSD negative alterations in mood/cognitions subscale and impulsivity.

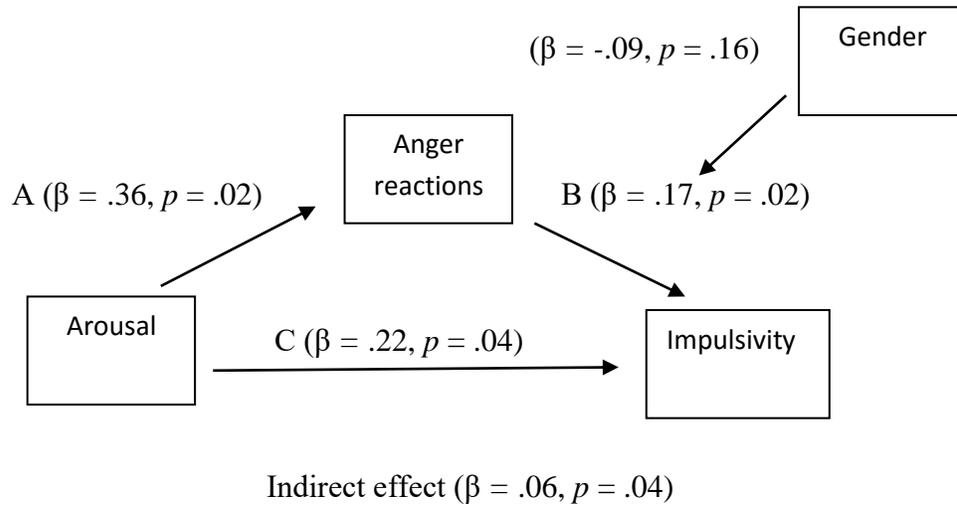


Figure 3. Mediating role of anger in the relationship between the *DSM-5* PTSD arousal subscale and impulsivity.