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Self-injurious Behaviors in Posttraumatic Stress Disorder: An Examination of Potential Moderators

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Abstract

Background—Despite increasing evidence for a relation between posttraumatic stress disorder (PTSD) and self-injurious behaviors (SIB), limited research has examined the factors that may moderate the associations between PTSD and both nonsuicidal SIB (deliberate self-harm; DSH) and suicidal SIB (suicide attempts). Nonetheless, research suggests that characteristics of the traumatic event, co-occurring borderline personality disorder (BPD), and emotion dysregulation may influence the relations between PTSD and SIB.

Methods—Thus, the aim of this study was to examine the moderating role of these factors in the association between PTSD and SIB (including history and frequency of DSH and suicide attempts, and DSH versatility) among a sample of substance use disorder inpatients with (n = 116) and without (n = 130) a history of PTSD.

Results—Results from stepwise regression analyses indicate that sexual assault-related PTSD predicted suicide attempt frequency and DSH versatility among those with PTSD. Furthermore, results from hierarchical linear and logistic regression analyses suggest that co-occurring BPD moderates the relationship between PTSD and both DSH history and versatility and emotion dysregulation moderates the relationship between PTSD and DSH frequency. Specifically, the relations between PTSD and DSH outcomes were stronger among participants with co-occurring BPD and higher levels of emotion dysregulation.

Limitations—This study is limited by its reliance on cross-sectional, self-report data.

Conclusions—Despite limitations, findings suggest distinct risk factors for suicide attempts and DSH, and highlight the importance of examining characteristics of the trauma and associated BPD and emotion dysregulation in assessing risk for SIB in PTSD.

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Keywords

posttraumatic stress disorder; deliberate self-harm; self-injury; suicidal behaviors; emotion dysregulation; sexual assault; borderline personality

Introduction

Posttraumatic stress disorder (PTSD) is a severe mental health disorder characterized by persistent reexperiencing, avoidance, hyperarousal, and cognitive or affective symptoms in response to direct or indirect exposure to a traumatic event (American Psychological Association [APA], 2013). PTSD is associated with a number of self-destructive and risky behaviors, including substance misuse (e.g., Brady et al., 2004; Kessler et al., 1995) and risky sexual behaviors (Rosenberg et al., 2001). Of particular concern, PTSD is associated with high rates of self-injurious behaviors (SIB; i.e., the deliberate destruction of body tissue with or without suicidal intent; see Tate and Baroff, 1966), both suicidal (i.e., SIB with a clear or ambivalent intent to die, or suicidal behavior; O'Carroll et al., 1996) and nonsuicidal (i.e., SIB with no intent to die, or deliberate self-harm [DSH]; Chapman et al., 2006; Fliege et al., 2009; Gratz, 2001; Pattison and Kahan 1983). In fact, rates of DSH among individuals with PTSD often exceed 50% (Dyer et al., 2009; Sacks et al., 2008; Zlotnick et al., 1999), and PTSD symptoms have been found to predict DSH (Weierich and Nock, 2008). Furthermore, PTSD diagnoses are associated with heightened rates of suicidal behaviors, predicting higher odds of suicidal ideation and suicide attempts (Kessler et al., 1999; 1995), even when controlling for demographic, mood, and substance use variables (Sareen et al., 2005). Moreover, individuals with PTSD are at higher risk for suicidal ideation and attempts relative to other trauma-exposed individuals (Ferrada-Noli et al. 2005). Despite the clear clinical relevance of SIB among patients with PTSD, little is known about the factors that increase the risk for these behaviors among individuals with PTSD, or moderators of the association between PTSD and SIB.

In considering moderators of the association between PTSD and SIB, one population that warrants particular attention is patients with substance use disorders (SUD). Patients with SUD have been found to have high rates of PTSD (Brady et al., 2004), suicide attempts (Ullman and Brecklin, 2002; Wunderlich et al., 1998), and DSH (Evren and Evren, 2005; Evren et al., 2006, Evren et al., 2008; Gratz and Tull, 2010a; Zlotnick et al., 1999). Furthermore, evidence suggests that patients with co-occurring PTSD-SUD are at particularly heightened risk for SIB, compared with either diagnosis alone (Harned et al., 2006; Moylan et al., 2001; Najavits et al., 1999). Thus, investigating potential moderators of the PTSD-SIB relation among SUD patients is of particular clinical relevance and public health significance.

One potential moderator that warrants examination is the specific type of traumatic event experienced. In particular, there is evidence to suggest that the nature and associated features of sexual assault-related traumatic events may be qualitatively different than many other forms of traumatic exposure. Specifically, sexual assault-related traumatic events tend to be intimate in nature, often engender a sense of violation or betrayal, and may involve a known

perpetrator (e.g., Goodman et al., 1993; Wiederman et al., 1998). As a result, researchers have proposed that sexual assault-related traumatic experiences may be more likely than other types of traumatic events to result in a range of negative clinical outcomes and impairments (Goodman et al., 1993; Sandberg et al., 2010), including SIB. Empirical evidence supports this proposition, finding heightened risk for SIB in sexual assault-related traumatic events. Specifically, a history of sexual abuse or assault has been associated with increased suicidal ideation and suicide attempts (Davidson et al., 1996; Kilpatrick et al., 1985; Ullman and Brecklin, 2002) and DSH (Jaquier et al., 2013; Romans et al., 1995). Furthermore, even controlling for physical and emotional forms of childhood maltreatment, childhood sexual abuse has been found to be associated with risk for suicide attempts (Wiederman et al., 1998). Moreover, evidence suggests that sexual assault-related traumas may be more strongly linked to suicide-related outcomes than other types of traumatic experiences, such as accidents, natural disasters, or combat (e.g., Belik et al., 2009; Borges et al., 2008). Finally, although no studies have examined the relative strength of the relations between sexual assault-related traumas (vs. other traumatic events) and DSH in particular, research does indicate higher rates of DSH among women with a history of sexual assault (vs. women without sexual assault; Jaquier et al., 2013; Romans et al., 1995). As such, it is possible that individuals with PTSD resulting from sexual assault-related traumatic exposure may be at particularly heightened risk for SIB.

Another factor that may increase the risk for SIB among those with PTSD is the presence of co-occurring borderline personality disorder (BPD) pathology, which co-occurs frequently with PTSD (at rates of 10-76%; Pagura et al., 2010; Shea et al., 1999; Zlotnick et al., 2002) and has been found to be associated with worse clinical severity among those with PTSD (Feeny et al., 2002; Zlotnick et al., 2003). Of particular relevance to this study, patients with co-occurring BPD and PTSD have been found to have higher rates of suicide attempts than patients with PTSD alone (Connor et al., 2002; Heffernan and Cloitre, 2000). Moreover, SIB are a hallmark feature of BPD (APA, 2013), with up to 75% of individuals with BPD endorsing a history of DSH (Gunderson, 2001) and up to 84% attempting suicide (Soloff et al., 2002). Notably, although a recent study of substance-dependent patients failed to find support for the moderating role of BPD in the relation between PTSD and DSH frequency (Gratz and Tull, 2012), this study did not examine other aspects of DSH (i.e., DSH history or versatility) or suicidal behaviors. However, given previous literature underscoring the relevance of co-occurring BPD to suicide attempts among patients with PTSD (e.g., Connor et al., 2002), the examination of suicide-related outcomes is particularly important in this context.

A final factor that may moderate the association between PTSD and SIB is emotion dysregulation. As defined here, emotion dysregulation is a multidimensional construct involving a lack of awareness, clarity or acceptance of emotions, difficulties controlling behaviors when distressed, limited access to effective emotion modulation strategies, and an unwillingness to experience distress in order to pursue meaningful activities in life (Gratz and Roemer, 2004; Gratz and Tull 2010b). In addition to evidencing strong relations with PTSD pathology in both clinical (McDermott et al., 2009; Weiss et al., 2013; Weiss et al., 2012) and nonclinical (e.g., Tull et al., 2007) samples, emotion dysregulation has been implicated as a risk factor for SIB. In particular, DSH has been conceptualized as serving an

emotion regulatory function (Chapman et al., 2006; Gratz, 2001; Suyemoto, 1998), and emotion dysregulation has demonstrated robust associations with DSH in nonclinical (Gratz and Chapman, 2007; Gratz and Roemer, 2008; Heath et al., 2008) and clinical (Gratz and Tull, 2010a; Slee et al., 2008) samples. Given that PTSD is associated with heightened emotional arousal, the presence of emotion regulation difficulties among individuals with this disorder may prompt the use of maladaptive strategies to avoid or escape emotional distress (e.g., Weiss et al., 2012), including DSH. Notably, although heightened levels of emotion dysregulation among individuals with PTSD may increase the risk for DSH, the relation of emotion dysregulation to suicidal behaviors has been theorized to be more complex (Anestis et al., 2011), and there is evidence to suggest that emotion dysregulation may not increase the risk for suicidal behaviors in this population. Specifically, despite early evidence for an association between emotion dysregulation and suicide attempt frequency (Zlotnick et al., 1997), recent evidence (Anestis et al., 2011) suggests that emotion dysregulation may be positively associated with suicidal desire but negatively associated with the acquired capability for suicide (i.e., the habituation to physiological pain and the fear of death and bodily harm that permits individuals to enact serious and lethal self-injury; Joiner, 2005). These researchers have suggested that although individuals with high levels of emotion dysregulation may be more likely to desire suicide, they may be less inherently capable of enacting potentially lethal self-injury (which requires the ability to persist in the face of emotional and physical distress associated with serious suicidal behaviors; see Anestis et al., 2011; 2012). Thus, emotion dysregulation may moderate the relation of PTSD with some forms of SIB (e.g., DSH), but not others (e.g., suicidal behaviors).

The aim of the present study was to examine moderators of the association between PTSD and SIB in a high-risk sample of SUD patients. Despite research and theory underscoring the need to distinguish between DSH and suicidal outcomes (Chapman and Dixon-Gordon, 2007; Gratz, 2003), and evidence of divergent associations between these forms of SIB and risk factors (e.g., emotion dysregulation; Anestis et al., 2012; Gratz & Chapman, 2007), there is little research examining the associations with risk factors across various forms of SIB. Taking an initial step in this line of research, we examined a range of SIB in the present study. Consistent with past research (Harned et al., 2006; Moylan et al., 2001), we hypothesized that PTSD would be associated with a history of DSH and suicide attempts, frequency of DSH and suicide attempts, and DSH versatility (i.e., use of multiple methods of DSH; Turner et al., in press). We also hypothesized that sexual assault-related traumas and co-occurring BPD would moderate the relationship between PTSD and SIB, such that the presence of these factors would be associated with a stronger relation between PTSD and SIB. Finally, we hypothesized that overall emotion dysregulation would moderate the relationship between PTSD and DSH (but not suicide attempts; consistent with Anestis et al., 2012), such that the association between PTSD and DSH would be stronger at high (vs. low) levels of emotion dysregulation. Given the limited research examining the relations among PTSD, SIB, and specific dimensions of emotion dysregulation, exploratory analyses examined the moderating role of specific emotion dysregulation dimensions in the associations between PTSD and SIB outcomes.

Methods

Participants

Participants in this study were 246 (63.8% male) SUD patients consecutively admitted to a residential SUD treatment facility in central Mississippi. Participants were ethnically diverse (56.5% White; 35.8% African-American), and ranged in age from 18 to 61 (*M* = 35.60; *SD* = 10.07). Additional demographic and clinical characteristics are available in Table 1.

Measures

Clinical interviews—The *Clinician-Administered PTSD Scale* (CAPS; Blake et al., 1990) was used to assess frequency and intensity of DSM-IV PTSD criteria and associated symptoms. Participants with a lifetime diagnosis of PTSD were included in the PTSD group for the present study. The Criterion A traumatic event identified as the index trauma was categorized as physical assault, sexual assault, accident or natural disaster, illness, or other. The CAPS has demonstrated adequate interrater reliability, internal consistency, and convergent validity (i.e., with other measures of PTSD; Weathers et al., 2001).

The *Structured Clinical Interview for DSM-IV Axis I Disorders* (SCID; First et al., 1996) was used to assess for the exclusion criterion (primary psychosis), and the *Diagnostic Interview for DSM-IV Personality Disorders* (DIPD-IV; Zanarini et al., 1996) was used to assess for the presence of BPD. Both the SCID and DIPD-IV have demonstrated adequate interrater and test-retest reliability (First et al., 1996; Zanarini et al., 2000).

Interviews were conducted by bachelors- or masters-level clinical assessors trained to reliability with one of the investigators (KLG or MTT). All interviews were reviewed by a PhD-level psychologist (KLG or MTT). For the SCID and CAPS, diagnostic discrepancies were found in fewer than 5% of cases. For the DIPD-IV, diagnostic discrepancies were found in fewer than 10% of cases. In these instances, areas of disagreement were discussed as a group and a consensus was reached.

The *Lifetime Parasuicide Count* (LPC; Linehan and Comtois, 1996) was used to assess lifetime history of suicidal behaviors. The LPC is a structured interview designed to assess lifetime frequency of suicidal and nonsuicidal SIB across severity and intent. Behaviors were categorized as suicide attempts if participants endorsed any intent to die (either ambivalent or clear; Muehlenkamp and Gutierrez, 2007). A dichotomous suicide attempt variable was created by assigning a “1” to participants who reported one or more suicide attempts, and a “0” to participants who did not report any history of suicide attempts. A suicide attempt frequency variable was computed by summing the total number of suicide attempts.

Self-report questionnaires—The *Deliberate Self-Harm Inventory* (DSHI; Gratz, 2001) is a 17-item self-report questionnaire that assesses lifetime history of various aspects of DSH (defined as the deliberate, direct destruction of body tissue without suicidal intent), including frequency, duration, and type of DSH behavior (e.g. cutting, burning, carving, biting). The DSHI has demonstrated high internal consistency, adequate test-retest reliability, and adequate construct, discriminant, and convergent validity among

undergraduate student, community adult, and patient samples (Fliege et al., 2006; Gratz, 2001; Gratz et al., 2011). Consistent with past research (Gratz and Tull, 2010a), a dichotomous DSH variable was created by assigning a "1" to participants who reported having engaged in DSH, and a "0" to participants who denied any DSH. In addition, a DSH frequency variable was computed by summing the total number of DSH episodes reported (consistent with consistent with Gratz, 2001; Gratz and Tull, 2012) and a DSH versatility index was computed by summing the number of different types DSH behaviors (e.g., cutting, burning, etc.) endorsed on the DSHI (consistent with Turner et al., in press).

The *Difficulties in Emotion Regulation Scale* (DERS; Gratz and Roemer, 2004) is a 36-item self-report measure that assesses individuals' typical levels of emotion dysregulation across six domains: nonacceptance of negative emotions, difficulties engaging in goal-directed behaviors when distressed, difficulties controlling impulsive behaviors when distressed, limited access to emotion regulation strategies perceived as effective, lack of emotional awareness, and lack of emotional clarity. Participants rate each item using a 5-point Likert-type scale (*1 = almost never*, *5 = almost always*). The DERS demonstrates good test-retest reliability and construct and predictive validity and is significantly associated with objective measures of emotion regulation (Gratz and Roemer, 2004; Gratz and Tull, 2010b). Items were recoded so that higher scores indicate greater emotion dysregulation, and a sum was calculated (in this sample, $\alpha = 0.93$ for the total score and 0.75-0.88 for the subscale scores).

Procedures

All procedures for the present study were approved by the institution's review board and conducted in accordance with the ethical guidelines of the World Medical Association. Interested participants provided written informed consent prior to participation. These data were collected as part of a larger study examining predictors of residential SUD treatment dropout. Inclusion criteria included a Mini-Mental Status Exam (Folstein et al. 1975) score of ≥24 and the absence of psychotic symptoms. Eligible participants were recruited ≥72 hours after admittance to the facility to reduce any impact of withdrawal symptoms on study participation. Diagnostic interviews were administered in the first session, and questionnaires were administered in the second session. Participants were paid $15 for each session.

Results

Data Screening and Transformations

Several variables (i.e., DSH frequency, DSH versatility, suicide attempt frequency) exhibited non-normal distributions (skew > 3.0, kurtosis > 10.0; Curran et al., 1996; Kline, 1998) and were $\log_{10}$ transformed, resulting in acceptable distribution properties. Although some univariate outliers remained (Tabachnick and Fidell, 2007), these values did not have undue influence on the primary analyses of interest (*DFFITS* < 1; Cohen et al., 2003). Therefore no values were removed from these variables. There was no evidence of multicollinearity in the predictors for the primary analyses (*VIFs* < 3; Tabachnick and Fidell, 2007), or heterogeneity of variance of the continuous dependent variables across the lifetime PTSD and no PTSD groups ($F_{max} < 5$; Tabachnick and Fidell, 2007)

Preliminary Analyses

Rates and frequencies of self-injurious behaviors—Consistent with past studies of SUD populations (Borrill et al., 2003; Bornovalova et al., 2011; Gratz and Tull, 2010a), 29% of participants reported a history of DSH and 21% reported a history of suicide attempts. Furthermore, the overlap between these behaviors was high, with a history of DSH reported by 46% of participants with a history of suicide attempts and a history of suicide attempts reported by 30% of participants with a history of DSH (consistent with extant literature on the frequent co-occurrence of these behaviors; e.g., Hawton et al., 1999; Joiner et al., 1995). To examine the impact of PTSD diagnosis on SIB outcomes, we conducted a series of one-tailed chi-square and independent *t* tests. As shown in Table 2, participants with (vs. without) PTSD were more likely to report a history of suicide attempts and DSH, as well as a greater number of lifetime suicide attempts and greater DSH versatility.

Identification of covariates—Zero-order correlations and chi-square analyses were conducted to explore the impact of demographic factors on SIB outcomes to identify potential covariates for primary analyses (Tabachnick and Fidell, 2007). Age demonstrated inverse associations with DSH history and DSH frequency (*r*s = -0.17, *p*s = 0.01). In addition, results revealed differences in rates of suicide attempts and DSH (suicide attempts: χ^2 [1] = 19.67, $p < 0.001$; DSH: χ^2 [1] = 5.09, $p = 0.02$), suicide attempt frequency ($r = 0.30$, $p < 0.001$) and DSH versatility ($r = 0.17$, $p = 0.01$) as a function of gender, with women reporting higher rates of these behaviors, as well as greater suicide attempt frequency and DSH versatility. Further, White (vs. non-White) race/ethnicity was associated with a history of DSH (χ^2 [1] = 6.90, $p = 0.01$), DSH frequency ($r = 0.16$, $p = 0.02$), suicide attempt frequency ($r = 0.13$, $p = 0.045$), and DSH versatility ($r = 0.14$, $p = 0.03$). Finally, unemployment status was positively associated with suicide attempt history (χ^2 [1] = 9.89, $p < 0.01$) and frequency ($r = 0.18$, $p = 0.01$). Primary analyses controlled for relevant covariates.

Primary Analyses

Type of traumatic event—Among participants with a lifetime history of PTSD, the most frequent index traumatic event for the PTSD diagnosis was a sexual assault-related trauma (29%), followed by death or injury to another person (28%), physical assault (20%), accident or natural disaster (10%), and illness (4%). All other index traumatic events were collapsed into an “other” category (10%). To examine the association between type of index traumatic event and SIB among patients with a lifetime history of PTSD ($n = 116$), we conducted hierarchical linear and logistic regression analyses with stepwise entry of the categories of index traumatic events. Only sexual assault-related trauma emerged as a significant predictor of suicide attempt frequency ($\beta = 0.33$, $t = 3.42$, $\eta_p^2 = 0.10$, $p < 0.001$, $R^2 = 0.12$), and DSH versatility ($\beta = 0.23$, $t = 2.27$, $\eta_p^2 = 0.05$ $p = 0.03$, $R^2 = 0.11$). No trauma types emerged as significant predictors of other SIB outcomes.

Co-occurring borderline personality disorder—To examine whether co-occurring BPD moderated the association between lifetime history of PTSD (regardless of index event) and SIB, we conducted hierarchical linear and logistic regression analyses. All relevant covariates and both PTSD and BPD were entered in the first step. The BPD × PTSD

interaction was entered in the second step. Significant interactions were explored following the methods described by Aiken and West (1991). First, regressions lines were plotted at high and low levels of PTSD and the moderator (i.e., BPD), after which follow-up tests were conducted to determine whether the slopes of the regression lines differed significantly from zero.

As shown in Table 3, BPD moderated the relationship between PTSD and both DSH history and DSH versatility. Specifically, results revealed a significant relation between PTSD and DSH history and versatility among individuals with co-occurring BPD (*b*s = 1.27 and 0.12, SEs = 0.65 and 0.06, z = 1.97 and *t* = 2.06, *p*s < 0.05), but not those without BPD (*b*s = -.26 and -.02, SE = 0.43 and 0.04, z = -0.61 and *t* = -0.40, *p*s > 0.50). BPD did not moderate the relations between lifetime PTSD and the other SIB outcomes.

Overall emotion dysregulation—As shown in Table 4, overall emotion dysregulation moderated the relationship between lifetime history of PTSD (regardless of index event) and DSH frequency, with this relation emerging as significant among individuals with high levels (i.e., mean+1SD) of emotion dysregulation (*b* = 0.21, SE = 0.10, *t* = 2.10, *p* = 0.04) but not low levels (i.e., mean-1SD) of emotion dysregulation (*b* = -0.11, SE = 0.10, *t* = -1.07, *p* = 0.28). As shown in Table 4, overall emotion dysregulation did not moderate relations between lifetime PTSD and the other SIB outcomes.

Exploratory Analyses

Given past findings of the differential relevance of particular emotion dysregulation dimensions to SIB (e.g., Anestis et al., 2012; Gratz & Chapman, 2007), exploratory analyses examined the moderating role of particular emotion dysregulation dimensions in the relation between lifetime PTSD and SIB. Results revealed that nonacceptance of emotions moderated the relationship between lifetime PTSD and DSH versatility (β = 0.26, *t* = 2.37, η_p^2=0.03,*p* = 0.02, R^2 = 0.08), with this relation emerging as significant at high levels of emotional nonacceptance (*b* = 0.12, SE = 0.05, *t* = 2.44, *p* = 0.02) but not at low levels (*b* = -0.04, SE = 0.05, *t* = -0.79, *p* = 0.43). Similarly, both limited access to effective regulation strategies (β = 0.22, *t* = 1.99, η_p^2=0.02, *p* = 0.048, *R* = 0.11), and lack of emotional awareness moderated the relationship between lifetime PTSD and DSH frequency (β = 0.18, *t* = 2.01, η_p^2 = 0.02, *p* = 0.046, R^2 = 0.09), with the PTSD-DSH frequency relation emerging as significant only for individuals with high (*b*s = 0.22 and 0.26, SEs = 0.11 and 0.10, *t*s = 2.02 and 2.66, *p*s < 0.05) versus low (*b*s = -0.08 and -0.02, SEs = 0.10, *t*s = -0.81 and -0.17, *p*s > 0.42) levels of these particular emotion regulation difficulties. None of the other emotion dysregulation dimensions significantly moderated the PTSD-SIB relationships (βs < .0.19, ORs < 1.11, η_p^2 < 0.02, *p*s > .07).

Discussion

Despite increasing awareness of the association between PTSD and SIB (e.g., Kessler et al., 1995; 1999; Zlotnick et al., 1999), only a few studies (e.g., Anestis et al., 2012; Gratz and Tull, 2012) have examined potential moderators of this association, providing some evidence for a stronger association between PTSD and certain SIB outcomes among individuals with sexual assault-related trauma (Jaquier et al., 2013; Ullman and Brecklin,

2002), co-occurring BPD (Connor et al., 2002), and heightened emotion dysregulation (e.g., Zlotnick et al., 1997). The current study sought to extend extant research by examining these potential moderators across a wide range of SIB outcomes (both suicidal and nonsuicidal) in an at-risk sample of SUD patients. Replicating and extending past research (e.g., Gratz and Tull, 2010a), SUD patients with (vs. without) a lifetime PTSD diagnosis reported higher rates of DSH and suicide attempts, a greater frequency of suicide attempts, and greater DSH versatility. However, results of this study suggest that the relation between lifetime PTSD and SIB may be present among only a subset of individuals with PTSD (i.e., those with particular traumatic experiences, co-occurring disorders, or vulnerability factors).

Specifically, our findings highlight the particular relevance of sexual assault-related trauma to SIB (both suicide attempt frequency and DSH versatility) among individuals with a history of PTSD. In particular, results suggest that the experience of a sexual assault (vs. another type of traumatic event) is uniquely associated with repeated suicide attempts and a greater variety of forms of DSH (vs. the initial occurrence of either of these behaviors). Given past research linking both SIB frequency and versatility to risk for suicide (Nock et al., 2006; Turner et al., in press), perhaps through their impact on the acquired capability for suicide (Van Orden et al., 2010), findings that sexual assault-related PTSD is associated with increased frequency and variety of SIB have great clinical relevance and highlight the need for further research examining the mechanisms through which sexual assault-related PTSD may increase the risk for more severe SIB. Given evidence that sexual assault-related traumatic experiences may be particularly likely to impair interpersonal trust and attachment processes (e.g., Sandberg et al., 2010), potentially resulting in greater interpersonal isolation, such traumatic events may increase the risk for suicidal behaviors through the experience of thwarted belongingness (considered a critical component of suicidal desire; Joiner, 2005). Alternatively, the shame associated with interpersonal traumas (La Bash and Papa, 2014) may be another mechanism underlying the relation between sexual assault-related traumatic events and risk for suicide. Studies examining these and other potential mechanisms may elucidate event-specific risk factors for SIB among trauma-exposed individuals.

Results also revealed a stronger association between lifetime PTSD and both DSH history and DSH versatility among individuals with (vs. without) co-occurring BPD. Conversely, and consistent with past research (Gratz and Tull, 2012), the presence of BPD did not moderate the relation between lifetime PTSD and DSH frequency. Thus, although the co-occurrence of BPD among individuals with PTSD may increase the risk for the development or initiation of DSH, it does not appear to contribute to the maintenance of this behavior among those with a history of DSH. With regard to suicidal behaviors in particular, although BPD did not moderate the association between lifetime PTSD and suicide attempt history or frequency, findings suggest that it may account for the relation between lifetime PTSD and these suicidal behavior outcomes. Specifically, although findings revealed significant zero-order associations between a lifetime PTSD diagnosis and suicide attempt history and frequency, these associations did not remain significant when BPD was included in the model. Instead, BPD (and not PTSD) emerged as a significant unique predictor of suicide attempt history and frequency. These findings are in line with past literature highlighting the robust association between BPD and suicide attempts (McGlashan, 1986; Paris and Zweig-Frank, 2001; Soloff et al., 1994, 2000; Zanarini et al., 2008), and suggest that past findings

of an association between PTSD and suicidal behaviors may be accounted for by their shared relation to BPD.

Consistent with expectations, emotion dysregulation moderated the relation between PTSD and DSH but not suicide attempts. Specifically, lifetime PTSD was associated with DSH frequency only among individuals with heightened overall emotion dysregulation. These results are consistent with past research indicating robust associations between emotion dysregulation and DSH frequency (Gratz and Roemer, 2008; Gratz and Tull, 2010a), and suggest that individuals with PTSD may be particularly likely to engage in DSH in the context of increased emotion dysregulation. In particular, results of exploratory analyses examining specific dimensions of emotion dysregulation revealed the particular relevance of limited access to effective emotion regulation strategies, lack of emotional awareness, and nonacceptance of emotions to the PTSD-DSH relation.

With regard to the former, findings that lifetime PTSD was related to DSH frequency only among individuals with difficulties accessing effective emotion regulation strategies are consistent with conceptualizations of DSH as an emotion regulation strategy (Gratz, 2003) and suggest that PTSD-SUD patients who do not believe they have access to effective strategies for regulating their emotions may be more likely to rely on a maladaptive (albeit negatively reinforcing) strategy such as DSH. Likewise, findings that lifetime PTSD was associated with greater DSH frequency only among individuals with high levels of difficulties in emotional awareness are consistent with past research demonstrating a relation between lack of emotional awareness and DSH (Polk and Liss, 2007) and suggest that difficulties identifying and attending to emotions may increase the reliance on DSH among individuals with PTSD in particular. Finally, findings of the moderating role of emotional nonacceptance in the PTSD-DSH versatility relation suggest that lifetime PTSD relates to a wider range of DSH behaviors only among individuals with elevated emotional nonacceptance. It is possible that those individuals with PTSD who are less accepting of their emotions may be more likely to resort to a greater number of methods of DSH in an effort to eliminate their emotional experiences. When the symptoms of PTSD persist, individuals with lower emotional acceptance may be more likely to “up the ante” and use different methods of DSH in an effort to reduce distress. This pattern is particularly concerning in light of evidence that DSH versatility is a particularly robust predictor of the severity of future suicide attempts (Turner et al., in press).

Results of the present study have potential implications for both the assessment and treatment of SIB in SUD patients with PTSD. Pending replication, these data suggest that suicide risk monitoring should include assessments for co-occurring BPD or sexual assault-related PTSD in substance using populations. These findings also provide preliminary support for extending treatment options for SUD patients with PTSD and SIB. Treatment options currently available for these patients are limited by extant guidelines suggesting that SIB may be a contraindication for PTSD treatments (e.g., prolonged exposure; Foa et al., 2007). For patients suffering from PTSD and co-occurring BPD, dialectical behavior therapy may be an important first-line option for reducing risk for SIB (Harned et al., 2012). For PTSD-SUD patients without BPD, however, the current findings suggest the potential utility of targeting emotion dysregulation in the treatment of DSH. Specifically, our exploratory

analyses suggest that interventions aimed at increasing emotional awareness and acceptance and teaching patients more effective emotion regulation strategies may be particularly useful for reducing DSH among these patients. In support, research provides evidence for the utility of treatments targeting emotion dysregulation for patients with PTSD (e.g., Cloitre et al., 2002), PTSD-SUD (Najavits et al., 1998), and DSH in general (e.g., emotion regulation group therapy; Gratz and Gunderson, 2006; Gratz et al., in press).

Limitations

The results of this study should be considered in light of the study's limitations. First, the cross-sectional nature of the data precludes determination of the precise nature and direction of the interrelations examined here. As such, although we proposed that a history of PTSD may confer risk for SIB, it is possible that SIB preceded PTSD (although past research suggests that some index traumatic events, such as sexual assault, are more likely to precede SIB than to follow these behaviors; Ullman and Brecklin, 2002). Future longitudinal studies are needed to clarify the time course of these relations. Second, although the sample of interest in this study (i.e., a low SES, diverse SUD sample) represents a population at particular risk for SIB, it limits the generalizability of these findings. Indeed, the extent to which these findings generalize to other (non-SUD) PTSD and trauma-exposed populations remains unclear. Future research is needed to examine these relations among more diverse clinical and nonclinical samples of trauma-exposed individuals, including outpatients and individuals in the community. In particular, given the importance of base rates to the identification of risk factors (e.g., Rice and Harris, 1995), it is crucial to examine risk factors for SIB across multiple at-risk samples with a range of SIB base rates. Third, the relatively small sample size and low base rates of the behaviors of interest limited our statistical power and ability to detect small effect sizes. In light of this modest power and the a priori nature of our primary analyses, we did not apply an alpha correction in the present study (see Tutzauer, 2003), potentially increasing our risk of Type I error as well. As such, it will be important for future research to replicate and extend the present findings. Our relatively modest power also precluded the simultaneous examination of the potential moderators of interest. Given the demonstrated interrelations among sexual assault-related trauma, BPD, and emotion dysregulation (e.g., Gratz et al. 2008; Walsh et al., 2011), future research examining the interplay of these distinct yet overlapping constructs vis-à-vis SIB is crucial.

Conclusion

Despite limitations, the current study constitutes an important addition to the growing literature on factors relevant to the association of PTSD with SIB. Specifically, our results point to sexual assault-related PTSD as particularly relevant to suicidal behaviors and both co-occurring BPD and emotion dysregulation as important for DSH. In addition, the present findings provide further support for targeting emotion dysregulation and co-occurring BPD in interventions for DSH among patients with PTSD, in line with emerging research on effective treatments for this at-risk population (Cloitre et al., 2002; Harned et al., 2012). Future studies examining the relations among PTSD, SIB, and co-occurring pathology have the potential to further clarify the particular patients most at-risk for SIB and pinpoint particular targets of treatment for reducing risk for SIB among trauma-exposed individuals.

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Table 1
Demographic and Clinical Characteristics of the Sample (N = 246)

Variables	M (SD) or N (%)
Age	35.6 (10.1)
Female	89 (36.2%)
Race	
White	139 (56.5%)
Black/African American	88 (35.8%)
Native American	10 (4.1%)
Other	9 (3.6%)
Income[a]	
<$9,999	117 (47.6%)
$10,000-19,999	34 (13.8%)
$20,000-29,999	38 (15.4%)
$30,000-49,999	30 (12.1%)
>$50,000	24 (9.6%)
Education	
12th grade or less	68 (27.6%)
High school graduate or GED	88 (35.7%)
Some college or technical school	72 (29.2%)
College graduate	13 (5.3%)
Graduate degree	5 (2.0%)
Married or cohabitating	45 (17.3%)
Clinical and Diagnostic[b]	
PTSD	
Lifetime PTSD	116 (47.2%)
Current PTSD	75 (30.5%)
BPD	83 (33.7%)
Current alcohol dependence	89 (36.2%)
Current cocaine dependence	85 (34.6%)
Current opioid dependence	37 (15.0%)

Note. BPD = borderline personality disorder; DSH = deliberate self-harm; PTSD = posttraumatic stress disorder; SA = suicide attempt.

[a] There were missing data (n = 3) for this variable.

[b] Percentages reflect the presence of the disorder or behavior.

Table 2

Rates and Frequencies of Self-injurious Behaviors (SIB) in Participants with and without Posttraumatic Stress Disorder (PTSD)

SIB Outcomes	PTSD Present (*n*=116)[a]	PTSD Absent (*n*=130)[a]	Statistical Tests
DSH forms *n* (%)			
Cut self	19(18.3%)	13(11.3%)	
Burned self with cigarette	6 (5.8%)	9 (7.8%)	
Burned self with lighter/match	6 (5.8%)	4 (3.5%)	
Carved words into skin	13 (12.5%)	7(6.1%)	
Carved designs into skin	6 (5.8%)	9 (7.8%)	
Banged head	9 (8.7%)	6 (5.2%)	
Punched self	5 (4.8%)	3 (2.6%)	
SA forms *n* (%)			
Overdose	28 (24.1%)	9 (6.9%)	
Cutting	13 (11.2%)	4 (3.1%)	
Shooting	5 (4.3%)	2 (1.5%)	
Drowning	3 (2.6%)	0 (0.0%)	
Swallowing poison	1 (0.09%)	2 (1.5%)	
DSH history[a] *n* (%)	36 (31.0%)	28 (21.5%)	$\chi^2 = 2.78^{*}$
DSH frequency[a,b]	*M*= 8.28 (*SD* = 29.40)	*M*= 5.85 (*SD* = 32.03)	*t*(201.09) =1.53
DSH versatility[a,b]	*M*= 0.82 (SD= 1.52)	*M*= 0.48 (*SD*= 1.04)	$t(197.81) = 2.00^{*}$
SA history *n* (%)	37 (31.9%)	14 (10.8%)	$\chi^2 = 16.65^{***}$
SA frequency	*M*= 1.27 (*SD* = 3.71)	*M*=0.27 =1.13)	$t(169.76) = 3.91^{***}$
Any SIB history *n* (%)	58 (50.0%)	38 (29.2%)	$\chi^2 = 11.11^{***}$

Note. DSH = deliberate self-harm; SA = suicide attempts.

[a] There were missing data (*n* = 27) for the deliberate self-harm variable, resulting in smaller samples of patients with (*n* = 104) and without (*n* = 115) PTSD for these analyses.

[b] These variables were logarithmically (base 10) transformed for analyses, but tables present raw means and percentages for ease of interpretation.

$^{*}p < .05$,

$^{**}p < .01$,

*** $p < .001$.

Table 3

Hierarchical Logistic and Linear Regression Analyses examining Borderline Personality Disorder as a Potential Moderator of the Relationship between Posttraumatic Stress Disorder and Self-injurious Behaviors

	SA History[a]		DSH History[b]		SA Frequency[c]		DSH Frequency[d]		DSH Versatility[e]	
	OR	block χ^2	OR	block χ^2	β (η_p^2)	ΔR^2	β (η_p^2)	ΔR^2	β (η_p^2)	ΔR^2
Step l		49.79***		16.07**		0.20***		0.07**		0.06*
PTSD	1.94		1.26		0.09 (0.01)		0.06 (0.004)		0.06 (0.003)	
BPD	4 60***		1.51		0.29*** (0.08)		0.11 (0.01)		0.12 (0.01)	
Step 2		0.34		4.46*		0.003		0.01		0.02*
PTSD	2.46		0.77		0.05 (0.01)		-0.01 (0.01)		-0.03 (0.01)	
BPD	6.10**		0.58		0.22* (0.07)		-0.02 (0.01)		-0.05 (0.01)	
PTSD × BPD	0.64		4.63*		0.11 (0.004)		0.19 (0.01)		0.25* (0.02)	

Note. BPD = borderline personality disorder; DSH = deliberate self-harm; PTSD = posttraumatic stress disorder (lifetime); SA = suicide attempt.

[a] Covariates (not shown) in this analysis included sex (coded where=male and 0 = female), employment status (coded where 1 = employed and 0 = unemployed).

[b] Covariates (not shown) in this analysis included age and ethnicity/race (coded where 1 = White and 0 = minority).

[c] Covariates (not shown) in this analysis included sex (coded where 1 = male and 0 = female), employment status (coded where 1 = employed and 0 = unemployed), and race/ethnicity (coded where 1 = minority and 0 = White).

[d] Covariates (not shown) in this analysis included age and race/ethnicity.

[e] Covariates (not shown) in this analysis included sex and race/ethnicity.

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 4

Hierarchical Logistic and Linear Regression Analyses examining Emotion Dysregulation as a Potential Moderator of the Relationship between Posttraumatic Stress Disorder and Self-injurious Behaviors

	SA History[a]		DSH History[b]		SA Frequency[c]		DSH Frequency[d]		DSH Versatility[e]	
	OR	block χ^2	OR	block χ^2	β (η_p^2)	ΔR^2	β (η_p^2)	ΔR^2	β (η_p^2)	ΔR^2
Step l		28.84**		21.89***	β(η_p^2)	0.13***	β(η_p^2)	q12***	β(η_p^2)	q Q9***
PTSD	1.73		1.21		0.11 (0.01)		0.05 (0.003)		0.05 (0.002)	
DERS	1.01		1.02*		0.04 (0.002)		0.24*** (0.06)		0.22** (0.05)	
Step 2		0.24		1.08		0.00		0.02*		0.01
PTSD	1.74		1.16		0.11 (0.01)		0.05 (0.002)		0.05 (0.002)	
DERS	1.01		1.01		0.04 (0.002)		0.07 (0.05)		0.10 (0.04)	
PTSD × DERS	0.99		1.01		-0.01 (< 0.001)		0.23* (0.02)		0.16 (0.01)	

Note. DSH = deliberate self-harm; DERS = difficulties in emotion regulation scale; PTSD = posttraumatic stress disorder (lifetime); SA = suicide attempt.

[a] Covariates (not shown) in this analysis included sex (coded where 1 = male and 0 = female), employment status (coded where 1 = employed and 0 = unemployed).

[b] Covariates (not shown) in this analysis included age and race/ethnicity (coded where 1 = minority and 0 = White).

[c] Covariates (not shown) in this analysis included sex (coded where 1 = male and 0 = female), employment status (coded where 1 = employed and 0 = unemployed), and race/ethnicity (coded where 1 = minority and 0 = White).

[d] Covariates (not shown) in this analysis included age and race/ethnicity.

[e] Covariates (not shown) in this analysis included sex and race/ethnicity.

* $p < .05$,

** $p < .01$,

*** $p < .001$.