

# Extending Models of Deliberate Self-Harm and Suicide Attempts to Substance Users: Exploring the Roles of Childhood Abuse, Posttraumatic Stress, and Difficulties Controlling Impulsive Behavior When Distressed

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The current study examined models of risk for deliberate self-harm (DSH) and suicide attempts (SA) in a sample of 180 inner-city substance users. The factors of childhood physical, sexual, and emotional abuse, posttraumatic stress (PTS) symptoms, and difficulties controlling impulsive behaviors when distressed were examined, with path modeling used to explore the interrelationships between variables. Analyses examined the utility of a model wherein childhood abuse is associated with DSH and SA as a result of its relationship with PTS symptoms. Further, we examined whether difficulties controlling impulsive behaviors when distressed accounted for the relationship between PTS symptoms and DSH and SA. DSH and SA were both related to physical abuse and sexual abuse, PTS symptoms, and difficulties controlling impulsive behavior when distressed; only SA was associated with emotional abuse. Further, results demonstrated that the effect of childhood sexual abuse on DSH and SA was partially explained by PTS symptoms; however, difficulties controlling impulsive behaviors when distressed contributed little to either model. Findings suggest the importance of developing targeted interventions for PTS symptoms in order to reduce risk for SA and DSH.

*Keywords:* child abuse, deliberate self-harm, posttraumatic stress, self-injurious behavior, suicide

Substance-dependent individuals have been found to be at heightened risk for a wide range of impulsive and self-destructive behaviors, including intravenous drug use (Dinwiddie, Reich, & Cloninger, 1992; Kidorf et al., 2004), risky sexual behaviors (Langer & Tubman, 1997; Lejuez, Simmons, Aclin, Daughters, & Dvir, 2004), interpersonal aggression (Chase, O'Farrell, Murphy, Fals-Stewart, & Murphy, 2003), and criminal behavior (D'Amico, Edelen, Miles, & Morral, 2008; Friedman, 1998). However, two clinically relevant behaviors that have been relatively understudied within this population are deliberate self-harm (DSH; defined as the deliberate, direct destruction of body tissue *without* conscious suicidal intent but resulting in injury severe enough for tissue damage to occur; see Gratz, 2003; Klonsky, Oltmanns, & Turkheimer, 2003; Pattison & Kahan, 1983) and suicide attempts

(SA; defined as engagement in self-injurious behaviors with an intent to die; Beautrais, Joyce, & Mulder, 1994; Fergusson, Horwood, & Lynskey, 1996; Silverman, Reinherz, & Giaconia, 1996).

The relative absence of research on DSH and SA within substance users is particularly notable given that both DSH and SA have been found to be common among individuals diagnosed with psychiatric disorders that frequently co-occur with substance use disorders, including borderline personality disorder (Linehan, 1993; Soloff, Lis, Kelly, Cornelius, & Ulrich, 1994) and posttraumatic stress disorder (Cloitre, Koenen, Cohen, & Han, 2002; Sacks, Flood, Dennis, Hertzberg, & Beckham, 2008; Tarrier & Gregg, 2004). Preliminary work has found elevated rates of DSH and SA within substance-using samples. For example, rates of DSH among substance users have been found to range from 29–52% (Evren & Evren, 2005; Evren, Kural, & Cakmak, 2006; Evren, Sar, Evren, & Dalbudak, 2008; Zlotnick, Mattia, & Zimmerman, 1999; Harned, Najavits, & Weiss, 2006; Haw, Hawton, Houston, & Townsend, 2001; Schwartz, Cohen, Hoffmann, & Meeks, 1989), which is greater than rates generally reported among high school and college students (14–35%; Favazza, DeRosear, & Conterio, 1989; Gratz, 2001; Muehlenkamp & Gutierrez, 2004; Ross & Heath, 2002; Whitlock, Eckenrode, & Silverman, 2006) and considerably higher than rates found within community samples (e.g., military recruits, 4%; Klonsky et al., 2003). Likewise, substance users exhibit elevated rates of lifetime SA (22–58%; Cottler, Campbell, Krishna, Cunningham-Williams, & Ben Abdallah, 2005; Johnsson & Fridell, 1997; Landheim, Bakken, &

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Vaglum, 2006) as compared to the general population (5%; Kessler, Borges, & Walters, 1999). Further, a number of studies have reported that substance use is a risk factor for SA in its own right (e.g., Borges, Angst, Nock, Ruscio, & Kessler, 2008; Crumley, 1990; Kessler et al., 1999; Mino, Bousquet, & Broers, 1999; Wilcox, Conner, & Caine, 2004). Despite evidence of substantially elevated rates of DSH and SA within substance using samples, however, there is a dearth of information on the factors that may account for DSH and SA within this at-risk group (the identification of which may have important implications for the development of novel prevention and intervention strategies).

Given the lack of research on models of DSH and SA within substance users, potentially relevant factors may be identified from models focused on the pathogenesis of these behaviors within non-substance-using samples. Previous research among both community and clinical samples highlights the role of childhood emotional, physical, and sexual abuse in both DSH and SA. Indeed, childhood abuse is by far the most frequently reported trauma event among substance users (Brown, Stout, & Mueller, 1996). For example, individuals who experienced childhood abuse are up to four times more likely to engage in DSH (McHolm, MacMillan, & Jamieson, 2003; Whitlock et al., 2006) and up to 11 times more likely to attempt suicide (Fergusson et al., 1996; Johnson et al., 2002; Noll, Horowitz, Bonanno, Trickett, & Putnam, 2003; Paivio & McCulloch, 2004; Whitlock et al., 2006; Zoroglu et al., 2003; Anderson, Tiro, Price, Bender, & Kaslow, 2002; Silverman et al., 1996; Ystgaard, Hestetun, Loeb, & Mehlum, 2003). Further, research focusing on substance-using populations has found an association between childhood abuse and both DSH (Evren & Evren, 2005; Evren et al., 2006, 2008) and SA (Rossow & Lauritzen, 2001; see Darke & Ross, 2002, for a review).

Despite evidence that childhood abuse increases the risk for DSH and SA, it is possible that this relationship may be accounted for by the presence of posttraumatic stress (PTS) symptoms. A recent study, for instance, reported that almost one third of a sample of females with co-occurring PTSD and substance dependence was engaging in DSH, with 21% reporting it in the past 3 months (Harned et al., 2006). Similarly, previous work indicates that a PTSD diagnosis has been found to be positively associated with DSH (Nock & Prinstein, 2005; Weaver, Chard, Mechanic, & Etzel, 2004; Weierich & Nock, 2008; Zlotnick et al., 1999) and SA (Sareen, Houlahan, Cox, & Asmundson, 2005; Thompson, Kaslow, Bradshaw, & Kingree, 2000). This finding has been replicated in substance-using samples presenting with co-occurring PTSD as well (Harned et al., 2006). Moreover, a recent study by Weierich and Nock (2008) found that the severity of PTS symptoms mediated the relationship between childhood sexual abuse and DSH in a sample of adolescents (see Thompson et al., 2000, for similar results). Yet, to date, no studies have examined PTS symptoms as a factor that explains the relationship between childhood trauma and DSH or SA among substance users. Moreover, the factors that may account for the relationship between PTS symptoms and DSH and SA are unclear.

One promising factor is the inability to refrain from engaging in impulsive behaviors when experiencing emotional distress. It is important to distinguish this construct from the related construct of trait-impulsivity, most frequently operationalized as acting without thinking (e.g., Barratt, 1994; Patton, Stanford, & Barratt, 1995). The construct of difficulties controlling impulsive behaviors when

distressed refers to a propensity for engaging in impulsive, potentially self-destructive behaviors in the context of negative affect *in particular* (as opposed to a tendency to engage in impulsive behavior in general). In support of making this distinction, several studies report that impulsive nonplanning and this latter type of emotionally driven impulsivity are differentially related to substance use and personality disorders (Fischer, Smith, & Anderson, 2003; Lynam & Miller, 2004; Miller, Flory, Lynam, & Leukefeld, 2003). As such, this construct may have particular relevance for understanding behaviors that serve an emotion-regulating or emotionally avoidant function, such as DSH (e.g., Gratz & Roemer, 2008) and SA (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996).

In particular, evidence suggests that PTS symptoms are associated with more intense emotional (both subjective and psychophysiological) responding to emotionally evocative stimuli (Litz, Orsillo, Kaloupek, & Weathers, 2000; Orsillo, Batten, Plumb, Luterek, & Roessner, 2004), and recent work has shown that this emotional arousal interferes with an individual's ability to control unhealthy behaviors and frequently increases the desire to eliminate distress (Tice, Bratslavsky, & Baumeister, 2001; Crepez & Marks, 2002; Leith & Baumeister, 1996). As an example, two recent studies found that individuals with elevated PTS symptoms and, respectively, a diagnosis of PTSD reported significantly greater difficulties controlling impulsive behaviors when distressed, compared to individuals with traumatic exposure but sub-threshold PTS symptoms (Tull, Barrett, McMillan, & Roemer, 2007; McDermott, Tull, Gratz, Daughters, & Lejuez, 2009). As such, it is reasonable to hypothesize that difficulties controlling impulsive behavior when distressed might account for the relationship between PTS symptoms and self-injury outcomes.

## Current Study

The present study examined whether (1) PTS symptoms account for the relationship between childhood abuse and DSH and SA, and if (2) difficulties controlling impulsive behaviors when distressed account for the relationship between PTS symptoms and DSH and SA among a sample of inner-city substance users at the onset of residential substance use treatment. Given that this is the first study to examine factors that account for DSH and SA within an inner-city, substance dependent sample, no a priori predictions were made about the specific nature of the relationships between childhood abuse, PTS symptoms, and difficulties controlling impulsive behaviors and DSH versus SA; however, it was expected that differential relationships would emerge in light of literature suggesting unique relationships between some variables (e.g., attitudes toward life) and SA versus DSH (Muehlenkamp & Gutierrez, 2004).

## Method

### Participants

Participants were consecutively admitted inpatient residents in a drug and alcohol abuse residential treatment center in the greater Washington, D.C., metropolitan area. Residents were approached for participation within one week of their arrival at the treatment center. Of all individuals who were approached (182), only two

refused to participate; the total number of participants was 180. Participants (72% male; 28% female) ranged in age from 19 to 61, with a mean age of 43.05 ( $SD = 9.86$ ). The majority of participants (91.4%) were African American. With regard to the highest education level achieved, 28.5% of participants did not complete high school, 39.2% had a high school degree or equivalent, and 32.3% had some college education or above. With regard to income, 55.6% of participants reported an income of \$10,000 or less per year. Regarding marital status, 68.6% of participants were single, 9.9% were living with a partner as if married, 14.0% were married but separated, and 7.6% were married. Data pertaining to the type and frequency of drug use (i.e., use of a particular drug over the last year and use of a particular drug during the heaviest period of use) are presented in Table 1. Inclusion criteria were as follows. Participants were required to (1) have been in residential treatment for at least three days, in order to limit the potential impact of current high and/or withdrawal symptoms on responses on the questionnaires; (2) be able to give informed, voluntary, written consent to participate; and (3) have no evidence of current psychosis, as evidenced by a structured screening instrument (SCID-I psychosis module, First, Spitzer, Gibbon, & Williams, 1996). Two individuals were excluded due to current psychosis.

Treatment at this center involves a mix of strategies adopted from Alcoholics Anonymous and Narcotics Anonymous, as well as group sessions focused on relapse prevention and functional analysis. Entry into the treatment center requires that individuals evidence abstinence from all drug use and complete a detoxification program if needed; thus, acute drug effects likely did not affect participants' scores on the testing battery. Further, the center requires complete abstinence from drugs and alcohol (including any form of pharmacological treatment, such as methadone), with the exception of caffeine and nicotine; regular drug testing is provided and any substance use is grounds for dismissal. Typical treatment lasts between 30 and 180 days and, aside from scheduled activities (e.g., group retreats, physician visits), residents are not permitted to leave the center grounds during treatment.

Table 1  
Percentage of Sample Acknowledging Any Use or Weekly Use Among Each Drug Type in the Past Year and During Heaviest Lifetime Use

	Acknowledging any use	Acknowledging frequent use
(A) Drug class, past year		
Alcohol	85.6	52.5
Marijuana	67.4	27.3
Crack/Cocaine	83.3	65.6
Opiates	47.6	32.1
PCP	33.9	8.1
(B) Drug class, heaviest lifetime use		
Alcohol	87.7	57.8
Marijuana	77.0	47.1
Crack/Cocaine	84.9	67.2
Opiates	47.3	36.0
PCP	46.7	14.7

## Measures

**Demographics.** A brief demographics questionnaire was administered to obtain information on age, gender, race, education level, employment status, and marital status.

**Drug use questionnaire.** Past year and lifetime severity of alcohol and drug use was assessed through a self-report measure modeled after the Alcohol Use Disorders Identification Test (Saunders, Aasland, Babor, & De la Fuente, 1993). On this measure, participants rate the frequency with which they have used the following drug classes in the past year and during the heaviest period of use in their life: (a) alcohol, (b) marijuana, (c) crack/cocaine, (d) heroin, and (e) PCP. Ratings were made using a Likert-type scale (0 = none to 4 = more than 5 times per week). Responses for each time frame were summed to create two overall scores representing past year and heaviest lifetime substance use severity. Additionally, for the purpose of descriptive statistics, we present the percentage of participants reporting any use and frequent use (defined as 2 or more times per week) across time frames and drug categories (see Table 1). This measure has shown adequate reliability and predictive utility in past studies (e.g., Lejuez, Bornovalova, Reynolds, Daughters, & Curtin, 2007; Lejuez et al., 2004; Bornovalova, Ouimette, Crawford, & Levy, 2009).

**Childhood abuse.** To assess participants' experiences with childhood abuse, we administered the emotional, physical, and sexual abuse subscales of the Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein et al., 2003). The CTQ-SF is a 28-item measure that assesses childhood maltreatment experiences (i.e., "while you were growing up") using a 5-point scale ranging from 1 (*never true*) to 5 (*very often true*) across physical, sexual, and emotional abuse, and physical and emotional neglect. Sample items include, "Someone tried to touch me in a sexual way, or tried to make me touch them," "People in my family hit me so hard that it left me with bruises or marks," and "People in my family called me things like 'stupid,' 'lazy,' or 'ugly.'" The CTQ-SF has good sensitivity (.78-.86) and satisfactory specificity (.61-.76) when self-reports are compared with trauma ratings from child welfare records and reports of family members and clinicians (Bernstein, Ahluvalia, Pogge, & Handelsman, 1997). Similarly, among a sample of adult substance abusers, the CTQ demonstrated good test-retest reliability over a period of greater than one month ( $r = .86$ ,  $p < .01$ ; see Bernstein & Fink, 1998). In the present sample, internal consistency was good to excellent for emotional, physical, and sexual abuse (.85, .82, .95, respectively).

**Difficulties controlling impulsive behaviors when distressed.** To assess difficulties controlling impulsive behaviors when distressed, we administered the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). The DERS is a 36-item measure that assesses individuals' typical levels of emotion dysregulation across a number of domains, including difficulties controlling impulsive behaviors when distressed. This particular subscale is composed of six items. Participants are asked to indicate how often the items apply to themselves, with responses ranging from 1 (*almost never, 0-10%*) to 5 (*almost always, 91-100%*). Example items include, "When I'm upset, I lose control over my behaviors," and "When I'm upset, I feel out of control." Higher scores are indicative of greater difficulties controlling impulsive behaviors when experiencing emotional distress. This subscale has been found to be associated with both DSH among men (Gratz &

Roemer, 2004) and PTSD symptom severity (McDermott et al., 2009; Tull et al., 2007) and is heightened among treatment-seeking substance dependent patients (Fox, Hong, & Sinha, 2008). Internal consistency within this sample was excellent ( $\alpha = .95$ ).

**Posttraumatic stress symptoms.** The Posttraumatic Stress Disorder Checklist, Civilian Version (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993) is a 17-item self-report measure of the severity of intrusive, avoidance, and hyperarousal symptoms experienced in response to a stressful life event, as outlined by the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (*DSM-IV*), diagnostic criteria for PTSD. Using a 5-point Likert scale (1 = *not at all*, 5 = *extremely*), participants rate the extent to which each symptom has bothered them in the past month. The PCL provides an overall score reflecting the severity of PTSD symptoms in general, as well as separate scores representing the severity of each PTSD symptom cluster (i.e., reexperiencing, avoidance, emotional numbing, and hyperarousal). The validity of the PCL has been demonstrated in both military and civilian populations (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Weathers et al., 1993). Further, the PCL has been found to be associated with other validated measures of PTSD (Ruggiero, Del Ben, Scotti, & Rabalais, 2003) and demonstrates a high level of agreement with the Clinician Administered PTSD Scale (Blake et al., 1990), a well-established and supported interview-based measure of PTSD (Grubaugh, Elhai, Cusack, Wells, & Frueh, 2007; Palmieri, Weathers, Difede, & King, 2007). The PCL also has been found to be temporally stable over a 3-day period ( $r = .96$ ). Internal consistency in the sample was excellent ( $\alpha = .95$ ).

Given evidence that PTSD is best represented as a dimensional construct (Broman-Fulks et al., 2006; Forbes, Haslam, Williams, & Creamer, 2005; Ruscio, Ruscio, & Keane, 2002), we utilized a continuous measure of PTSD symptoms in the current study. However, to speak to the severity of PTSD symptoms within this sample, we examined the percentage of individuals with a probable diagnosis of PTSD, as demonstrated by a PCL cutoff score of  $\geq 50$  (Weathers & Ford, 1996; Weathers et al., 1993). Using this cutoff, 27.4% of the participants ( $n = 49$ ) met criteria for probable PTSD—a rate consistent with previous studies of substance users (Brady, Dansky, Back, Foa, & Carroll, 2001; Cottler, Compton, Mager, Spitznagel, & Janca, 1992; Najavits, Weiss, & Shaw, 1997; Najavits et al., 2003).

**DSH and SA.** To determine lifetime history of DSH and SA, we used items from the Self-Harm Inventory (SHI; Sansone, Wiederman, & Sansone, 1998). The SHI was designed to measure a variety of self-destructive behaviors, including DSH, self-destructive thoughts, substance use, eating disorder behaviors, involvement in unhealthy relationships, and SA. Past studies have provided support for the reliability and validity of the SHI (Sansone et al., 1998; Sansone, Songer, & Gaither, 2001). From the larger set of items, we isolated the four items that are consistent with our conceptualization of DSH (i.e., the deliberate, direct destruction of body tissue without suicidal intent). Specifically, the items were, “Have you ever intentionally, or on purpose . . . 1) ‘Burned yourself?’ 2) ‘Hit yourself?’ 3) ‘Banged your head on purpose?’ and 4) ‘Scratched yourself on purpose?’” Participants responded to each question with a “yes” or “no.” Consistent with previous findings focused on DSH, participants were classified according to whether or not they reported a history of any type of DSH. Reliability of our DSH composite item (yes vs. no) was

adequate ( $\alpha = .70$ ). We also isolated the single item of the SHI addressing SA (“Have you ever attempted suicide?”). As above, a dichotomous variable was created, grouping individuals into suicide attempters and suicide nonattempters. This approach to examining DSH and SA is common practice in the extant literature, and previous studies utilizing this approach have demonstrated reliable and significant differences between individuals who are classified into groups of lifetime DSH (or SA) and no lifetime DSH or SA (Anderson et al., 2002; Andover, Pepper, Ryabchenko, Orrico, & Gibb, 2005; Evren & Evren, 2005; Evren et al., 2006; Heath, Toste, Nedecheva, & Charlebois, 2008; Kaslow et al., 2000; Muehlenkamp & Gutierrez, 2004; Ross & Heath, 2002). In further support of our choice to examine lifetime DSH/SA versus no history of DSH/SA, a recent study (Gratz & Tull, in press) found, within a sample of substance users, no differences on emotion dysregulation as a function of whether DSH was classified as recent (vs. no history) or lifetime (vs. no history).

## Procedure

All procedures were approved by the University of Maryland Institutional Review Board. As described previously, residents were approached for participation within one week of their arrival at the treatment center. Participants were informed verbally and in writing about the nature of the study and any potential risks. All participants were required to provide written informed consent prior to participating. Following this, all participants completed a self-report questionnaire packet including the measures described herein. Measures were randomly sequenced across participants to limit the influence of order effects. All self-report instruments were completed in one classroom that was staffed by the experimenter (MAB) and a research assistant; however, because of the sensitive nature of some of the questionnaires, measures were taken to ensure the anonymity of participant responding. Specifically, participants were seated at individual tables, and all measures were identified with a number only. Participants were actively encouraged to seek assistance regarding questions that were unclear. At least one male and one female researcher were available at each session to provide participants with a same-sex individual for queries regarding the questionnaires.

## Results

### Analysis Plan

Given that several participants had partial missing data on the analysis variables, full-information maximum likelihood solutions (Enders, 2001) to the models were obtained in Mplus (Muthén & Muthén, 1998–2006) to capitalize on all the information in the available data. The models were estimated for both outcomes (i.e., DSH and SA) simultaneously. Simultaneous calibration allows for modeling and testing the possible dependence between SA and DSH, and facilitates the testing of the specified relationships.

### Variable Transformations

Descriptive analyses suggested that natural-log transformations of the childhood abuse (CTQ), PTS, and difficulties controlling impulsive behaviors when distressed (IMP) variables resulted in



distributions more closely approximating normality. Table 2 contains descriptive statistics for the untransformed and transformed versions of the CTQ, PTS, and IMP variables (where the LN denotes the natural log). Table 2 also contains descriptive statistics for potential covariates. The log-transformed variables were used in the analyses. To make the following section more readable, log-transformed CTQ-SA is referred to below as sexual abuse; log-transformed CTQ-EA as emotional abuse; log-transformed CTQ-PA as physical abuse; log-transformed PCL-C as PTS symptoms; and log-transformed IMP as IMP.

### Identification of Covariates

With regard to the identification of potential covariates (i.e., variables that demonstrate a significant relationship with the dependent variable; Tabachnick & Fidell, 1996), age was found to be related to DSH ( $\beta = -0.06, p = .01$ ) but not SA ( $\beta = 0.002, p > .10$ ). Conversely, frequency of drug use in the last year was related to SA ( $\beta = -0.09, p < .01$ ). Frequency of drug use during the heaviest period of drug use, gender, income level, education status, and marital status all failed to demonstrate a significant relationship with the outcomes (all  $ps > .10$ ). Lastly, the odds ratio for SA and DSH (i.e., the interrelationship between the two) was estimated to be 3.39 ( $p < .05$ ). As such, we controlled for past-year drug use in the modeling of SA and AGE in the modeling of DSH. Moreover, we formally modeled the relationship between SA and DSH.

### Bivariate Relationships Between Childhood Abuse, PTS Symptoms, Impulsivity, and DSH/SA

Consistent with previous studies of urban, minority drug-using samples (e.g., Borrill et al., 2003), 15.7% of participants reported a history of DSH and 36.7% reported a history of SA. To assess the presence of marginal relationships with the outcomes, each predictor and covariate was used in bivariate regression models for

Table 2  
Descriptive Statistics for Potential Covariates and Independent Variables

Variable	<i>M</i>	<i>SD</i>	<i>N</i>
Emotional abuse	1.84	1.00	180
Physical abuse	1.75	0.90	180
Sexual abuse	1.63	1.16	179
PTS symptoms	38.62	16.80	179
Difficulties controlling impulsive behaviors when distressed	13.87	5.52	179
Emotional abuse (LN)	0.49	0.47	180
Physical abuse (LN)	0.46	0.44	180
Sexual abuse (LN)	0.31	0.53	179
PTS symptoms (LN)	3.56	0.45	179
Difficulties controlling impulsive behaviors when distressed (LN)	2.55	0.39	179
Age	42.80	9.62	180
Drug use frequency, last year	9.42	4.76	170
Drug use frequency, heaviest lifetime use	7.83	4.11	167
Income	2.07	2.56	168

Note. Demographic and drug use variables were examined as potential covariates; LN = natural log transformation of the variable; SA = suicide attempts; DSH = Deliberate self-harm.

both SA and DSH. These results indicate that emotional abuse was significantly related to SA ( $\beta = 1.12, p < .001$ ) but not DSH ( $\beta = 0.75, p > .05$ ), and that physical abuse ( $\beta = 1.21, p < .001$  for SA and  $\beta = 0.88, p < .05$  for DSH) and sexual abuse ( $\beta = 1.47, p < .0001$  for SA and  $\beta = 1.45, p < .0001$  for DSH) were each significantly related to both outcomes. Similarly, PTS symptoms ( $\beta = 1.75, p < .0001$  for SA and  $\beta = 1.97, p < .001$  for DSH) and IMP ( $\beta = 1.16, p < .01$  for SA and  $\beta = 1.30, p < .05$  for DSH) were each related to both outcomes.

### Primary Analyses

As a first step in investigating the potential relationships of interest, the outcomes were regressed on emotional abuse, physical abuse, and sexual abuse. In this and all subsequent analyses, the effects of past-year drug use and age on SA and DSH were controlled by entering them as predictors. To model the dependence between the outcomes, SA and DSH were specified to reflect a latent factor (in addition to their dependence on the predictors and the covariates), where the variance of the factor and the dependence of SA on the factor were fixed at values of one to identify the model.

**Are all types of childhood abuse equally related to DSH and SA?** The unique effect of sexual abuse on SA was significant ( $\beta = 1.47, p < .001$ ), while the unique effects of emotional abuse ( $\beta = 0.18, p > .10$ ) and physical abuse ( $\beta = 0.63, p > .10$ ) were not. Similar results were found for the prediction of DSH. The effect of sexual abuse was significant ( $\beta = 1.89, p < .05$ ), while the effects of emotional abuse ( $\beta = -1.25, p > .10$ ) and physical abuse ( $\beta = 1.08, p > .10$ ) were not. The path from the latent factor to DSH was estimated to be 1.00 ( $p = .080$ ).

Accordingly, emotional abuse and physical abuse were removed from consideration for the remainder of the analyses. The model was reestimated with just sexual abuse as the predictor. The effects for sexual abuse ( $\beta = 1.76, p < .0001$  for predicting SA and  $\beta = 1.65, p < .01$  for predicting DSH). The path from the latent factor to DSH was again estimated to be 1.00 ( $p = .10$ ).

**Are PTS symptoms related to DSH/SA above and beyond the effects of sexual abuse?** To assess the possible effect of PTS symptom severity, PTS symptoms were introduced as a predictor of the outcomes. PTS symptoms were related to sexual abuse ( $\hat{\rho} = 0.34, p < .0001$ ), and both outcomes were related to PTS symptoms ( $\beta = 1.52, p < .01$  for SA and  $\beta = 1.79, p < .01$  for DSH). There remained effects from sexual abuse to the outcomes ( $\beta = 1.33, p < .001$  for SA and  $\beta = 1.07, p < .05$  for DSH). The path from the latent factor to DSH was estimated to be 0.74 ( $p > .10$ ).

**Do difficulties controlling impulsive behavior when distressed (IMP) relate to DSH/SA above and beyond the effects of sexual abuse and PTS symptoms?** The relationship between PTS symptoms with sexual abuse remained essentially as before ( $\hat{\rho} = 0.34, p < .0001$ ). The effects of sexual abuse and PTS symptoms on SA ( $\beta = 1.29, p < .001$  and  $\beta = 1.39, p < .01$ , respectively) were close to those as in the previous analysis. Likewise, the effects of sexual abuse and PTS symptoms on DSH ( $\hat{\rho} = 1.05, p < .05$  and  $\beta = 1.82, p < .05$ , respectively) were close to those as in the previous analysis. The newly introduced predictor, IMP, was related to both sexual abuse ( $\hat{\rho} = 0.02, p < .0001$ ) and PTS symptoms ( $\hat{\rho} = 0.03, p < .0001$ ). However, the effect of

IMP on SA was minimal ( $\beta = 0.37, p > .10$ ). Similarly, the effect of IMP on DSH was negligible ( $\beta = -0.11, p > .10$ ). Thus, although IMP is related to both sexual abuse and PTS symptoms, it is not related to either outcome. This implies that the effects of sexual abuse and PTS symptoms on the outcomes are not mediated by IMP. Lastly, the estimate of the path from the factor to DSH was 0.66 ( $p > .10$ ). Thus, the final model (see Figure 1) is that in which, controlling for past year drug use and age, there are effects of sexual abuse and PTS symptoms on SA and DSH.<sup>1,2</sup>

**Predictive utility of current model.** The estimated odds ratio for the effect of sexual abuse on SA is 3.07, with 95% CIs [1.61, 5.85]. The estimated odds ratio for the effect of sexual abuse on DSH is 2.71, with a 95% CIs [1.33, 5.52]. The estimated odds ratio for the effect of PTS symptoms on SA is 3.59, with 95% CIs [1.65, 7.83]. The estimated odds ratio for the effect of PTS symptoms on DSH is 5.57, with 95% CIs [1.68, 18.49]. To evaluate the effectiveness of the model, predicted values for SA for the participants who had data on all the predictors and SA were calculated and compared to the actual values. The model correctly predicts 95 of the 108 participants (88%) who did not attempt suicide and 28 of the 60 participants (47%) who did attempt suicide. A similar analysis was conducted to predict DSH. The model correctly predicts 144 of the 148 participants (97%) who did not engage in DSH and 6 of the 28 participants (21%) who did.

## Discussion

The current study examined a model of risk for DSH and SA in a sample of inner-city substance users. Specifically, we examined whether PTS symptoms account for the relationship between childhood trauma and DSH or SA, and further, if difficulties controlling impulsive behaviors when distressed account for the relationship between PTS symptoms and DSH and SA. We found that, although levels of physical and sexual abuse were related to both DSH and SA, only sexual abuse was uniquely associated with these behaviors. The primacy of sexual abuse in the prediction of DSH and SA is consistent with findings from past studies (e.g., Boudewyn & Liem, 1995; Brown, Cohen, Johnson, & Smailes,

1999; Gratz, Conrad, & Roemer, 2002; Zlotnick et al., 1996). In addition, results indicated that although PTS symptoms were positively associated with greater risk for SA, they had a particularly strong relationship with DSH, increasing the odds of engaging in DSH by a factor of greater than 5. Finally, results indicated a significant relationship between difficulties controlling impulsive behaviors when distressed and both DSH and SA, consistent with past findings of an association between this aspect of emotion dysregulation and DSH among male undergraduate students (Gratz & Roemer, 2004).

In examining the more complex interrelationships between variables, the results partially supported the proposed model. Specifically, the results indicated that the effects of childhood sexual abuse on DSH and SA were partially explained by the severity of PTS symptoms, consistent with previous findings demonstrating the explanatory role of PTS symptoms in the relationship between childhood abuse and these behaviors (Thompson et al., 2000; Weierich & Nock, 2008). However, despite findings that difficulties controlling impulsive behaviors when distressed was positively associated with both DSH and SA at a univariate level (as well as being positively associated with both sexual abuse and PTS symptoms), this particular factor failed to account for the relationship between PTS symptoms and DSH or SA, as proposed.

Finally, it is worth noting that the model predicting SA reliably classified a greater percentage of participants than the model predicting DSH (45% vs. 25%). These results suggest that although DSH and SA may share some of the same underlying mechanisms (e.g., experiential avoidance; Chapman, Gratz, & Brown, 2006; Hayes et al., 1996), they are also distinct behaviors that may have different precursors and functions. This analysis is consistent with previous reports. For example, in a sample of women diagnosed with borderline personality disorder, Brown, Comtois, and Linehan (2002) found different self-reported reasons for engaging in DSH or attempting suicide (with making others better off emerging as one of the primary reasons for SA, and expressing anger, punishing oneself, and distracting oneself most often endorsed as the reasons for DSH). Given this, a focus on the

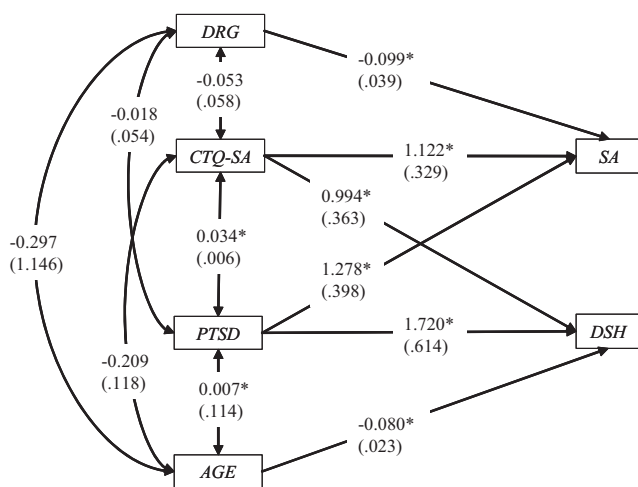


Figure 1. The final path model with estimates and standard errors in parentheses (unique variances not shown). \*  $p < .01$ .

<sup>1</sup> Following with the work of Weierich and Nock (2008), who examined particular PTSD symptom clusters (reexperiencing and avoidance) separately as potential mediators between childhood trauma and deliberate self-harm, we examined the symptom clusters of Intrusions, Avoidance, Numbing, and Hyperarousal as potential mediators as well as the PCL total score. The use of symptom clusters (rather than the total score) did not change the results of the mediational models (with or without the presence of LN-IMP).

<sup>2</sup> As noted throughout the results, the path estimate from the "outcomes" factor to DSH was consistently small and nonsignificant, suggesting that the association between DSH and SA is negligible (at least when accounting for other correlated influences). Thus, we fit a model without a latent factor. This model is nested within the previously presented model that includes the latent factor. The Satorra-Bentler corrected  $\chi^2$  difference statistic was not significant ( $p > .10$ ), suggesting that the model with the latent factor does not statistically significantly improve the fit. In addition, the AIC, BIC, and sample-size adjusted BIC values were all lower than their counterparts based on the model with the latent factor. Thus, the association between SA and DSH is accounted for by their dependence on sexual abuse, PTS symptoms, past year drug use, and age. As such, the final model removed the latent "outcome" factor and separated DSH and SA into two separate outcomes.

potential *functions* of these behaviors may have clarified the specific pathways through which childhood sexual abuse differentially explains DSH versus SA.

Although these findings are promising, they must be considered in light of the study's limitations. First and foremost, data were cross-sectional and correlational in nature. Therefore, it is impossible to determine the exact nature of the relationships between the variables of interest. For instance, it is not clear whether DSH and SA followed childhood abuse or occurred prior to the experience of childhood sexual abuse. Theoretical and empirical literature generally demonstrates that childhood abuse typically precedes PTS symptoms and PTS symptoms generally precede DSH and SA (Noll et al., 2003; Fontana & Rosenheck, 1995; Linehan, 1993; Silverman et al., 1996; van der Kolk, McFarlane, & Weisaeth, 1996; Ullman & Brecklin, 2002). However, in lieu of a longitudinal study, any temporal conclusions are preliminary.

There were also limitations associated with our measure of PTS symptoms. Specifically, our measure of PTS symptoms did not assess for a *DSM-IV* PTSD Criterion A event. As such, it is not possible to determine the extent to which participants' PTS symptoms were directly the result of their reported childhood abuse, and it is possible that participants experienced, or were exposed to, other traumatic events that contributed to the development of PTS symptoms. Indeed, inner-city residents are generally highly exposed to other traumas even though physical and sexual abuse may be most associated with PTS symptoms (e.g., Brown et al., 1996). Yet even in the context of another or multiple Criterion A traumatic events, a history of childhood abuse may still contribute to the experience of PTS symptoms. Moreover, despite limited information on participants' Criterion A event, the current model is still clinically useful, suggesting the need to assess (and treat) symptoms of PTS symptoms and associated distress regardless of the source of these symptoms.

It is also important to note the limitations associated with our measure of DSH and SA. For instance, the SHI does not assess specific characteristics of participants' DSH and SA (e.g., frequency, method, time since last episode), nor does it specifically assess for suicidal intent for the four items used to assess DSH. Despite these limitations, however, the current study specifically selected DSH behaviors that are unlikely to be accompanied by any suicidal intent (i.e., burning, scratching, or hitting self; banging head against wall), thus limiting any potential overlap with SA. Moreover, the DSH measure may lack other behaviors that would be classified as DSH (e.g., scratching oneself). Although restricting our assessment of DSH to these behaviors increases the likelihood that our measure of DSH is distinct from suicidal behaviors, it does not provide us with the full range of behaviors that individuals may use to harm themselves.

Further, the current study did not measure some of the variables that might indeed be differentially associated with DSH and SA, including hopelessness (Beck, Steer, Beck, & Newman, 1993; Beck, Steer, & Brown, 1993; Beck, Weissman, & Kovacs, 1976), past and present mood disorders (Brent et al., 2002), and family history of suicide attempts (Brent et al., 2002; Joiner et al., 2005). A related limitation is the failure to examine other co-occurring disorders in this sample (e.g., panic disorder) that might have co-occurred with PTSD symptoms and influenced the results. Future studies should examine factors that may be differentially relevant for DSH and SA among individuals exposed to past

traumatic events. Additionally, the fact that our participants were almost exclusively African American limited our ability to test the potentially moderating role of race in our analyses. This fact could also have influenced the low rate of DSH (relative to SA) in this population. In general, work on self-harm and suicide suggests that the former have higher rates than the latter; in the current sample, we found the exact opposite. For instance, in a sample of substance-using African American women, the rate of DSH was quite comparable to our sample (around 22%), and the rate of DSH was equal to or smaller than SA (Borrill et al., 2003). This flipped effect is also true for nonsubstance using African American samples (Muehlenkamp & Gutierrez, 2004). The reasons for the flipped effect are unclear but imply a need for future work on the topic. Another potential concern is the lack of variability in the level of care participants were receiving. Indeed, all of our participants were inpatients in a residential drug treatment facility. As such, it is possible that a less psychiatrically impaired outpatient sample may show a different pattern of results.

Finally, although it is a definite strength of this study that our sample was primarily composed of men (and thus provides important information on potential pathways through which childhood abuse may contribute to DSH and SA among male substance users), the small proportion of women in our sample did not allow us to conduct analyses for each gender separately. Consequently, although we were able to control for the effect of gender in our analyses, it would be important for future studies to examine if different individual factors are more or less relevant for DSH and SA as a function of gender (see, for example, Gratz & Chapman, 2007; Gratz & Roemer, 2008).

Despite these limitations, findings from the present study have a number of important clinical and research implications. First, this study adds to the relatively small body of literature on DSH and SA among inner-city, predominantly African American substance users in residential substance use treatment, and suggests the importance of continuing to examine these behaviors within this population. The rates of both DSH (15.7%) and SA (36.7%) reported within this sample are relatively high and consistent with past studies of at-risk populations for DSH and SA. In addition, it is clinically meaningful that most predictors (i.e., childhood trauma, difficulties controlling impulsive behavior when distressed, and PTS) demonstrated a unique relationship with both DSH and SA, especially given that the current sample (a) is at high risk for both abuse and abuse-related psychopathology (e.g., Bornovalova, Gratz, Delany-Brumsey, Paulson, & Lejuez, 2006; Gil-Rivas, Fiorentine, Anglin, & Taylor, 1997); (b) is likely to exhibit underlying temperamental vulnerabilities for psychopathology (Krueger et al., 2002; Lejuez et al., 2004); and (c) may exhibit a variety of difficulties associated with a history of severe substance abuse (see Mowbray, Collins, Plum, Masterton, & Mulder, 1997; Zilberman, Cao, & Jacobsen, 2003).

Further, the finding that PTS symptoms were found to be significantly associated with DSH and SA above and beyond childhood abuse suggests the benefit of incorporating well-established treatments for co-occurring PTSD and substance misuse—such as Seeking Safety and/or Seeking Safety plus Exposure Therapy (Najavits et al., 1998; Najavits, 2004; Najavits, Schmitz, Gotthardt, & Weiss, 2005)—within residential substance use treatment centers. Individuals receiving this treatment have shown a



reduction in suicidality and DSH among men and women with comorbid substance use and PTSD (Najavits, Weiss, Shaw, & Muenz, 1998; Najavits et al., 2005). Further research is needed on examining the utility of Seeking Safety on reducing SA and DSH within substance users at risk for such outcomes, as well as determining the specific mechanisms through which such interventions operate.

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