

3-8-2016

## The Interactive Effect of Major Depression and Nonsuicidal Self-Injury On Current Suicide Risk and Lifetime Suicide Attempts

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### Recommended Citation

Knorr, A. C., Tull, M. T., Anestis, M. D., Dixon-Gordon, K. L., Bennett, M. F., Gratz, K. L. (2016). The Interactive Effect of Major Depression and Nonsuicidal Self-Injury On Current Suicide Risk and Lifetime Suicide Attempts. *Archives of Suicide Research*, 20(4), 539-552.  
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Published in final edited form as:

*Arch Suicide Res.* 2016 ; 20(4): 539–552. doi:10.1080/13811118.2016.1158679.

## The Interactive Effect of Major Depression and Nonsuicidal Self-injury on Current Suicide Risk and Lifetime Suicide Attempts

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### Abstract

**Objectives**—This study examined the main and interactive effects of MDD and lifetime nonsuicidal self-injury (NSSI) on current suicide risk and past suicide attempts. We predicted that individuals with a history of NSSI and current MDD would be at greater suicide risk than those with either risk factor alone. An interaction between lifetime MDD and NSSI was hypothesized for past suicide attempts.

**Methods**—204 substance dependent inpatients completed self-report measures and a diagnostic interview.

**Results**—Patients with both a history of NSSI and current MDD, relative to all other groups, had the greatest suicide risk. No support was found for the lifetime MDD by NSSI interaction.

**Conclusion**—Findings suggest the relevance of both NSSI and MDD in suicide risk.

### Keywords

deliberate self-harm; depression; suicidality; suicidal behavior; substance dependence

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Suicidality is a substantial public health concern, with suicide accounting for over 41,000 deaths per year in the United States (Centers for Disease Control, 2013) and costing hundreds of billions of dollars each year (Institute of Medicine, 2002). As such, research identifying the risk factors for lethal and non-lethal suicidal behavior, defined as deliberate self-directed violence with at least some intent to die (Crosby, Buckner, & Taylor, 2011), is an urgent health priority. One well-established risk factor for suicidal behavior is major depressive disorder (MDD). Studies have demonstrated that individuals with (vs. without) mood disorders in general are at heightened risk for suicide (Kessler, Borges, & Walters, 1999; Nock et al., 2009; World Health Organization, 2001). In addition, individuals with a history of MDD have been found to have higher rates of death by suicide and suicide

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attempts, as well as higher levels of suicidal ideation than individuals without this diagnosis (Kessler, Berglund, Borges, Nock, & Wang, 2005; Neeleman, 2001; Nock, Hwang, Sampson, & Kessler, 2010). Indeed, up to 32% of individuals who die by suicide suffer from MDD (Foster, Gillespie, McClelland, & Patterson, 1999; Vijayakumar & Rajkumar, 1999). Yet, despite strong evidence for a robust relation between MDD and suicidal behavior, many individuals with MDD do not attempt suicide (Verona, Sachs-Ericsson, & Joiner, 2004). Consequently, there is a need to identify factors that may increase the risk for suicidal behaviors among individuals with MDD.

One factor that warrants consideration is nonsuicidal self-injury (NSSI), defined as the deliberate, direct, self-inflicted destruction of body tissue without suicidal intent and for purposes not socially sanctioned (Gratz, 2001; International Society for the Study of Self-Injury, 2007; Klonsky, Oltmanns, & Turkheimer, 2003; Pattison & Kahan, 1983). Although considered distinct from suicidal behavior (Brausch & Gutierrez, 2010; Muehlenkamp & Gutierrez, 2004; Plener, Libal, Keller, Fegert, & Muehlenkamp, 2009), NSSI has been found to co-occur commonly with suicidal behaviors among both adults and adolescents (Asarnow et al., 2011; Klonsky & Muehlenkamp, 2007; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). Furthermore, there is evidence that NSSI is a robust risk factor for future suicidal behavior (Guan, Fox, & Prinstein, 2012; Klonsky, May, & Glenn, 2013; Tang et al., 2011; Wilkinson, Kelvin, Roberts, Dubicka, Goodyer, 2011).

Although extant literature provides support for the roles of both MDD and NSSI in suicidal behavior, less is known about how MDD and NSSI interact to influence suicidal behavior and suicide risk. According to the interpersonal psychological theory of suicidal behavior (IPTs; Joiner, 2005), suicidal behavior requires two elements: (1) the capacity for suicidal behavior and (2) the desire to die by suicide. With regard to the first component, although recent research suggests a sizable portion of this variable is accounted for by genetic factors (Smith et al., 2012), the IPTs posits that individuals must acquire the capability for suicide through repeated engagement in and/or exposure to painful or provocative events, which, in turn, results in habituation to physiological pain and fear of death/bodily harm. Theoretical and empirical literature demonstrate that engagement in NSSI is a particularly robust path toward acquiring this capacity (Joiner, 2005; Franklin, Aaron, Arthur, Shorkey, & Prinstein, 2012; Nock et al., 2006; Van Orden, Witte, Gordon, Bender, & Joiner, 2008). As for the second component of the IPTs (i.e., the desire to die by suicide), suicidal desire is a common feature of depressive episodes (Joiner, 2005) and depression severity has demonstrated strong associations with suicidal ideation (Genischen, Teising, Konig, Gerlach, & Petersen, 2010; Keilp et al., 2012), although not necessarily with suicide attempts (e.g., van Gastel, Schotte, & Maes, 1997). Thus, NSSI and MDD may capture both components of the IPTs, with the interaction between NSSI and MDD representing the interaction of acquired capability and suicidal desire posited in the IPTs (and found in past studies; e.g., Anestis & Joiner, 2011; Joiner et al., 2009). Notably, although no studies have directly examined the interaction of NSSI and MDD in suicide risk or suicidal behaviors, past research provides indirect support for the proposed model, finding a positive association between depressive symptoms and suicidal behavior among individuals with a history of NSSI (Muehlenkamp & Gutierrez, 2007).

Given the absence of research on the interrelations of NSSI and MDD in suicide risk, and consistent with recent recommendations within the field of suicidology to focus less on main effect models and more on the ways in which specific risk factors interact to influence various aspects of suicide risk (e.g., ideation vs. behavior; Klonsky & May, 2014), this study sought to extend extant research by examining the interactive effects of NSSI and MDD on suicide-related outcomes (both current suicide risk and past suicide attempts) within an at-risk sample of substance dependent patients. Specifically, substance dependent patients have been found to exhibit heightened rates of suicidal behaviors (Anestis, Tull, Bagge, & Joiner, 2012; Bornovalova, Tull, Gratz, Levy, & Lejuez, 2011), NSSI (Bornovalova et al., 2011; Gratz & Tull, 2010), and MDD (for a review, see Armstrong & Costello, 2002), as well as elevated levels of suicide risk (Beautrais et al., 1996; Cheng, Chen, Chen, & Jenkins, 2000; Nock et al., 2009). We hypothesized that lifetime NSSI and current MDD would interact to predict current suicide risk (defined as the totality of past suicidal behavior and current suicidal thoughts, plans, and preparations; see Beck, Brown, Steer, Dahlsgaard, & Grisham, 1999; Joiner et al., 2005; Joiner & Rudd, 2000; Lewinsohn, Rohde, & Seely, 1996), such that individuals with a history (i.e., lifetime) of NSSI and current (i.e., past month) MDD would be at higher risk for suicide than individuals with either risk factor alone. These particular timeframes (i.e., current MDD and lifetime NSSI) were chosen in the model examining current suicide risk because they correspond most closely to the components of the IPTS model and ideation-to-action framework (Klonsky & May, 2015). Specifically, whereas acute suicidal desire is best captured by current MDD, the acquired capability for suicide is best captured by lifetime NSSI (given that the acquired capability for suicide is expected to develop gradually over time through repeated exposure to painful and provocative events; Joiner, 2005).

Likewise, we hypothesized that lifetime NSSI and lifetime MDD would interact to predict past suicidal behaviors, such that individuals with a history of both MDD and NSSI would be most likely to report a history of suicide attempts. Lifetime MDD was selected over current MDD in this model due to the focus on lifetime suicide attempts and the greater applicability of historical experiences of depression to historical suicidal behaviors (as current depression was expected to have little relevance to suicide attempts that pre-dated the current mood episode).

## Method

### Participants

Participants were 204 substance dependent patients (51% female) consecutively admitted to a residential SUD treatment program in central Mississippi. Participants ranged in age from 18 to 65, with an average age of 35 ( $SD = 10.29$ ). In regard to their racial/ethnic background, 60.8% identified as White, 36.3% as Black/African-American, 1.5% as Latino/Latina, and 1.5% as another racial/ethnic background. The majority of participants were single (75%) and low-income (67% < \$20,000 yearly income). Approximately 72% were unemployed. With regard to their educational attainment, 28% had not completed high school or received a GED, 33% had completed high school or received a GED, 29% had attended at least some

college or technical school, and 10% had graduated college. Information on the psychiatric diagnoses of participants is presented in Table 1.

## Measures

**Clinical Interviews**—The Mini International Neuropsychiatric Interview, Version 6.0 (MINI; Sheehan, Janays, Harnett-Sheehan, Sheehan, & Gray, 2009) was used to assess for current DSM-IV Axis I disorders (with the exception of posttraumatic stress disorder), including MDD. Lifetime MDD was also assessed. The MINI has shown adequate reliability and validity in its assessment of psychiatric disorders, as well as strong test-retest and inter-rater reliability (Sheehan et al., 1997).

The MINI was also used to assess current (past month) suicide risk and suicide attempt history, consistent with past studies that have used similar clinician-rated measures of suicide risk to evaluate the IPTS (Van Orden et al., 2008). Specifically, the MINI includes 11 items aimed at assessing a variety of suicide risk factors within the past month that increase the risk for imminent suicidal behavior. These items assess constructs related to current ambivalent and clear suicidal desire (i.e., experience of an accident where an individual had an intent to hurt themselves or die, hopelessness, thoughts of being better off dead, a desire to harm oneself, and thoughts about suicide), current plans and preparations for suicide (i.e., presence of a suicide plan, taking steps to prepare to injure or kill oneself), recent and lifetime self-injurious behaviors (i.e., past month NSSI, past month suicide attempts, and lifetime suicide attempts), and current difficulties controlling impulses to end one's life. Each item is accompanied by a particular point value. Values associated with endorsed items are then summed to provide a score representing suicide risk within the past month. Suicide risk scores can range from 0 (no risk) to 52 (high suicide risk). Previous studies have demonstrated that the MINI suicidal risk index predicts suicidal behaviors over the course of one year (Roaldset, Linaker, & Bjørkly, 2012). Due to the possible criterion contamination between current suicide risk on the MINI and both MDD and NSSI, items assessing hopelessness and NSSI in the past month were excluded from the suicide risk score. The unadjusted and adjusted suicide risk scores were highly correlated ( $r = .97, p < .001$ ). Within this sample, internal consistency of the suicide risk item of the MINI was adequate ( $\alpha = .81$ ). History of a suicide attempt (presence vs. absence) was determined by using the lifetime suicide attempt question from the MINI (i.e., item 11 for assessing suicide risk).

The Clinician-Administered PTSD Scale (CAPS; Blake et al., 1990) was used to assess current PTSD. Evidence for the reliability and validity of the CAPS in a variety of samples, including SUD patients, has been provided (e.g., Blake et al., 1990; Brown, Stout, & Mueller, 1996; Shalev, Freedman, Peri, Brandes, & Sahar, 1997; Weathers, Keane, & Davidson, 2001). Finally, participants were interviewed using the borderline personality disorder module of the Diagnostic Interview for DSM-IV Personality Disorders (DIPD-IV; Zanarini, Frankenburg, Sickel, & Yong, 1996), a structured diagnostic interview of DSM-IV Axis II disorders. The DIPD-IV has been found to demonstrate good inter-rater and test-retest reliability (Zanarini et al., 2000). All interviews were conducted by bachelors- or masters-level clinical assessors trained by the principal investigator (MTT) and co-

investigator (KLG). All interviews were reviewed by the principal investigator, with diagnoses confirmed in consensus meetings.

**Measure of NSSI**—History of NSSI was assessed using the Deliberate Self-Harm Inventory (DSHI; Gratz, 2001), a 17-item questionnaire that assesses lifetime history of various aspects of NSSI, including frequency, duration, and type of DSH behavior (including cutting, burning, carving, bone-breaking, biting, and head-banging, among others). Specifically, the DSHI asks participants whether and how often they have engaged in a variety of behaviors “intentionally (i.e., on purpose),” as well as the last time they engaged in each of the behaviors. For the one behavior that could also be used to end one’s life (cutting), participants are asked whether they have cut themselves “without intending to kill yourself.” In addition, participants are instructed to exclude behaviors they engaged in with the sole purpose of delivering substances, especially in regard to the item, “Have you ever intentionally (i.e., on purpose) stuck sharp objects such as needles, pins, staples, etc. into your skin.” The DSHI has demonstrated high internal consistency, adequate test-retest reliability, and adequate construct, discriminant, and convergent validity among undergraduate student and patient samples (Fliege et al., 2006; Gratz, 2001). Internal consistency of the DSHI in this sample was adequate ( $\alpha = .70$ ). Consistent with past research examining the factors associated with NSSI among various populations, including SUD patients, a dichotomous NSSI variable was created by assigning a score of “1” to participants who reported having engaged in NSSI, and a score of “0” to participants who did not report having engaged in any of the behaviors on the DSHI (for a comparable approach to examining NSSI, see Evren, Jural, & Cakmak, 2006; Heath, Toste, Nedecheva, & Charlebois, 2008; Klonsky et al., 2003; Muehlenkamp & Gutierrez, 2004; Polk & Liss, 2007).

## Procedure

All procedures were reviewed and approved by the relevant Institutional Review Boards. Data were collected as part of a larger study examining risky behaviors among SUD patients. To be eligible for inclusion in the larger study, participants were required to: 1) be dependent on cocaine and/or alcohol; 2) have a Mini-Mental Status Exam (Folstein, Folstein, & McHugh, 1975) score of  $\geq 24$ ; and 3) have no current psychotic disorder (as determined by the SCID-IV Psychotic Disorder Screener). Eligible participants were recruited for this study no sooner than 72 hours after entry in the facility (to limit the possible interference of withdrawal symptoms on study engagement). Those who met inclusion criteria were provided with information about study procedures and associated risks, following which written informed consent was obtained. Participants were reimbursed \$25 for the assessment session.

## Results

### Preliminary Analyses

Clinical descriptive data for all participants is presented in Table 1. Based on the MINI, 26% ( $n = 53$ ) of participants met criteria for a current diagnosis of MDD, 65% ( $n = 133$ ) met

criteria for a lifetime diagnosis of MDD, 37% ( $n = 76$ ) reported a history of NSSI, and 25% ( $n = 50$ ) reported having attempted suicide at least one time in the past.

Prior to conducting primary analyses, in order to identify potential covariates (see Tabachnick & Fidell, 2007), a series of correlation and chi-square analyses were conducted to explore associations between the dependent variables (suicide risk and suicide attempt history) and demographic (i.e., age, racial/ethnic background, income, education level, and marital status) and clinical (i.e., presence vs. absence of current anxiety disorders, current substance use disorders, borderline personality disorder, and psychotropic medication use) characteristics. Given the small number of participants in many of the demographic categories, these variables were collapsed into dichotomous variables of: (1) White (61%) versus non-White (39%); (2) past year income of < \$20,000 (67%) versus \$20,000 (33%); (3) a high school education or less (61%) versus some post-high school education (39%); and (4) single (76%) versus married (24%).

Current opioid dependence ( $r = .16, p < .05$ ), cocaine dependence ( $r = .15, p < .05$ ), hallucinogen dependence ( $r = .35, p < .001$ ), generalized anxiety disorder ( $r = .28, p < .001$ ), marital status ( $r = -.14, p < .05$ ), education ( $r = .15, p < .05$ ), and use of psychotropic medications ( $r = .18, p < .01$ ) were found to be significantly associated with suicide risk. Consequently, these variables were included in analyses examining suicide risk as a dependent variable. Current opioid dependence ( $\chi^2 = 5.21, p < .05$ ), generalized anxiety disorder ( $\chi^2 = 7.63, p < .01$ ), borderline personality disorder ( $\chi^2 = 8.63, p < .01$ ), racial/ethnic background ( $\chi^2 = 4.85, p < .05$ ), education ( $\chi^2 = 6.07, p < .05$ ), and use of psychotropic medications ( $\chi^2 = 16.59, p < .001$ ) were found to be significantly associated with having attempted suicide at least once in the past. Thus, these variables were included in analyses examining lifetime suicide attempt history as a dependent variable. No other significant relations emerged ( $ps > 0.05$ ).

### Primary Analyses

To test our first hypothesis, we conducted a 2 (current MDD vs. no current MDD)  $\times$  2 (lifetime NSSI vs. no NSSI) analysis of covariance (ANCOVA; controlling for opioid dependence, cocaine dependence, hallucinogen dependence, generalized anxiety disorder, marital status, education, and use of psychotropic medications), with our adjusted suicide risk variable serving as the dependent variable (see Table 2 for sample size and mean suicide risk levels across all groups). Results revealed significant main effects of current MDD,  $F_{(1, 193)} = 12.53, p < .001, \eta_p^2 = .06$ , and lifetime NSSI,  $F_{(1, 193)} = 4.71, p < .05, \eta_p^2 = .02$ . As hypothesized, these main effects were qualified by a significant interaction,  $F_{(1, 193)} = 5.58, p < .02, \eta_p^2 = .03$ . Tukey HSD post-hoc analyses demonstrated that participants with current MDD and a history of NSSI exhibited significantly higher levels of suicide risk relative to all other groups ( $ps < .01$ ). No other comparisons were significant (see Figure 1).

Next, we conducted a hierarchical logistic regression to examine whether lifetime NSSI and lifetime MDD interact to predict lifetime suicide attempt status. The covariates of opioid dependence, generalized anxiety disorder, borderline personality disorder, racial/ethnic background, education, and use of psychotropic medications were entered in the first step of the model, followed by lifetime NSSI and lifetime MDD in the second step of the model and



the lifetime MDD by lifetime NSSI interaction in the third step of the model. Lifetime suicide attempts (yes vs. no) served as the dependent variable. The overall model was significant,  $\chi^2_{(9)} = 37.76, p < .001$ , accounting for 25% of the variance in lifetime suicide attempts. However, only lifetime NSSI emerged as a significant predictor of lifetime suicide attempts above and beyond the covariates. Further, the step including lifetime NSSI was found to significantly improve the model, accounting for an additional 5% of the variance in lifetime suicide attempt history above and beyond covariates and MDD,  $\chi^2_{(2)} = 7.11, p < .05$  (see Table 3).

Given documented concerns about the use of covariates in analyses (see Miller & Chapman, 2001), we reran analyses without the inclusion of covariates. Results did not change. In analyses examining current suicide risk, results revealed significant main effects of current MDD,  $F_{(1, 200)} = 10.92, p < .001, \eta_p^2 = .05$ , and lifetime NSSI,  $F_{(1, 200)} = 10.27, p < .01, \eta_p^2 = .05$ , as well as a significant MDD by NSSI interaction,  $F_{(1, 200)} = 5.55, p < .02, \eta_p^2 = .03$ . Further, Tukey HSD post-hoc analyses demonstrated that participants with current MDD and a history of NSSI exhibited significantly higher levels of suicide risk relative to all other groups ( $p < .01$ ). Likewise, only lifetime NSSI emerged as a significant predictor of lifetime suicide attempts, accounting for 9% of the variance in lifetime suicide attempts,  $\chi^2_{(2)} = 13.62, B (SE) = 1.12 (.34), Wald = 11.06, OR = 3.07, 95\% \text{ Confidence Interval} = 1.55\text{--}5.95, p < .001$ .

## Discussion

The aim of the present study was to examine the interactive effects of both current MDD and lifetime NSSI on current suicide risk and lifetime MDD and lifetime NSSI on past suicidal behavior within a high-risk sample of SUD patients in residential treatment. As predicted, we found a significant interaction of current MDD and lifetime NSSI on current suicide risk. Specifically, relative to all other groups of participants, participants with current MDD and a history of NSSI exhibited the greatest levels of suicide risk. These findings are consistent with past research underscoring the importance of co-occurring depression and NSSI in suicidality (Muehlenkamp & Gutierrez, 2007), and expand upon extant research demonstrating that MDD and NSSI are unique risk factors for suicidal behavior (Kessler et al., 2005; Neeleman, 2001; Nock et al., 2010; Guan et al., 2012; Tang et al., 2011; Wilkinson et al., 2011).

Our results are also consistent with the IPTS (Joiner, 2005), as well as Klonsky and May's (2015) ideation-to-action model. Specifically, according to the IPTS (Joiner, 2005), a desire to die is not sufficient for determining suicide risk. Likewise, Klonsky and May (2015) suggest that the experience of pain, hopelessness, and a lack of connectedness may contribute to suicidal ideation but not necessarily risk for enacting lethal self-harm. Instead, according to both of these models, a key factor in establishing suicide risk is the presence of the acquired capability for making a suicide attempt (Joiner, 2005; Klonsky & May, 2015). The results of the current study support these theories by suggesting that it is the joint presence of both a desire to die (as experienced in a depressive episode) and the acquired capability for suicide (which can be attained through a history of NSSI) that places individuals at the highest risk for suicide, above and beyond lifetime NSSI or current MDD

alone (Joiner, 2005). Notably, there were no significant differences in current suicide risk between participants with a history of NSSI alone and those with current MDD alone, suggesting that these factors may contribute equally to current suicide risk.

The results of this study also revealed a main effect of lifetime NSSI on lifetime suicide attempts, highlighting the particular relevance of NSSI to suicidal behavior. This finding is consistent with past research on the common co-occurrence of these behaviors (Asarnow et al., 2011; Bryan, Bryan, May, & Klonsky, 2014; Klonsky et al., 2013; Klonsky & Muehlenkamp, 2007; Nock et al., 2006), and adds to the literature on NSSI as a major risk factor for suicidal behavior. Indeed, Klonsky et al. (2013) found that NSSI was a robust predictor of suicide attempts (second only to suicidal ideation) across four different samples: adolescent psychiatric inpatients, adolescent high school students, university undergraduate students, and a sample of community adults in the United States. Likewise, in a recent study of military personnel and veterans, Bryan et al. (2014) found that 41% of those with a past suicide attempt had a history of NSSI, and NSSI preceded suicide attempts in 91% of the cases.

Conversely, lifetime MDD alone did not emerge as being associated with lifetime suicide attempts, suggesting that a history of MDD in and of itself may not increase risk for suicide attempts. Consistent with this finding, studies have shown that depression severity is associated with suicidal ideation (Genischen et al., 2010; Keilp et al., 2012) but not suicide attempts (e.g., van Gastel et al., 1997). Thus, although worsening depression symptoms may increase the desire to end one's life, these symptoms in and of themselves may not actually increase the risk for suicidal behaviors in the absence of additional risk factors (other than NSSI). That said, it is important to consider that the absence of a significant relation between lifetime MDD and suicide attempts in this study may also be due to limitations in our assessments. Specifically, our data did not allow us to determine whether a suicide attempt occurred in the context of or in proximity to a past major depressive episode. Given this, longitudinal studies are needed that explore the specific interplay of risk factors that may increase the likelihood that an individual with MDD attempts suicide.

There are several limitations to the present study that warrant discussion. First, the present study relied on a cross-sectional design, requiring a focus on current suicide risk and past suicide attempts rather than future engagement in suicidal behavior. As such, future prospective research should examine the utility of the proposed model in predicting future suicide attempts. Likewise, it is important to note that the IPTS focuses specifically on lethal and nearly lethal suicidal behavior, so the use of an outcome variable in one of our analyses that includes suicidal ideation, suicide plans, and related non-behavioral variables is a deviation from the initial purpose of this theoretical framework. In addition, given our focus on SUD patients, it is unclear whether these findings would be generalizable to other clinical or nonclinical populations. Nonetheless, given evidence that substance use and dependence are important risk factors for both suicide attempts and death by suicide (Beautrais et al., 1996; Cheng et al., 2000; Nock et al., 2009), SUD patients are an important population for examining suicide risk. Furthermore, although we controlled for the presence of other psychiatric disorders, future studies would benefit from examining whether the presence of certain psychiatric disorders influence or moderate the relation between MDD, NSSI, and

suicide risk and/or attempts. One disorder in particular that may be worthwhile to examine in this regard is borderline personality disorder, given its frequent co-occurrence with MDD (Zanarini et al., 1998), NSSI (Gunderson, 2001; Soloff, Lis, Kelly, Cornelius, & Ulrich, 1994), and suicidal behavior (Soloff et al., 1994).

Additionally, it warrants mention that IPTS constructs were not measured directly in these analyses. Thus, the constructs of interest in this study may be capturing other components of the IPTS, or other risk factors for suicide not specified in the IPTS. For example, although the IPTS suggests that NSSI may increase the risk for suicide by increasing the acquired capability for suicide, there may be other reasons why NSSI is associated with suicide risk and/or attempts. NSSI is associated with elevated levels of shame, self-criticism, and feelings of inferiority (Gilbert et al., 2010), and past research indicates that shame and self-punishment motives are a major contributing factor in an individual's decision to attempt suicide (Brown, Comtois, & Linehan, 2002; Hastings, Northman, & Tangney, 2000; Lester, 1998). Alternatively, the experience of loss of control that accompanies chronic and escalating NSSI may contribute directly to suicide risk, as the individual feels helpless to control the behavior (Buser & Buser, 2013; Groschwitz & Plener, 2012). Future research that directly tests the role of these and other factors in the model tested here would increase confidence in our current interpretation of the results. Finally, as with all interview-based and self-report measures, some participants may have been unwilling to report on their history of NSSI and suicide attempts and current suicidal thoughts and ideation due to concerns about stigma and social desirability. To address this limitation, future studies should include alternative methods of assessment capable of overcoming the interference of these factors in the assessment of suicidal thoughts and behaviors (e.g., implicit association tasks; see Nock & Banaji, 2007).

Despite these limitations, the findings from the present study suggest important directions for clinical assessment and intervention. In particular, these findings underscore the importance of assessing for both lifetime NSSI and current MDD when determining current suicide risk. Indeed, our results suggest that it may be the combination of these factors, relative to either alone, that increases suicide risk in SUD patients. These findings also highlight the potential utility of interventions targeting both depression and NSSI for reducing suicide risk in SUD patients. In particular, behavioral activation has demonstrated efficacy in reducing depression among SUD patients in residential treatment (Daughters et al., 2008). Emotion regulation group therapy for deliberate self-harm (Gratz & Gunderson, 2006; Gratz, Tull, & Levy, 2014) may also be useful in reducing NSSI and symptoms of depression through the improvement of emotion regulation skills. Results of the current study highlight the potential utility of incorporating these or related interventions into residential SUD treatment in order to decrease suicide risk among this at-risk population.

## Acknowledgments

This study was supported in part by R21 DA030587, awarded to the second author (MTT) from the National Institute on Drug Abuse of the National Institutes of Health. The authors would also like to thank the Mississippi State Department of Mental Health and the Mississippi State Hospital for their assistance with this project.

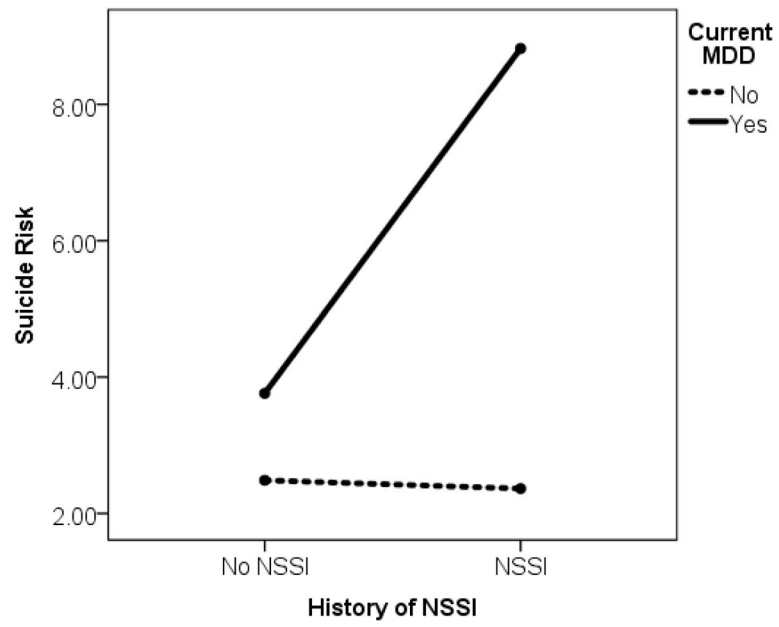
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**Figure 1.** The interactive effect of current MDD and lifetime NSSI on suicide risk (controlling for opioid dependence, cocaine dependence, hallucinogen dependence, generalized anxiety disorder, marital status, education, and psychotropic medication use).



**Table 1**

## Clinical and Diagnostic Characteristics of Participants.

	<b>% Present (n)</b>
Lifetime Major Depression	65.2% (133)
Major Depression	26% (53)
Panic Disorder	26% (53)
Social Anxiety Disorder	25% (51)
Obsessive-Compulsive Disorder	13.2% (27)
Generalized Anxiety Disorder	30.4% (62)
Posttraumatic Stress Disorder	26% (53)
Alcohol Dependence	66.7% (136)
Cocaine Dependence	57.8% (118)
Opioid Dependence	24% (49)
Marijuana Dependence	28.9% (59)
Sedative Dependence	20.6% (42)
Stimulant Dependence	21.1% (43)
Hallucinogen Dependence	3.4% (7)
Borderline Personality Disorder	34.8% (71)
Lifetime Nonsuicidal Self-injury	37.3% (76)
Lifetime Suicide Attempt	27% (50)
Psychotropic Medication Use	51% (104)

*Note.* All psychiatric disorders presented are current diagnoses unless noted otherwise.

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**Table 2**

Means, standard deviations, and sample size for suicide risk across all groups

	No Current MDD	Current MDD
No Lifetime NSSI	2.05 (6.54) <sup>a</sup> <i>n</i> = 100	3.18 (5.02) <sup>a</sup> <i>n</i> = 28
Lifetime NSSI	3.06 (6.03) <sup>a</sup> <i>n</i> = 51	9.80 (12.97) <sup>b</sup> <i>n</i> = 25

*Note.* Non-adjusted means are presented. Standard deviations are presented in parentheses. MDD = major depressive disorder. NSSI = nonsuicidal self-injury. Means that do not share superscripts are significantly different according to Tukey HSD post-hoc tests.

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**Table 3**

Binomial Logistic Regression Examining Lifetime MDD and DSH as Predictors of Lifetime Suicide Attempts

	<b>B (SE)</b>	<b>Wald</b>	<b>OR</b>	<b>95% CI</b>
<i>Step 1</i>				
Opioid Dependence	.63 (.40)	2.48	1.88	0.86–4.12
Generalized Anxiety Disorder	.48 (.39)	1.52	1.61	0.75–3.45
Borderline Personality Disorder	.68 (.38)	3.14	1.97	0.93–4.15
Racial/Ethnic Background	-.01 (.43)	.001	0.99	0.43–2.28
Education	.36 (.37)	.93	1.43	0.69–2.93
Psychotropic Medication Use	1.25 (.40)	9.62	3.48	1.58–7.64
<i>Step 2</i>				
Lifetime MDD	.26 (.41)	.42	1.30	0.59–2.87
Lifetime NSSI	.97 (.38)	6.52*	2.63	1.25–5.52
<i>Step 3</i>				
Lifetime MDD × Lifetime NSSI	.59 (.57)	1.07	1.80	0.59–5.43

Note. MDD = lifetime major depressive disorder. NSSI = nonsuicidal self-injury. OR = Odds Ratio. CI = Confidence Interval.

\*  $p < .05$ .