Major Depression and Risky Sexual Behavior among Substance Dependent Patients: The Moderating Roles of Distress Tolerance and Gender

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Abstract

The goal of the present study was to examine the main and interactive effects of major depressive disorder (MDD), distress tolerance (DT), and gender on multiple indices of risky sexual behavior (RSB) within a sample of 185 substance dependent patients in residential substance abuse treatment. Participants were interviewed to establish current MDD (as well as other Axis I and II diagnoses) and completed a behavioral measure of DT, the Paced Auditory Serial Addition Task – Computerized Version. Results provided evidence of a MDD × DT interaction for number of different past year commercial and casual sexual partners with which penetrative sex occurred. Post-hoc analyses demonstrated that participants with current MDD and low DT reported the greatest number of commercial and casual sexual partners. Results highlight one psychological vulnerability (DT) that may improve our understanding of the complex relationship between depression and RSB. Treatment implications of findings are discussed.

Despite significant advances in prevention efforts, more than 1,000,000 individuals in the United States are living with HIV/AIDS, and an estimated 42,959 more continue to contract HIV each year (Centers for Disease Control and Prevention [CDC], 2011). Throughout the United States, risky sexual behavior (RSB) is the primary mode of HIV transmission (CDC, 2011). Engagement in both commercial sex (i.e., the exchange of sex for drugs or money) and casual sex (i.e., sex with a partner one does not know well) have been found to be associated with heightened risk for HIV/AIDS and other sexually transmitted diseases (STD; Levin et al., 1995; McKeganey, 1994; Rosenheck, Ngilangwa, Manongi, & Kapiga, 2010; Wood et al., 2007). Indeed, studies have found that unprotected sex is common within both commercial (Bellis, 1990; McGowan et al., 2004; Patterson et al., 2009) and casual (Catania et al., 1995; Levin et al., 1995; Mitchell & Latimer, 2009b) sexual relationships.

The substantial economic, societal, and personal costs associated with HIV/AIDS (e.g., Hellinger, 1998; Holtgrave & Pinkerton, 1997; Hutchinson et al., 2006) have contributed to a rapidly growing body of research focused on identifying the factors that may be associated with heightened risk for engaging in RSB, with the goal of developing targeted intervention

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and prevention programs. One factor that has received considerable attention in this regard is depression. Individuals suffering from depression exhibit deficits in executive functioning, such as decision-making, concentration, planning, and problem-solving (American Psychiatric Association, 2000; Rogers et al., 2004). Moreover, research has found that individuals with a diagnosis of major depressive disorder (MDD) have an altered sensitivity to reward and punishment, exhibiting a tendency to engage in behaviors associated with high immediate reward despite risk for greater future punishment (Must et al., 2006). Consequently, individuals who are depressed may be more likely to engage in behaviors that provide the opportunity for immediate reinforcement despite the potential for longer-term negative consequences, such as RSB. Consistent with this, studies have demonstrated that depression is associated with greater levels of impulsivity and maladaptive behaviors in general (Gonzalez, Reynolds, & Skewes, 2011; Hanson, Luciana, & Sullwold, 2008). Likewise, the high levels of negative affect, hopelessness, and helplessness associated with depression (American Psychiatric Association, 2000) may motivate RSB in an effort to avoid or distract from unpleasant internal states. In support, Alvy et al. (2011) found that avoidant coping mediated the relationship between depression and RSB.

Importantly, however, despite growing evidence for an association between depression and multiple forms of RSB (including unprotected sex, commercial sex, casual sex, number of sexual partners, and sex while under the influence of alcohol or drugs; Alvy et al., 2011; Hutton, Lyketsos, Zenilman, Thompson, & Erbelding, 2004; Klein, Elifson, & Sterk, 2008; Perdue, Hagan, Thiede, & Valleroy, 2003; Reisner et al., 2009; Risser, Timpson, McCurdy, Ross, & Williams, 2006; Seth, Raiji, DiClemente, Wingood, & Rose, 2009), other studies have failed to find a significant association between depression and RSB (e.g., Koblin et al., 2006; McCusker, Goldstein, Bigelow, & Zorn, 1995; Stall et al., 2003). Thus, findings suggest that the relation between depression and RSB may be complex and accounted for by other psychological vulnerabilities (see Alvy et al., 2011).

One particular psychological vulnerability that warrants investigation is distress tolerance (DT), defined as the willingness to withstand or persist in the face of aversive psychological states (Simons & Gaher, 2005). Low DT has recently received increasing attention as a psychological vulnerability for diverse forms of psychopathology and maladaptive behaviors (Leyro, Zvolensky, & Bernstein, 2010; Zvolensky, Bernstein, & Vujanovic, 2011). Depression in particular is characterized by a variety of deficits in emotional responding (e.g., appraisal of negative emotions as threatening, low self-efficacy for coping with negative emotional situations, and the unwillingness to experience negative emotions) characteristic of low DT (for a review, see Clen, Mennin, & Fresco, 2011). Although empirical research on the association between depression and DT is limited, a small body of research has found evidence of a negative association between depression and DT (Cougle, Timpano, & Goetz, 2012; Dennhardt & Murphy, 2011; Iverson, Follette, Pistorello, & Fruzzetti, in press).

As for the relevance of DT to RSB, previous research has demonstrated that negative affective states may contribute to risky decision making (Leith & Baumeister, 1996) and engagement in RSB in particular (Crepaz & Marks, 2001; Lucenko, Malow, Sanchez-Martinez, Jennings, & Dévieux, 2003). Consequently, it has been suggested that RSB may function to avoid or escape negative emotional states (Crepaz & Marks, 2001). In support of this notion, avoidant coping has been found to be associated with RSB (Alvy et al., 2011; Folkman, Chesney, Pollack, & Phillips, 1992; Semple, Patterson, & Grant, 2000). Furthermore, emotion regulation difficulties (defined as maladaptive ways of responding to emotional distress, including the unwillingness to experience emotional distress) have been found to be significantly associated with RSB above and beyond other RSB-relevant risk

factors (Tull, Weiss, Adams, & Gratz, 2012). It is possible that individuals with depression and low DT may experience considerable difficulty withstanding the negative affect associated with a depressed mood, thus increasing motivation to engage in behaviors that function to escape negative affective states, such as RSB. In support of this notion, research has demonstrated that low DT is associated with a variety of other risky behaviors that have been proposed to serve an emotionally avoidant function (see Chapman, Gratz, & Brown, 2006; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996), such as substance use (e.g., Buckner, Keough, & Schmidt, 2007; Gorka, Ali, & Daughters, in press; Howell, Leyro, Hogan, Buckner, & Zvolensky, 2010); deliberate self-harm (Gratz et al., 2011), and bulimic behaviors (Anestis, Lavender, et al., in press; Anestis, Selby, Fink, & Joiner, 2007).

Another factor worth considering in the relation between MDD and RSB is gender. Although studies have consistently demonstrated higher rates of MDD among women compared to men (Nolen-Hoeksema, 2001; Piccinelli & Wilkinson, 2000), few consistent gender differences in the presentation of MDD have been found (Carter, Joyce, Mulder, Luty, & McKenzie, 2000). However, there is support for gender differences in RSB. First, there is evidence that substance dependent women are more likely than substance dependent men to engage in commercial sex in order to obtain money or drugs (Tyndall et al., 2002). Consistent with this, Mitchell and Latimer (2009a) found that female (vs. male) injection drug users exhibited greater engagement in commercial sex, whereas male (vs. female) injection drug users engaged in more casual sex. In addition, Evans et al. (2003) demonstrated that female injection drug users were more likely than male injection drug users to report having sexual partners who were also injection drug users (Evans et al., 2003).

Consequently, the goal of the present study was to examine the effects of MDD, DT, and gender on multiple indices of RSB (i.e., frequency of past year penetrative sex with a commercial or casual partner and likelihood of using a condom when having penetrative sex with a commercial or casual partner). To ensure that our findings were specific to RSB versus sexual behavior in general, we also explored the effects of MDD, DT, and gender on frequency of past year penetrative sex with a regular (i.e., committed) partner and the likelihood of using a condom when having penetrative sex with a regular partner. These associations were examined within a particularly high-risk sample of patients with substance use disorders (SUD) in residential substance abuse treatment. SUD patients have been shown to be at high risk for both RSB (Bornovalova, Daughters, & Lejuez, 2010; Reynolds et al., 2010; Subramaniam, Stitzer, Woody, Fishman, & Kolodner, 2009) and MDD (Grant et al., 2004). Furthermore, the co-occurrence of MDD with SUD has been associated with RSB (Carey et al., 2004) and other HIV-risk behaviors (injection risk behaviors; Stein, Solomon, Herman, Anderson, & Miller, 2003). SUD patients also exhibit heightened difficulties in emotion regulation (Fox, Hong, & Sinha, 2008; McDermott, Tull, Gratz, Daughters, & Lejuez, 2009), including low DT (Richards, Daughters, Bornovalova, Brown, & Lejuez, 2011). Although the effect of low DT on RSB among SUD patients has yet to be explored, low DT has been found to be associated with a number of negative clinical outcomes in SUD patients, including duration of most recent abstinence attempt (Daughters, Lejuez, Kahler, Strong, & Brown, 2005) and substance abuse treatment dropout (Daughters, Lejuez, Bornovalova et al., 2005; Tull, Gratz, Coffey, & McDermott, in press). Low DT has also been found to be associated with antisocial personality disorder among SUD patients (Daughters, Sargeant, Bornovalova, Gratz, & Lejuez, 2008). Consistent with previous research, we expected to find main effects of MDD, DT, and gender on RSB. Further, we hypothesized that female participants with MDD and low DT would exhibit the highest rates of RSB compared to all other participants.

Method

Participants

Participants were 185 substance dependent patients (60% male) consecutively admitted to a residential substance abuse treatment facility in the Jackson, Mississippi area. Participants ranged in age from 18 to 61, with an average age of 36 (SD = 10.10). With regard to racial/ethnic background, 59.5% were White, 31.9% Black/African-American, 4.3% Native American, 2.2% bi-racial, 1.6% Latino, and 0.5% Asian/Asian-American. The majority of participants (60.5%) reported obtaining a high school education or less, being single (71.4%), and unemployed (70.3%). In addition, approximately half of participants (46.5%) reporting a past year income of less than $10,000. Clinical data for participants is presented in Table 1.

Measures

Assessment of demographic information—All participants completed a general demographics form assessing age, racial/ethnic background, marital status, education, and income in the past year.

Diagnostic assessment measures—In order to assess for current (i.e., past month) MDD and other Axis I disorders (with the exception of posttraumatic stress disorder [PTSD]), participants were interviewed using the Structured Clinical Interview for DSM-IV Axis I disorders (SCID-IV; First, Spitzer, Gibbon, & Williams, 1996). PTSD was assessed with the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1990). Finally, participants were also interviewed using the borderline personality disorder (BPD) module of the Diagnostic Interview for DSM-IV Personality Disorders (DIPD-IV; Zanarini, Frankenburg, Sickel, & Young, 1996) to assess for the presence of current (i.e., past two years) BPD (Zanarini et al., 2000). Interviews were conducted by bachelors- or masters-level clinical assessors trained to reliability with the principal investigator (first author) and co-investigator (second author). All interviews were reviewed by the principal investigator, with diagnoses confirmed in consensus meetings.

Assessment of DT—The Paced Auditory Serial Addition Task - Computerized Version (PASAT-C; Lejuez, Kahler, & Brown, 2003) was used to assess DT. During this task, numbers are sequentially flashed on a computer screen, and participants are instructed to sum the most recent number with the previous number (using the computer mouse to click on the correct answer). After providing each sum, the participant must ignore the sum and add the following number to the most recently presented number. When a correct answer is provided, a point is obtained. If an incorrect answer is provided, or if the participant fails to provide an answer before the next number is presented, an "explosion" sound is played and the score does not change.

The version of the PASAT-C used in this study consisted of 3 levels with increasingly shorter latencies between number presentations. Because the correct answer must be provided before the presentation of the next number to obtain a point, difficulty increases as latencies decrease. Level 1 (low difficulty) had a 3-second latency between number presentations, Level 2 (medium difficulty) had a 2-second latency, and Level 3 (high difficulty) had a 1-second latency. The first level lasted 3 minutes, the second level lasted 5 minutes, and the third level lasted 7 minutes and included an option to terminate the task at any time. However, participants were under the impression that their performance on this task (including the length of time they persisted on it) would determine the amount of money they would receive as reimbursement for their participation (providing an incentive

to perform well on the task, although all participants were reimbursed the full amount regardless of their performance).

To determine whether DT is best represented as a continuous or dichotomous variable, we examined whether latency in seconds to task termination was normally distributed. According to the Shapiro-Wilk test (Shapiro & Wilk, 1965), latency to terminate the PASAT-C was not normally distributed ($p < .001$), supporting dichotomization of this variable (see MacCallum, Zhang, Preacher, & Rucker, 2002). Providing further support for the use of a dichotomous DT variable, the vast majority (86%) of participants who terminated the PASAT-C did so within the first 2 minutes of the final level, and the mean latency to terminate the PASAT-C among participants who quit the PASAT-C was 60.13 sec ($SD = 91.53$). Consequently, and consistent with previous studies (e.g., Anestis, Gratz, et al., in press; Gorka et al., in press; Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006; Schloss & Haaga, 2011), DT was indexed by quit status, with individuals who persisted until the end of the task categorized as having high DT and those who quit the task categorized as having low DT.

As a manipulation check to ensure that the task induced emotional distress, participants rated their level of anxiety, frustration, and irritation both before the task (pre-task) and immediately prior to receiving the option to terminate the task (post-task). Each item was rated from 0 to 100, with the average rating across all forms of distress used to examine changes in distress in response to the task (see Manipulation Check below).

The PASAT-C has been used extensively with patients in residential substance abuse treatment (e.g., Anestis, Tull, Bagge, & Gratz, 2012; Bornovalova et al., 2008; Daughters et al., 2008; Daughters, Lejuez, Bornovalova et al., 2005; Gratz, Bornovalova, Delany-Brumsey, Nick, & Lejuez, 2007). In support of the construct validity of the PASAT-C, this task has been shown to induce emotional distress in the form of anxiety, anger, frustration, and irritability among clinical and non-clinical samples (e.g., Bornovalova et al., 2008; Gratz et al., 2011; Lejuez et al., 2003), and to be significantly correlated with self-report measures of emotion dysregulation and the unwillingness to experience emotional distress (Gratz et al., 2006). Providing evidence for its convergent and predictive validity, substance users with (vs. without) both BPD (Bornovalova et al., 2008) and antisocial personality disorder (Daughters et al., 2008) have been found to exhibit low DT. Furthermore, low DT has been found to predict early treatment dropout among substance users in residential substance abuse treatment (Daughters, Lejuez, Bornovalova et al., 2005; Tull et al., in press) and to interact with depressive symptoms in predicting problematic alcohol use (Gorka et al., in press). Performance on the PASAT-C has also been found to be stable across time among SUD patients in residential substance abuse treatment (Bornovalova, Gratz, Daughters, Hunt, & Lejuez, 2012). Finally, providing evidence that persistence on this task is not simply a measure of skill level or emotional distress in response to the task, neither emotional distress in response to the task nor task performance has been found to be significantly associated with task termination (Bornovalova et al., 2008; Daughters et al., 2008; Gratz et al. , 2007).

Assessment of RSB—Participants completed a modified version of the HIV Risk-taking Behavior Scale (HRBS; Darke, Hall, Heather, Ward, & Wodak, 1991) to assess RSB. The HRBS has been found to have good construct and convergent validity, with high rates of agreement between respondents and their sexual partners on sexual behavior items (average percentage of 96%), as well as strong test-retest reliability ($r = .86$) over a period of 1 week (Darke et al., 1991).

Six items pertaining to penetrative sex with regular, commercial, or casual partners were of interest in this study. Three items asked participants to indicate the number of different regular, commercial, and casual sexual partners with whom they had engaged in penetrative sex in the past year (with individuals who did not have penetrative sex with a regular, commercial, or casual partner in the past year asked to enter a zero). This is a modification of the original HRBS (which utilizes a Likert-type scale to assess number of sexual partners). Participants were then presented with three items asking how often a condom was used during penetrative sex with regular, commercial, or casual partners. Participants were asked to respond to these three items using a 5-point Likert-type scale (1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Everytime), with a "does not apply" response option available to participants who reported never engaging in penetrative sex with a regular, commercial, or casual partner in the past year. Participants who indicated that this question did not apply to them were excluded from analyses involving these items. Consistent with past research (Lejuez, Bornovalova, Daughters, & Curtin, 2005), and to obtain a better representation of sexual behavior patterns, we lengthened the timeframe of the items to the past year (vs. the past 6 months specified in the original HRBS). Although these modifications create a non-standardized version of the HRBS, they allowed us to obtain a more accurate representation of RSB patterns.

Procedure

All procedures were reviewed and approved by the University of Mississippi Medical Center's Institutional Review Board. To be eligible for inclusion in the study, participants were required to have: 1) obtained a Mini-Mental Status Exam (Folstein, Folstein, & McHugh, 1975) score of   24; and 2) exhibited no current psychotic disorders (as determined by the SCID-IV). 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. All participants took part in this study within their first two weeks of treatment. To reduce participant burden, the study protocol was conducted across two different sessions and participants were paid $15 per session.

Results

Preliminary Analyses

Descriptive data for all participants across MDD, DT, and gender categories are presented in Table 1. Based on the SCID-IV, 20.5% (n = 38) of participants had a current diagnosis of MDD, and 70.8% (n = 131) were classified as having low DT on the PASAT-C. With regard to RSB and other sexual behaviors, 19.5% (n = 36) of participants reported having penetrative sex with a commercial partner in the past year, 47.6% (n = 88) reported having penetrative sex with a casual partner in the past year, and 73.5% (n = 136) reported having penetrative sex with a regular partner in the past year. Among those who engaged in past-year penetrative sex with a commercial, casual, or regular partner, the average number of past-year penetrative sexual partners was 5.89 (SD = 8.85) for commercial partners, 4.03 (SD = 6.31) for casual partners, and 1.87 (SD = 3.4) for regular partners. Correlations between the primary variables of interest (i.e., RSB and other sexual behaviors, DT, MDD, and gender), as well as those examined as potential covariates, are presented in Table 2.

RSB and other sexual behavior variables evidenced skew and/or kurtosis; thus, a logarithmic transformation was performed on the RSB variables, following which they approximated normal distributions. For ease of presentation and interpretation, the original means and

standard deviations of these variables prior to transformation are presented in Table 2. However, all analyses utilized the transformed scores.

Manipulation check—Providing support for the use of quit status on the PASAT-C as a measure of the willingness to tolerate distress (DT), results of a 2 (current MDD vs. no current MDD) × 2 (female vs. male) × 2 (pre- vs. post-task) repeated measures analysis of variance (ANOVA) for emotional distress revealed a significant main effect of time, $F (1, 181) = 91.06$, $p < 0.001$, $\eta_p^2 = 0.34$, with all participants reporting an increase in distress from pre- (*Mean* = 68.88, *SD* = 71.50) to post-task (*Mean* = 146.96, *SD* = 93.37). Further, the MDD × gender × time interaction was not significant, $F (1, 181) = 0.02$, $p > 0.05$, $\eta_p^2 = 0.00$, indicating that the task resulted in a comparable increase in distress across MDD status and gender.

Identification of covariates—Prior to conducting primary analyses, in order to identify potential covariates (see Tabachnick & Fidell, 2007), a series of Pearson product-moment and point-biserial correlation analyses was conducted to explore associations between the different indices of RSB and demographic factors (i.e., age, racial/ethnic background, income, education level, marital status, and employment) and diagnostic variables (anxiety disorders, specific substance use disorders, and BPD). Given the small number of participants in many of the demographic categories, these variables were collapsed into dichotomous variables of: (1) White (59.5%) versus non-White (40.5%); (2) past year income of < $10,000 (46.5%) versus $10,000 (53.5%); (3) a high school education or less (60.5%) versus some post-high school education (39.5%); (4) single (71.4%) versus married (28.6%); and (5) unemployed (70.3%) versus employed (29.7%). Variables found to be significantly associated with each dependent variable (see Table 2) were included in analyses involving that dependent variable.

Primary Analyses

To test hypotheses, we conducted a series of 2 (current MDD vs. no current MDD) × 2 (high-DT vs. low-DT) × 2 (female vs. male) analysis of covariance (ANCOVA; controlling for covariates relevant to each outcome), with number of penetrative regular sexual partners, likelihood of using a condom when having penetrative sex with a regular partner, number of penetrative commercial sexual partners, likelihood of using a condom when having penetrative sex with a commercial partner, number of penetrative casual sexual partners, and likelihood of using a condom when having penetrative sex with a casual partner (all transformed) serving as the dependent variables.

With regard to the number of commercial sexual partners in the past year, a significant MDD × DT interaction was found, $F (1, 171) = 4.07$, $p < .05$, $\eta_p^2 = .02$ (controlling for age, racial/ethnic background, cocaine dependence, specific phobia, obsessive-compulsive disorder, and BPD; see Table 3). Post-hoc planned comparisons revealed that participants with MDD and low DT reported the greatest number of commercial sexual partners in the past year compared to all other groups, *t*s (*df* = 36–129)   1.99, *p*s < .05. However, no significant main effects or interactions were found for the likelihood of using a condom when having penetrative sex with a commercial partner (controlling for cocaine dependence, specific phobia, and BPD), Fs $(1, 55) < 2.50$, ps $> .05$, η_p^2s   .04.

As for the number of different casual sexual partners in the past year, significant MDD × DT, $F (1, 173) = 6.02$, $p < .05$, $\eta_p^2 = .03$, and gender × DT, $F (1, 173) = 6.69$, $p < .05$, $\eta_p^2 = .04$, interactions were found (controlling for marijuana dependence, cocaine dependence, panic disorder, and marital status; see Table 4). Post-hoc planned comparisons revealed that participants with MDD and low DT reported the greatest number of casual sexual partners in

the past year compared to all other groups, ts (df = 36–129) $\ge$ 2.01, ps < .05. For the gender × DT interaction, post-hoc planned comparisons demonstrated that men with high DT reported significantly fewer past-year casual sexual partners than all other groups, ts (df = 52–109) $\ge$ 1.95, ps < .05. Similar to the findings regarding commercial sexual partners, however, no significant main effects or interactions were found for the likelihood of using a condom when having penetrative sex with a casual sexual partner (controlling for stimulant dependence and generalized anxiety disorder), Fs (1, 70) < 1.80, ps > .05, η_p^2s < .03.

Finally, with regard to the number of regular sexual partners in the past year, as well as the likelihood of using a condom when having penetrative sex with a regular partner, no significant main effects or interactions were found, Fs (1,173–174) < 2.28, ps > .05, η_p^2 < .015.

Discussion

The purpose of this study was to examine the main and interactive effects of current MDD, DT, and gender on multiple indices of RSB (i.e., frequency of past year penetrative sex with a commercial or casual partner and likelihood of using a condom when having penetrative sex with a commercial or casual partner) within a sample of SUD patients in residential substance abuse treatment. Hypotheses were partially supported. Contrary to past research (e.g., Alvy et al., 2011; Evans et al., 2003; Hutton et al., 2004; Klein et al., 2008; Mitchell & Latimer, 2009a; Perdue et al., 2003; Reisner et al., 2009; Risser et al., 2006; Seth et al., 2009; Tyndall et al., 2002), results did not provide support for the hypothesized main effects of MDD or gender on any RSB outcome. Likewise, and contrary to past research demonstrating significant associations between low DT and a myriad of risky behaviors (Anestis et al., 2007; Buckner et al., 2007; Gratz et al., 2011; Gorka et al., in press; Howell et al., 2010), findings did not provide evidence of a main effect of DT on RSB. Nonetheless, in partial support of hypotheses, findings of a significant gender × DT interaction revealed that men with high DT (compared to all other groups) reported the fewest number of casual sexual partners in the past year. Given evidence that substance dependent men may be at high risk for engaging in casual sex (Mitchell & Latimer, 2009a), this finding suggests that high levels of DT may serve as a protective factor for some forms of RSB among men. Future research in this area may help inform the development of interventions focused on increasing DT among substance dependent men in order to reduce the likelihood of casual sex and associated risks.

Consistent with the proposal that the association between depression and RSB may be complex, findings indicated that DT moderated the effect of MDD on two indices of RSB. Specifically, participants with current MDD and low DT reported engaging in penetrative sex with significantly greater numbers of casual and commercial sexual partners than all other groups of participants. These findings are in-line with theoretical (Crepaz & Marks, 2001) and empirical (Lucenko et al., 2003) literature suggesting that RSB may be motivated by negative affective states, as well as emerging research demonstrating that difficulties in emotion regulation may underlie RSB (e.g., Messman-Moore, Walsh, & DiLillo, 2010; Tull et al., 2012). Results of the present study suggest that the presence of MDD among SUD patients may increase the risk for RSB among patients with low DT. SUD patients with MDD who experience difficulties tolerating emotional distress may be more likely to engage in behaviors that function to alleviate or distract from negative affective states. Findings of significant MDD × DT interactions for two forms of RSB (combined with the absence of significant main effects of MDD or DT on any form of RSB) highlight the importance of exploring the different contexts in which patients with MDD or low DT may be at heightened risk for negative clinical outcomes. Such findings are also consistent with other research examining the roles of depression and DT in maladaptive behaviors. For example,

although Gorka et al. (in press) found that DT was not significantly associated with problematic alcohol use at a zero-order level, the combination of low DT and more severe depressive symptoms was predictive of problematic alcohol use.

Although results provided support for the combined role of MDD and DT in the number of past-year commercial and casual sexual partners, we did not find evidence for the role of MDD and/or DT in the likelihood of using a condom when engaging in penetrative sex with a commercial or casual partner. Whereas low DT among SUD patients with MDD may motivate engagement in penetrative sex with different commercial and sexual partners, other psychological vulnerabilities may be more relevant to the decision to use a condom when having penetrative sex with these partners. In particular, given that the unwillingness to experience emotional distress is considered to be one facet of the larger construct of emotion dysregulation (Gratz et al., 2006), it is possible that other dimensions of emotion dysregulation may influence the use of protection when having sex with a commercial or casual partner. For example, Tull et al. (2012) found that the specific emotion dysregulation dimension of lack of emotional clarity predicted the likelihood of using a condom when having penetrative sex with a commercial partner while under the influence of substances. Factors other than those associated with emotion dysregulation may also be driving unsafe sexual practices. For example, Alvy et al. (2011) demonstrated that self-efficacy for sexual safety and the use of sex and drugs to escape cognitions mediated the association between depression and sexual risk-taking (assessed as a composite variable that included unprotected sex) among men who have sex with men (MSM). In addition, Safren et al. (2010) found that negative expectancies about condom use were associated with unprotected receptive or insertive anal intercourse among MSM.

Results must be considered in light of the limitations present. First and foremost, the outcome being examined in this study, past year RSB, was assessed through self-report. Although few alternatives are available when it comes to assessing RSB, there are limitations associated with this approach that warrant mention. First, the veracity of self-reported RSB may be limited by the perceived negative consequences of reporting this behavior. In addition, despite multiple studies examining self-reported RSB in the past year among substance dependent individuals (Carey, Carey, Maisto, Gordon, & Vanable, 2001; Lejuez et al., 2005; for a review, see also Meade & Sikkema, 2005), the length of this time period (relative to the original HRBS) may have negatively influenced recall of RSB. Given that we are utilizing a substance dependent sample, some participants may also have been engaging in RSB in the context of substance use, further limiting their ability to provide an accurate report of their frequency of RSB in the past year. We also did not collect data on whether participants were involved in the criminal justice system or another residential treatment program in the past year, which would have limited opportunities for RSB. All of these factors may have resulted in the lower rates of RSB within this sample, compared to other studies of clinical populations that used a briefer assessment period (i.e., past 3 months; Carey et al., 2004; Meade, 2006). Nonetheless, it warrants mention that the percentage of participants in this study reporting penetrative sex with a commercial partner was higher (19.5%) than that reported by Meade and Sikkema (2005) in a review of studies examining past-year commercial sex among adults with severe mental illness, including substance dependence (*weighted mean* = 12.73%). Moreover, there is evidence that self-report measures may result in more valid reports of HIV-risk behaviors in general (e.g., drug use; Weatherby et al., 1994) and RSB in particular (Johnson et al., 2000; for a review, see Fenton, Johnson, McManus, & Erens, 2001), compared to other assessment methods (e.g., interviews). Nonetheless, future studies would benefit from the inclusion of other assessment methods of RSB that may result in more valid data, such as timeline follow-back procedures (Weinhardt, Carey, & Carey, 2000). Prospective or longitudinal studies that

examine the effects of MDD and DT on future engagement in RSB would also help to address this limitation.

Furthermore, although the use of a laboratory-based DT task is a strength of this study (as it assesses DT in the context of actual distress and is not susceptible to some of the limitations of self-report measures of DT), future research would benefit from the multimodal assessment of DT. Indeed, a growing body of research suggests that self-report and behavioral measures of DT are often not significantly intercorrelated (Anestis, Lavender et al., in press; Bernstein, Marshall, & Zvolensky, 2011; McHugh et al., 2011) and are differentially associated with a variety of clinical outcomes (Anestis, Lavender et al., in press; Bernstein et al., 2011; see also Zvolensky, Leyro, Bernstein, & Vujanovic, 2011). Consequently, it is possible that self-report and behavioral DT measures are capturing different (unique) aspects of a single construct or assessing two separate constructs. Future research exploring the unique effects of perceived and actual DT on RSB among SUD patients with MDD may help inform the development of more comprehensive and effective RSB reduction programs for these patients.

Likewise, although the PASAT-C is an empirically supported laboratory stressor (see Zvolensky, Leyro et al., 2011) and resulted in a significant increase in emotional distress among the participants in this sample, it is a general stressor. Thus, it may not induce distress comparable to that experienced in real world contexts among SUD patients with MDD. As such, studies that utilize more personally-relevant or MDD-relevant stressors (e.g., examination of the willingness to tolerate sadness, or the assessment of DT following a sadness induction) may produce results with greater generalizability, as well as findings with larger effect sizes than those obtained here. In addition, future studies would benefit from exploring whether the tolerance of specific emotional states (e.g., guilt, anger, shame) improves our understanding of the effect of MDD on RSB.

Research is also needed to examine the mechanisms underlying the interrelations of MDD, low DT, and RSB among SUD patients. For example, consistent with the findings of Gorka et al. (in press), the combination of low DT and MDD may contribute to substance abuse which, in turn, may then increase the risk for RSB. In addition, low DT has been found to be related to negative urgency (i.e., the tendency to act impulsively when experiencing negative affect; Kaiser, Milich, Lynam, & Charnigo, 2012), which is also associated with RSB (Simons, Maisto, & Ray, 2010). Future research should also explore other factors that may contribute to RSB within this population. Despite finding a significant interaction between MDD and low DT in the number of past-year commercial and casual sexual partners, these effects were accompanied by a small effect size. Consequently, in addition to exploring these relationships within larger samples of SUD patients with MDD, studies are needed to examine the effect of other diagnoses associated with low DT and RSB within SUD patients, such as antisocial personality disorder (Compton, Cottler, Shillington, & Price, 1995; Daughters et al., 2008).

Finally, this study was conducted within a population previously found to be at high risk for HIV and other STD infections – SUD patients (Klinkenberg & Sacks, 2004). However, it is not clear if the results of this study generalize to other populations at heightened risk for RSB and HIV infection, such as MSM (CDC, 2011; Safren et al., 2010) and individuals with other psychiatric disorders besides SUDs, including PTSD (Brief et al., 2004; Munroe, Kibler, Ma, Dollar, & Coleman, 2010) and BPD (Klinkenberg & Sacks, 2004; Tull, Gratz, & Weiss, 2011). Consequently, it will be important for future studies to attempt to replicate our findings within these populations.

Despite limitations, the results of this study add to the growing body of literature on the deleterious effects of low DT and highlight a potential avenue for reducing RSB within a high-risk population. Indeed, given the high rates of sexually transmitted diseases found among SUD patients (Klinkenberg & Sacks, 2004), research focused on identifying the factors associated with RSB within this population has great clinical and public health significance, highlighting potential targets for intervention. Findings from this study suggest that low DT may be one such treatment target among SUD patients (particularly those with co-occurring MDD). The past three decades have seen the development and evaluation of multiple interventions focused on reducing HIV-risk behaviors, including RSB. However, although a number of these HIV-risk reduction interventions include information on coping skills for reducing stress in general or symptoms associated with specific psychiatric conditions, or the discussion of safe sexual practices and/or HIV status disclosure (Gordon, Forsyth, Stall, & Cheever, 2005; Kalichman, Rompa, & Cage, 2005; Kelly & Kalichman, 2002; Knauz et al., 2007), none target DT or other dimensions of emotion regulation directly. Consequently, it may be worthwhile to examine the effect of interventions that specifically focus on improving DT and emotion regulation in reducing RSB. One intervention that may be particularly useful in targeting DT within this population is Skills for Improving Distress Intolerance, a six-session individual treatment for low DT that has been found to significantly improve both DT and depression among patients in residential SUD treatment (Bornovalova et al., 2012). Furthermore, given the emphasis within dialectical behavior therapy (DBT; Linehan, 1993) on both DT and emotion regulation in general, future research should examine the utility of DBT in the treatment of RSB among SUD patients (given evidence that DBT has been found to improve emotion regulation abilities within SUD populations; Axelrod, Perepletchikova, Holtzman, & Sinha, 2011).

Acknowledgments

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Table 1

Clinical descriptive data (*N* = 185).

	Men (n=111)				Women (n=74)			
	MDD (n=18)		No MDD (n=93)		MDD (n=20)		No MDD (n=54)	
	Low DT (n=12)	High DT (n=6)	Low DT (n=64)	High DT (n=29)	Low DT (n=14)	High DT (n=6)	Low DT (n=41)	High DT (n=13)
Panic disorder	25.0%	16.7%	14.1%	13.8%	50.0%	50%	17.1%	38.5%
Social anxiety disorder	16.7%	16.7%	3.1%	13.8%	21.4%	0%	12.2%	23.1%
Specific phobia	16.7%	16.7%	1.6%	17.2%	28.6%	50%	4.9%	7.7%
OCD	0%	0%	0%	3.4%	7.1%	33.3%	2.4%	7.7%
GAD	66.7%	66.7%	17.2%	20.7%	78.6%	83.3%	29.3%	38.5%
PTSD	33.3%	0%	10.9%	20.7%	64.3%	83.3%	39.0%	30.8%
Alcohol dependence	41.7%	50.0%	32.8%	48.3%	35.7%	50.0%	39.0%	15.4%
Cocaine dependence	50.0%	66.7%	28.1%	24.1%	21.4%	0%	41.5%	38.5%
Opioid dependence	8.3%	33.3%	15.6%	0%	14.3%	16.7%	14.6%	23.1%
Marijuana dependence	33.3%	50.0%	20.3%	24.1%	14.3%	0%	9.8%	7.7%
Sedative dependence	16.7%	0%	7.8%	6.9%	14.3%	0%	9.8%	15.4%
Stimulant dependence	8.3%	0%	7.8%	3.4%	28.6%	33.3%	17.1%	7.7%
Hallucinogen dependence	0%	0%	1.6%	0%	0%	0%	0%	0%
BPD	41.7%	50.0%	10.9%	5.0%	92.9%	50.0%	46.3%	46.2%
Number of regular sex partners	2.33 (4.21)	1.50 (1.05)	2.48 (4.86)	1.10 (1.82)	2.50 (4.24)	1.17 (0.98)	1.24 (1.14)	1.92 (1.55)
Condom use with regular partners	4.67 (1.72)	3.33 (2.25)	3.98 (1.77)	4.07 (1.87)	4.00 (1.84)	4.83 (0.98)	4.10 (1.79)	3.92 (1.71)
Number of commercial sex partners	6.08 (13.93)	0.67 (0.82)	0.59 (2.18)	0.21 (0.49)	3.71 (6.97)	1.00 (2.45)	0.37 (0.83)	1.38 (3.60)
Condom use with commercial partners	1.83[a] (1.84)	2.60[b] (2.51)	0.94[d] (1.77)	0.86[f] (0.69)	2.00[h] (2.07)	5.00[c] (0.00)	1.33[j] (1.82)	1.80[b] (2.49)
Number of casual sex partners	7.75 (14.02)	0.33 (0.82)	1.78 (2.99)	0.93 (1.60)	4.00 (6.85)	0.83 (0.75)	0.66 (1.20)	2.38 (3.57)
Condom use with casual partners	3.67[a] (1.21)	4.00[c] (0.00)	3.26[e] (1.68)	2.67[g] (1.72)	3.43[f] (1.99)	4.00[i] (2.00)	2.75[d] (1.88)	2.57[f] (1.81)

Note. Non-transformed means are presented for the risky sexual behavior variables. Standard deviations are presented in parentheses for risky sexual behavior variables. OCD = obsessive compulsive disorder; GAD = generalized anxiety disorder; PTSD = Posttraumatic stress disorder; BPD = borderline personality disorder;

[a] *n* = 6;

[b] *n* = 5;

[c] *n* = 1;

$d_{n = 16}$;

$e_{n = 27}$;

$f_{n = 7}$;

$g_{n = 12}$;

$h_{n = 8}$;

$i_{n = 4}$.

$j_{n = 18}$.

Table 2

Correlations between primary variables of interest and potential covariates.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Regular sex partners	---	-.22**	27**	.28*	.41**	-.07	-.23**	-.02	-.10	-.11	-.02	-.01	.00	.02
2. Condom use – regular		---	-.06	-.16	-.22**	.66**	.18*	-.02	-.20**	.04	.07	.01	.01	.04
3. Commercial sex partners			---	.73**	.62**	.01	.15*	-.06	-.05	.16*	.02	-.12	-.08	.27**
4. Condom use – commercial[a]				---	.61**	-.61**	.20	-.08	.08	.03	.19	-.09	-.16	.26*
5. Casual sex partners					---	-.07	-.09	.06	-.18*	-.01	.03	-.04	.02	.14
6. Condom use – casual[b]						---	.08	.08	.11	.02	.17	.08	.06	.18
7. Age							---	.07	.07	.24**	.14	-.11	.03	-.01
8. Gender (0=female)								---	-.17*	.27**	-.18*	.10	.22**	-.13
9. Marital status (0=single)									---	-.11	.03	.18*	-.05	.09
10. Race/ethnicity (0=White)										---	-.17*	-.22**	-.03	-.01
11. Education (0= high school)											---	.18**	.15*	.06
12. Income (0=<$ 10,000)												---	.51**	.02
13. Employed (0=unemployed)													---	-.16*
14. Major depression														---
15. PASAT-Quit														
16. Alcohol dependence														
17. Sedative dependence														
18. Marijuana dependence														
19. Stimulant dependence														
20. Opioid dependence														
21. Cocaine dependence														
22. Hallucinogen dependence														
23. Panic disorder														
24. Social anxiety disorder														
25. Specific phobia														
26. OCD														

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
27. GAD														
28. PTSD														
29. BPD														
Mean/%	1.92	4.09	1.15	1.50	1.92	3.10	36.00	60%	28.6%	40.5%	39.5%	53.5%	29.7%	20.5%
SD	3.47	1.76	4.51	1.89	4.78	1.73	10.10	---	---	---	---	---	---	---

	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1. Regular sex partners	.05	-.07	-.04	.15*	.04	.17*	.00	.10	.12	-.02	.02	.05	-.03	-.06	.04
2. Condom use – regular[a]	.01	-.09	.00	.00	.19**	-.02	-.07	.04	.06	.06	.06	.08	.16*	.12	-.03
3. Commercial sex partners	.05	-.04	-.10	.02	-.07	.00	.26**	.09	.06	.11	.16*	.16*	.04	.14	.24**
4. Condom use – commercial[a]	-.11	.04	-.17	.13	-.01	-.05	.25*	.01	.12	.18	.31*	.17	.09	.20	.29*
5. Casual sex partners	.07	.06	-.01	.16*	-.03	.05	.18*	.07	.15*	.01	.10	.13	.04	-.01	.08
6. Condom use – casual[b]	.07	-.03	.05	.06	.26*	-.11	-.05	.12	.02	-.08	.10	.05	.26*	.01	.00
7. Age	.24**	.12	-.10	-.19*	-.10	-.11	.17*	.06	-.06	-.01	.02	-.08	-.04	.03	-.03
8. Gender (0=female)	-.06	.04	-.05	.19*	-.20**	-.07	-.02	.06	-.17*	-.11	-.09	-.16*	-.19**	-.34**	-.39**
9. Marital status (0=single)	.07	-.04	-.04	-.02	.15*	.06	-.11	-.05	.05	.05	.02	.02	.03	.09	.12
10. Race/ethnicity (0=White)	-.08	.07	-.23**	.04	-.30**	-.29**	.25**	-.06	-.29**	-.04	.08	-.15*	-.14	-.04	-.18*
11. Education (0= high school)	-.07	.13	.05	-.21**	.03	.07	-.04	.09	.02	-.07	-.02	-.02	.20**	.12	.09
12. Income (0=<$ 10,000)	-.19**	.00	.18*	.08	-.04	.12	-.10	.07	.03	-.03	-.04	-.01	.09	-.06	-.12
13. Employed (0=unemployed)	-.03	.11	.04	.06	-.16*	.05	-.07	.11	-.02	-.04	-.03	-.05	-.04	-.14	-.21**
14. Major depression	-.03	.05	.02	.07	.11	.03	.02	-.04	.20**	.08	.27**	.13	.43**	.23**	.33**
15. PASAT-Quit	---	-.05	.04	-.03	.08	.05	.04	.05	-.05	-.08	-.17*	-.15*	-.05	.00	.02
16. Alcohol dependence		---	.06	-.02	-.03	-.01	.06	.10	.01	.02	.00	-.08	.12	.02	.08
17. Sedative dependence			---	.14	.06	.20**	.06	-.02	.20**	.01	-.05	.05	.13	-.03	.14
18. Marijuana dependence				---	.18*	.02	.12	.16*	.06	.10	.12	-.09	.14	.08	.11
19. Stimulant dependence					---	.06	-.10	.21**	.32**	-.02	.05	.13	.18*	.24**	.26**
20. Opioid dependence						---	-.04	-.03	.26**	.02	-.08	-.07	.09	.08	.19**
21. Cocaine dependence							---	.11	-.08	.02	.03	-.06	.02	-.12	.15*

	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
22. Hallucinogen dependence								---	-.04	-.03	-.03	-.01	-.05	-.05	-.05
23. Panic disorder									---	.25**	.26**	.28**	.28**	.22**	.26**
24. Social anxiety disorder										---	.34**	.23**	.20**	.29**	.24**
25. Specific phobia											---	.34**	.25**	.23**	.07
26. OCD												---	.19**	.23**	.13
27. GAD													---	.33**	.31**
28. PTSD														---	.34**
29. BPD															---
Mean/%	70.8%	37.3%	9.2%	18.4%	11.4%	13.5%	32.4%	0.5%	21.1%	10.8%	10.3%	3.2%	33.5%	27.6%	33.0%
SD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Note. Transformed variables are used for the risky sexual behavior variables. Percentages reflect a score of 1 for dichotomous variables or the presence of a diagnosis. OCD = obsessive compulsive disorder; GAD = generalized anxiety disorder; PTSD = posttraumatic stress disorder; BPD = borderline personality disorder;

[a] *n* = 66;

[b] *n* = 80.

*
  p < .05.

**
  p < .01.

Table 3

ANCOVA results examining the interactive effect of major depressive disorder, distress tolerance, and gender on number of past-year penetrative commercial sexual partners.

	F (1,171)	P	η_p^2
Age	1.73	.19	.01
Race/ethnicity	3.80	.05	.02
Cocaine dependence	5.59	.02	.03
Specific phobia	0.24	.62	.00
Obsessive compulsive disorder	4.68	.03	.03
Borderline personality disorder	3.70	.06	.02
Gender	0.01	.93	.00
Distress tolerance	2.46	.12	.01
Major depression	2.86	.09	.02
Gender × Distress tolerance	0.74	.39	.00
Gender × Major depression	0.42	.52	.00
Major depression × Distress tolerance	4.07	.045	.02
Major depression × Distress tolerance × Gender	0.03	.86	.00

Table 4

ANCOVA results examining the interactive effect of major depressive disorder, distress tolerance, and gender on number of past-year penetrative casual sexual partners.

	$F_{(1,173)}$	p	η_p^2
Marital status	5.89	.02	.03
Panic disorder	2.72	.10	.02
Marijuana dependence	3.37	.07	.02
Cocaine dependence	5.71	.02	.03
Gender	0.78	.38	.01
Distress tolerance	3.87	.05	.02
Major depression	0.53	.47	.00
Gender × Distress tolerance	6.69	.01	.04
Gender × Major depression	0.66	.42	.00
Major depression × Distress tolerance	6.02	.02	.03
Major depression × Distress tolerance × Gender	0.38	.54	.00