Published in final edited form as:

Drug Alcohol Depend. 2012 April 1; 122(1-2): 70–76. doi:10.1016/j.drugalcdep.2011.09.012.

Initial RCT of a Distress Tolerance Treatment for Individuals with Substance Use Disorders

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Abstract

Background—Psychological distress tolerance, the ability to persist in goal directed activity when experiencing psychological distress, is associated with poor substance use treatment outcomes including drug and alcohol treatment dropout and relapse.

Objective—The current study examines if a brief distress tolerance intervention that was specifically developed as an adjunctive treatment for patients in residential substance abuse treatment shows efficacy in improving the patients' distress tolerance.

Methods—Seventy-six individuals who were receiving treatment at a residential substance use treatment facility and indexed low distress tolerance on laboratory distress tolerance measures were randomized into three conditions: Treatment-As-Usual (TAU), six sessions of Supportive Counseling (SC), or six sessions of the novel distress tolerance treatment, Skills for Improving Distress Intolerance (SIDI).

Measures—Patients were assessed at baseline for DSM-IV psychiatric diagnoses, DSM-IV substance use disorders, distress tolerance, and depressive symptoms. Patients were again assessed at posttreatment. Therapeutic alliance and treatment expectancies and credibility were also assessed at posttreatment.

Results—Patients who received SIDI ($n = 28$) evidenced significantly greater improvements than SC ($n = 24$) and TAU participants ($n = 24$) on the distress tolerance laboratory measures, even when controlling for changes in negative affect (in the form of depression). Additionally, a higher percentage of patients in SIDI reached clinically significant improvement compared to patients in SC and TAU.

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Contributors

Bornovalova and Gratz designed the study and wrote the protocol. Daughters and Lejuez managed the implementation. Bornovalova undertook the statistical analysis and wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

Conclusion—This study supports the efficacy of SIDI in improving distress tolerance levels among individuals with drug and alcohol use disorders currently receiving residential substance use treatment. SIDI appears to be a brief and feasible intervention for use within inpatient substance use facilities.

Keywords

Distress Tolerance; Randomized Clinical Trial; Substance Use Disorders; Treatment Development

1. Introduction

The past two decades have seen the emergence of a new construct: *psychological distress tolerance*, defined as the ability to persist in goal directed activity when experiencing psychological distress (Brown et al., 2002; Lejuez et al., 2003; Strong et al., 2003). Studies of both community-based and psychiatric samples report that distress tolerance (also referred to in some studies as task persistence; see Brandon et al., 2003) is inversely related to a range of maladaptive behaviors, including antisocial behavior, maladaptive gambling, deliberate self-harm, binge/purge behavior, and, most notably, drug and alcohol use (Anestis et al., 2007; Bornovalova et al., 2008; Buckner et al., 2007; Daughters and Lejuez, 2005; Daughters et al., 2009; Daughters et al., 2008; Ellis et al., 2010; Howell et al., 2010; Keough et al., 2010; Nock and Mendes, 2008; Zvolensky et al., 2009). Indeed, distress intolerance is robustly associated with substance use coping motives, as well as substance use frequency and substance use disorders (SUDs) (Buckner et al., 2007; Howell et al., 2010; Marshall-Berenz et al., 2011; Vujanovic et al., 2009). Additionally, distress intolerance negatively affects drug and alcohol outcomes, with individuals low in distress tolerance more likely to drop out of substance use treatment (Daughters et al., 2005a) and subsequently relapse (Brandon et al., 2003; Brown et al., 2002; Daughters et al., 2005b; Quinn and Copeland, 1996). This is particularly concerning given evidence for a positive association between both treatment dropout and relapse and a variety of other negative outcomes, including arrest and imprisonment, suicide, and lethal drug overdose (Britton et al., 2010; Simpson et al., 1997). Thus, efforts to improve the distress tolerance of SUD patients may have important clinical and public health benefits. Particularly needed are brief, targeted interventions that may augment standard SUD treatments provided in the community (e.g., residential substance abuse treatments; see SAMHSA, 2008).

Despite the clear clinical utility of treatments aimed at increasing distress tolerance among SUD patients, few interventions target this mechanism directly and those that do may not be directly applicable to SUD patients in residential substance use treatment. For example, although Dialectical Behavior Therapy (DBT; Linehan, 1993) specifically targets distress tolerance and has been found to be efficacious in the treatment of co-occurring borderline personality disorder and SUDs (Linehan et al., 2002; Linehan et al., 1999), the duration and intensity of this treatment (as well as its breadth of focus on treatment targets other than distress tolerance, e.g., interpersonal effectiveness and mindfulness) preclude its use as an adjunctive treatment to relatively brief residential SUD treatments. Additionally, although Brown et al. (2008) provide preliminary support for the utility of a 15-session (6 group and 9 individual) smoking cessation treatment that specifically targets distress tolerance (including both an emotional exposure and skills training component), the authors did not actually examine changes in distress tolerance over the course of this open trial. Thus, it remains unclear if this treatment actually improves distress tolerance as theorized. In addition, given that this treatment was developed specifically for nicotine-dependent individuals only, its applicability to and utility for other (arguably more severe) substance dependent populations is unclear.

Thus, the current study sought to extend the extant literature in this area by examining the efficacy of a brief distress tolerance treatment specifically developed as an adjunctive treatment for SUD patients in residential substance abuse treatment. This intervention — Skills for Improving Distress Intolerance (SIDI) — was developed to teach SUD patients skills for tolerating distress, including increasing the ability to experience emotional distress and controlling behaviors in the context of emotional distress. To this end, SIDI draws on skills from DBT (Linehan, 1993; Linehan et al., 2002; Linehan et al., 1999) and Acceptance and Commitment Therapy (Hayes et al., 1999) – both of which have been shown to reduce substance use and other maladaptive behaviors. Further, this intervention draws upon the treatment approach of Brown et al. (2008) by including an emotional exposure component in addition to the skills-training component. Specifically, the emotional exposure component (see also Otto et al., 2004; Zvolensky et al., 2003) requires participants to practice the skills in session *in the context of negative affect* (induced through emotional exposure to everyday stressors). The rationale for incorporating emotional exposure comes from research documenting the importance of contextual (in particular, emotional) cues in triggering maladaptive behavioral responses such as substance use (Chaney et al., 1982; Childress et al., 1994; Drummond and Glautier, 1994; Franken et al., 1999; Litman et al., 1990; Lowman and Allen, 1996; Monti et al., 1993; O'Brien et al., 1990; O'Connell and Martin, 1987; Powell et al., 1993; Robbins et al., 2000; Sherman et al., 1986; Wikler, 1965). This component of the treatment also has the added benefits of promoting immediate behavioral practice and the replacement of maladaptive coping behaviors with more adaptive responses, as well as providing a sense of mastery as patients are assisted in applying new skills to high levels of negative affect (Otto et al., 2005; Otto et al., 2004). Thus, SIDI involves systematic and repeated exposure to negative mood states, during which patients are assisted in practicing distress tolerance-enhancing strategies.

To provide an initial test of the efficacy of SIDI as an adjunctive treatment to standard SUD treatment, residential SUD patients with distress tolerance deficits were randomly assigned to receive SIDI or one of two comparison conditions, supportive counseling (SC) or treatment-as-usual (TAU). These three conditions were then compared on outcome measures of distress tolerance and depressive symptoms. The inclusion of the SC comparison condition allowed us to control for the nonspecific treatment effects of contact time and client-therapist alliance. We hypothesized that the addition of SIDI to TAU in this residential treatment facility would have a positive effect on patients' distress tolerance, even when controlling for improvements in negative affect (on a measure of depressive symptoms).

2. Methods

2.1. Participants and Treatment Setting

Data were collected between May 2006 and May 2008. Participants were drawn from 110 consecutive admissions to a residential substance use treatment facility in NE Washington, D.C. General treatment at this center involves a mix of strategies adopted from Alcoholics and Narcotics Anonymous and group sessions focused on relapse prevention. All participants complete detoxification (if needed) prior to entering this treatment facility. Complete abstinence from drugs and alcohol (except for caffeine and nicotine) is required upon entry and throughout the program. Regular drug testing is provided and any drug or alcohol use results in immediate dismissal. Typical treatment lasts between 30 and 180 days.

Inclusion criteria were: 1) 18–65 years of age, 2) low distress tolerance (as indexed by termination of [i.e., lack of persistence on] at least one of two behavioral distress tolerance tasks; see Measures), and 3) no current psychosis. Based on these criteria, 76 participants were included in the study. Participants were primarily middle-aged (*mean* age =

43.20±9.25), male (71.1%), and African-American (90.5%). Thirty-two percent of the participants had not completed high school, 33% had graduated high school or received a GED, and 35% had completed at least some college. Additionally, most (82.9%) participants had some prior SUD treatment experience, and 57.9% were court-mandated into the current treatment. See Table 2 for complete information on the demographic and clinical characteristics of participants in each condition.

2.2. Measures

At the baseline assessment, trained graduate student assessors conducted DSM-IV diagnostic evaluations using the mood, anxiety, and drug and alcohol use disorder modules from the Mini-International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al., 1998). Additionally, antisocial and borderline personality disorders were assessed via the Structured Clinical Interview for DSM-IV, Axis II modules (SCID-II; First et al., 1997). A treatment history questionnaire asked about the number of previous drug treatments.

2.2.1. Main Outcome Measures—At baseline and posttreatment (we use the term posttreatment to refer to the assessments completed after participation in the SIDI, SC, or TAU protocols, but still in residential substance abuse treatment) participants completed two behavioral measures of distress tolerance, the computerized Mirror-Tracing Persistence task (MTPT; Quinn et al., 1996; Strong et al., 2003) and the Paced Auditory Serial Addition Task (PASAT; Lejuez et al., 2003). The MTPT requires participants to trace geometric figures on the screen using a computer mouse that is programmed to move in the reverse direction and return to the start if participants go outside the lines or pause for more than 2 seconds. On the PASAT, numbers are sequentially flashed on a computer screen at increasing speed, and participants are instructed to sum the most recent number with the previous number (using the computer mouse to click on the correct answer). Because the correct answer must be provided before the next number is presented, difficulty increases as latencies between number presentations decrease. Following exposure to several minutes of each task (both of which have been shown to induce emotional distress (Bornovalova et al., 2008; Gratz et al., 2007; Gratz et al., 2010; Lejuez et al., 2003), participants are given the opportunity to terminate the task (although they are told that their payment depends on their performance on the tasks). Distress tolerance was measured as time (in seconds) to task termination, and each task was capped at 300 seconds. To ensure that the tasks measure distress tolerance rather than absolute distress, levels of anxiety, frustration, irritability, and discomfort (on a scale from 0 [none] to 100 [extreme]) are assessed pre- and post-task for the MTPT and pre- and mid-final level for the PASAT. Levels of pre-task and post-task negative affect were used as potential covariates.

In support of their construct validity, the MTPT and the PASAT have been shown to reliably induce emotional distress among clinical and nonclinical samples (Bornovalova et al., 2008; Gratz et al., 2007; Gratz et al., 2010; Lejuez et al., 2003) and to be significantly intercorrelated (Bornovalova et al., 2008; Daughters et al., 2005a; Gratz et al., 2007). Providing evidence for their convergent validity, distress intolerance on these tasks has been found to be heightened among SUD patients with borderline personality, antisocial personality, and posttraumatic stress disorders, (Bornovalova et al., 2008; Bornovalova et al., 2011; Daughters et al., 2008) and to predict treatment dropout among substance users in residential treatment (Daughters, et al., 2005a). Finally, providing evidence that latency to termination scores on these tasks are not simply a measure of skill level or distress in response to the task, neither emotional distress in response to the tasks nor task performance have been found to be significantly associated with latency to task termination (Bornovalova et al., 2008; Daughters et al., 2008; Gratz et al., 2007). Given the significant correlations between the two tasks at baseline ($r = .34, p < .001$) and post-treatment ($r = .57, p < .001$), a

composite score was created to provide a single index of distress tolerance for subsequent analyses.

2.2.2. Potential Covariates—To ensure that any effects of SIDI on distress tolerance are not due to decreases in patients' overall distress or general negative affect, the 9-item Center for Epidemiological Studies-Depression (CES-D) scale was administered (Martensa et al., 2006). If the effects of SIDI were independent of changes in negative affect in general, we would expect to find evidence of improvements in distress tolerance when controlling for changes in CES-D scores. This also allows us to control for the decrease in negative affect often observed following TAU in inpatient or residential settings.

To control for nonspecific therapeutic factors, participants in the SIDI and SC conditions completed the California Psychotherapy Alliance Scale (CALPAS) and the Treatment Expectancy and Credibility Scales (CEQ) (Deville and Borkovec, 2000; Gaston, 1991). The CEQ measures the intervention credibility and improvement expectancy; the CALPAS measures a patient's perspective on the quality of the therapeutic alliance.

2.3. Procedure

To limit the potential influence of any remaining withdrawal symptoms on performance (expected to be minimal given the requirement of detoxification prior to entering this treatment facility), participants were recruited into the study between 2–5 days from residential treatment entry. Participants were given a detailed explanation of the procedures and asked to provide written informed consent. Next, participants completed the M.I.N.I. psychotic screener, MTPT, and PASAT.

Of all potential participants, 78 were eligible and 76 agreed to participate. Eligible participants completed the rest of the M.I.N.I., SCID-II modules, drug treatment history, CES-D, and demographics. Next, participants were randomized into three conditions: SIDI ($n = 28$), SC ($n = 24$), or TAU ($n = 24$). SIDI and SC consisted of six, 1.5-hour sessions administered across weeks 2 through 4 of the participant's stay in the residential center. SIDI and SC were provided in an individual format. All participants received TAU at the residential substance abuse treatment facility (see Participants and Treatment Setting for a description).

At the posttreatment assessment, participants in SIDI and SC completed the CEQ and CALPAS to control for nonspecific therapy effects. Those in the TAU group did not complete these measures because they did not receive individual therapy. Participants in all three conditions were re-administered the CES-D, MTPT, and PASAT.

2.3.1. Skills for Improving Distress Intolerance (SIDI)—See Table 1 for an outline of the skills covered in each session. As for the emotional exposure component, participants were asked to identify several distressing experiences from the past week. Next, guided by the therapist, participants were asked to vividly recall one of these situations until their ratings of distress increased to approximately 80–90 (range 0–100). Next, participants were assisted in applying their newly-learned skills (vs. typical avoidant behaviors) in the context of this elevated negative affect. To gauge the degree of skill acquisition and actual engagement, clients were asked to use the newly-learned skill for 20 minutes (or until their ratings of distress decreased). Progressive muscle relaxation was used as needed at the end of the session to ensure a return to baseline levels of distress. After each session, patients are instructed to practice the new skill whenever possible.

2.3.2. Supportive Counseling (SC)—SC was administered to control for the non-specific elements of therapist contact (time, therapeutic alliance, treatment expectancy). SC

consisted of unconditional support and general discussion of current problems. Therapists were provided with a manual including a script for the initial session and suggestions for potential topics of discussion (e.g., day to day annoyances, concerns related to drug court status, families and relationships, spirituality, relaxation and leisure time, and finances). SC specifically avoided acceptance-based or exposure techniques.

2.4. Therapist adherence

Trained, masters-level therapists administered SIDI and SC. All sessions were audiotaped, and supervision was held weekly by a Ph.D.-level clinician involved in the development of the protocol (KLG). Therapists were given feedback on their adherence during supervision. Approximately 30% of treatment tapes were rated by an independent rater to assess therapist adherence and competence. For both SIDI and SC, specific therapist behaviors were considered “prescribed” and “proscribed” (Waltz et al., 1993) to assure that the treatment delivered in each was distinct. For SC, ratings were made on a scale ranging from 0 (no adherence/competence) to 24 (complete adherence/competence), such that higher scores indicate more adherence/competence. Ratings for SC indicated high therapist adherence ($M = 22.3 \pm 0.8$; 92.9% adherence) and competence ($M = 20.1 \pm 1.1$; 83.8% competence). For SIDI, ratings were made on a scale ranging from 0 (no adherence/competence) to 52 (complete adherence/competence), with higher scores reflecting greater adherence/competence. Ratings for SIDI indicated high therapist adherence ($M = 49.2 \pm 1.9$; 94.6% adherence) and competence ($M = 47.4 \pm 1.8$; 91.2% competence).

3. Analyses and Results

3.1. Construct Validity of the Distress Tolerance Tasks

Providing support for the use of latency to task termination on the MTPT and PASAT as measures of distress tolerance, results of a series of paired t-tests performed on pre- and post-task negative affect ratings revealed an increase in negative affect in response to both tasks at both baseline and posttreatment (for MTPT: $t_s(1) > 5.14$, $p_s < 0.001$, $d_s > 0.52$; for PASAT: $t_s(1) > 5.82$, $p_s < 0.001$, $d_s > .73$). In addition, indices of task performance were not significantly associated with distress tolerance on either task at either time point ($r_s < -.10$ to $+.08$, $p_s > .50$), suggesting that results cannot be attributed to skill level on the tasks.

3.2. Demographic and Clinical Characteristics between Conditions

We compared SIDI, SC, and TAU conditions on demographic, psychopathology, and treatment-related non-specific therapy variables. Tests for between-group differences were one-way analyses of variance (ANOVAs) for continuous variables and chi-square tests for categorical variables. Due to the number of comparisons conducted, a more conservative alpha of 0.01 was used to establish statistical significance. Post-hoc ANOVAs and chi-square comparisons examining differences between any two given groups were used only if the omnibus ANOVAs and chi-square difference tests were significant. If these omnibus tests failed to show significance, specific between-group differences were not probed further. Effect sizes were also noted in all analyses. For continuous dependent variables, Cohen's d was used as a measure of effect size; for categorical variables, the Phi (ϕ) statistic, Cramer's V , and contingency coefficients were used as effect size indicators.

The demographic and clinical characteristics for each treatment group are summarized in Table 2. Treatment groups did not differ significantly on any demographic, psychopathology, treatment history, or court status variable, with two exceptions; however, even after including covariates that approached significance or showed a medium to large effect sizes (age, gender, major depressive disorder, and education), the findings remained the same. Specifically, chi-square analyses revealed significant between-group differences in

rates of both anxiety and borderline personality disorders. Post-hoc two-group chi-square comparisons indicated that participants in the SIDI condition had higher rates of both anxiety and borderline personality disorders than participants in TAU [$\chi^2(1)s = 9.07$ and 7.17 , and $\phi s = .43$ and $.38$, respectively; $ps < .01$], as well as higher rates of borderline personality disorder than participants in SC ($\chi^2(1) = 9.67$, $\phi = .44$; $p < .01$). Although SIDI participants also reported slightly higher rates of anxiety disorders than SC participants, this effect did not reach significance ($\chi^2(1) = 3.42$, $\phi = .26$, $p = .064$). SC participants did not differ significantly from TAU participants in rates of either disorder ($\chi^2(1)s < 1.57$, $\phi s < .19$, $ps > .30$). Thus, these disorders served as covariates in the efficacy analyses. Importantly, SIDI and SC did not differ on therapeutic alliance [$F(1) = .33$; $p = .57$; $d = .17$], treatment expectancy [$F(1) = .52$; $p = .48$; $d = .20$], or treatment credibility [$F(1) = .51$; $p = .48$; $d = .20$].

3.3. Efficacy

Outcome data from the baseline and posttreatment assessments are provided in Table 3 and Figures 1 and 2. (Four people (two in TAU, one in SC, one in SIDI) dropped out of the residential treatment facility before their posttreatment assessment could be completed. We present the findings without these individuals. However, we also conducted the analyses using a “worst-case scenario” where the dropouts were coded to have zero distress tolerance. Findings of these more conservative analyses did not differ from those presented here.). First, a repeated-measures ANCOVA (controlling for borderline personality and anxiety disorders, as well as changes in CES-D scores) was conducted on the composite distress tolerance index; results remained the same when the covariates were not included. All assumptions for the ANCOVA (normality, homoscedasticity, and independence of cases) were met in the current analyses. As noted above, controlling for changes in CES-D scores over the course of the treatment ensures that any observed changes in distress tolerance are not simply the result of changes in this dimension of negative affect in general. As indicated in Figure 1A, results revealed a significant group X time interaction for distress tolerance (see Table 3). Planned comparisons (controlling for borderline personality and anxiety disorders, as well as changes in CES-D scores) indicated that patients in the SIDI condition evidenced significantly greater improvements in distress tolerance than those in the SC [$F(1) = 10.77$; $p < .001$; $d = 1.00$] and TAU [$F(1) = 3.99$; $p < .05$, $d = .60$] conditions. A repeated-measures ANCOVA (controlling for borderline personality and anxiety disorders) revealed no significant group X time interactions for CES-D scores, suggesting that improvement in depression symptoms was comparable across the three groups (see Table 3 and Figure 1B). Next, results of paired-sample t-tests (see Table 3) indicated that patients in SIDI evidenced significant reductions in depression and significant improvements in distress tolerance from pre- to post-treatment, whereas those in SC reported significant improvements only in depression (and actually evidenced significant decreases in distress tolerance from baseline to posttreatment). Individuals in TAU failed to show significant change on either of the outcome variables. Together, these findings suggest that the effect of SIDI on distress tolerance is not simply due to a global improvement in negative affect in general.

Finally, we examined if the changes in distress tolerance were clinically significant (as indexed by the reliable change index (RCI; Jacobson and Truax, 1991)). The RCI is calculated by adding (or subtracting) the pretreatment standard deviation of the outcome measure from an individual pretreatment score. If, at posttreatment, a participant received a score higher (or lower) than the sum above, they are considered to have shown reliable change. A participant at posttreatment can fall into one of three categories: improved (has passed RCI in the expected positive direction), deteriorated (has passed RCI in the expected negative direction), or unchanged (has passed neither). We compared rates of improvement across groups via a series of chi-square analyses (Figure 2). Results indicated an overall effect of treatment condition on distress tolerance [$\chi^2(4) = 16.39$, $p < .01$], with the rate of

improvement in distress tolerance in the SIDI condition significantly higher than in the SC condition [$\chi^2(2) = 11.64, p < .01$], but not the TAU condition [$\chi(2) = 3.02, p = .22$].

4. Discussion

This study compared a novel adjunctive treatment, Skill for Improving Distress Intolerance (SIDI), to Supportive Counseling (SC) and Treatment as Usual (TAU) among SUD patients with low distress tolerance receiving residential substance abuse treatment. Results indicate that patients in the SIDI group evidenced a) greater mean-level improvement in distress tolerance than those in the SC and TAU groups, as well as b) higher rates of clinically significant improvement in distress tolerance than those in the SC group. Further, the observed improvements in distress tolerance are not due simply to a general reduction in negative affect over the course of the treatment. Specifically, SIDI had an effect on distress tolerance even when controlling for changes in depression symptoms (a measure of one dimension of negative affect). Additionally, although all three groups showed improvements in depression symptoms (likely due to the effects of TAU), only the SIDI group showed significant improvements in distress tolerance. The results of this study support the efficacy of SIDI as a brief, adjunctive treatment for improving distress tolerance among SUD patients in residential substance abuse treatment. These findings extend extant research on the development and utility of targeted distress tolerance treatments for substance use disorders (e.g., Brown et al., 2008) by providing evidence for the positive effects of this treatment on distress tolerance specifically. Indeed, findings that SIDI targets distress tolerance directly (and effectively) suggest the potential portability and generalizability of this treatment, highlighting its potential utility for a variety of psychological difficulties and maladaptive behaviors thought to stem from distress intolerance (e.g., Bornovalova et al., 2008; Daughters et al., 2008; Daughters et al., 2009).

Interestingly, although the SC group showed significant improvements in depression symptoms (consistent with research suggesting the clinical utility of non-specific treatment factors and the simple provision of support; see Horvath and Symonds, 1991; Klein et al., 2003), they evidenced a significant decline in distress tolerance over the course of the intervention. Although findings of a negative effect of SC on distress tolerance were unexpected (and suggest some limitations to the use of this particular comparison condition), they are not without support in the literature, as evidence suggests that the venting of emotions alone may not be an effective treatment strategy (Lohr et al., 2007). In particular, there is some evidence to suggest that the venting of emotions is associated with greater emotional avoidance (Rioli and Savicki, 2010). Thus, the focus within the SC condition of having patients verbalize and express ongoing problems and concerns (in the absence of direct instruction on skills for managing distress effectively) may have paradoxically increased their avoidance of this distress.

The current study has three major strengths. First, the treatment was implemented in an at-risk and underserved sample of low SES, primarily minority, SUD patients in a residential substance use treatment facility (one of the most common forms of SUD treatment available in many communities; see SAMHSA, 2008). Second, the study design included two different comparison conditions of varying degrees of therapeutic contact. This allowed us to experimentally control for the influence of non-specific therapy factors (therapeutic alliance, treatment credibility, and contact time) on changes in distress tolerance. Third, we used behavioral (rather than self-report) measures of distress tolerance, which are not subject to reporting biases related to social desirability or insight.

Despite these promising results, however, it is important to be cautious in interpreting the current findings for several reasons. First, the sample size was relatively small. Although the

emergence of significant results despite the small sample size supports the strength of the treatment effects, the small sample size limits the generalizability and statistical conclusion validity of our findings and necessitates replication of these results in larger samples. Second, our use of a rather unique underserved sample of urban, primarily minority, SUD patients makes replication across a variety of SUD populations a priority. Third, in an effort to examine the effects of SIDI on patients' tolerance of distress (rather than just their level of distress), we controlled for changes in one dimension of negative affect (i.e., depressive symptoms) over the course of this treatment. Although findings support the specificity of our treatment to the tolerance (vs. level) of distress, depressive affect is just one dimension of negative affect and distress. To more fully test the specificity of SIDI, future research should assess and control for other dimensions of negative affect. Finally, we included two comparison conditions, including a SC condition that captures non-specific treatment effects and mirrors a common form of treatment often provided in the community (Koekkoek et al., 2010; Andrews, 1993; Spirito et al, 2011). However, neither comparison condition was active or included empirically-supported elements. Further, the SC condition unexpectedly resulted in a decrease in distress tolerance (potentially inflating the positive effects of our active treatment). To address these limitations, future research should compare SIDI to other active interventions that may arguably promote distress tolerance as well. Finally, the lack of a long-term follow-up to examine either the stability of gains in distress tolerance or the effect of SIDI on real-world outcomes (e.g., relapse) necessitates large-scale treatment studies with a follow-up period.

Future investigations could take several directions. First, large-scale longitudinal studies are needed to investigate whether the effects of SIDI on distress tolerance are stable and lasting. Additionally, it will be important to investigate the long-term effects of SIDI on behavioral outcomes such as drug and alcohol relapse. Another research avenue is to identify the active component of SIDI. Specifically, SIDI incorporates a combination of skills-training and exposure-based techniques. Determining which component contributes to the effectiveness of the treatment would be useful for improving the implementation of the treatment, its portability, and its effectiveness in the long-term.

Acknowledgments

Data for this project were collected at the University of Maryland.

Role of Funding

Funding for this study was provided National Institute of Drug Abuse Grants R36 DA021820 and P30 DA028807, and the NIMH had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the paper for publication.

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A. Distress Tolerance Index

B. CES-D

Figure 1. Change on Main Outcome Measures from Baseline to Posttreatment

Abbreviations: SIDI, Skills for Improving Distress Intolerance; SC, Supportive Counseling; TAU, Treatment-As-Usual

Figure 2. Change in Distress Tolerance from Baseline to Posttreatment

Abbreviations: SIDI, Skills for Improving Distress Intolerance; SC, Supportive Counseling; TAU, Treatment-As-Usual; Improved, has passed RCI in the positive direction; Unchanged, has passed neither criterion; Deteriorated, has passed RCI in the negative direction.

Table 1**Overview of Skills for Improving Distress Intolerance (SIDI) Protocol**

Session 1

Overview of treatment goals and rationale.
 Antecedent-Emotion-Behavior-Consequence model
 Identification of distressing situations and emotions
 Begin self-monitoring of provocative situations and emotional and behavioral reactions

Session 2

Review self-monitoring homework
 Introduce acceptance and willingness
 Emotional exposure and behavioral practice
 Assign self-monitoring of acceptance and avoidance behavior

Session 3

Review self-monitoring homework
 Introduce “healthy distraction” skills
 Emotional exposure and behavioral practice
 Assign self-monitoring and practice of healthy distraction

Session 4

Review self-monitoring homework
 Introduce “Interpersonal Effectiveness” skills
 Emotional exposure and behavioral practice
 Assign self-monitoring and practice of interpersonal effectiveness

Session 5

Review self-monitoring homework
 Introduce “layering” (simultaneous use of multiple skills)
 Emotional exposure and behavioral practice
 Assign self-monitoring and practice of layering

Session 6

Review self-monitoring homework
 Review all skills learned
 Plan for future frustrating situations
 Emotional exposure and behavioral practice
 Termination

Table 2

Demographics, Treatment History, and Psychopathology across Groups

	Overall	SIDI	SC	TAU	Significance and Effect Size
	Mean $\pm$ SD or %				
Age, mean $\pm$ SD	43.20 $\pm$ 9.25	43.75 $\pm$ 8.97	40.00 $\pm$ 8.26	45.87 $\pm$ 9.93	$F(1) = 2.55; p = .09; d = .55$
Male, %	71.1%	67.9%	58.3%	87.5%	$\chi^2(1) = 5.18; p = .08; V = .26$
African American, %	90.5%	92.9%	87.5%	90.9%	$\chi^2(1) = .44; p = .80; V = .08$
Education, %					$\chi^2(1) = 1.87; p = .39; C = .22$
Some High School	32.0%	35.7%	29.2%	30.4%	
High School Grad/GED	33.3%	21.4%	45.8%	34.8%	
Some College/Technical	34.7%	42.9%	25.0%	34.8%	
School/College Grad					
Court Mandated to TX	57.9%	50.0%	58.3%	66.7%	$\chi^2(1) = 1.48; p = .48; V = .14$
% with past drug treatment	82.9%	85.7%	87.5%	75.0%	$\chi^2(1) = 1.57; p = .45; V = .14$
Bipolar Disorder, %	12.2%	18.5%	4.2%	13.0%	$\chi^2(1) = 2.47; p = .29; V = .18$
Major Depressive Disorder, %	31.1%	44.4%	29.2%	17.4%	$\chi^2(1) = 4.30; p = .12; V = .24$
Anxiety Disorder (panic, social phobia, OCD, PTSD), %	37.8%	59.3%^a	33.3%^{a b}	17.4%^b	$\chi^2(1) = 9.56; p < .01; V = .36$
Substance Dependence, %					
Alcohol	39.2%	48.1%	41.7%	26.1%	$\chi^2(1) = 2.63; p = .27; V = .19$
Cannabis	13.5%	18.5%	16.7%	4.3%	$\chi^2(1) = 2.44; p = .30; V = .18$
Heroin	29.9%	33.3%	33.3%	21.7%	$\chi^2(1) = 1.02; p = .61; V = .12$
Cocaine	60.8%	63.0%	66.7%	52.2%	$\chi^2(1) = 1.12; p = .57; V = .12$
PCP	12.2%	11.1%	16.7%	8.7%	$\chi^2(1) = .74; p = .69; V = .10$
Borderline Personality Disorder, %	33.8%	59.3%^a	16.7%^b	21.7%^b	$\chi^2(1) = 12.47; p < .01; V = .41$
Antisocial Personality Disorder, %	36.5%	34.8%	41.7%	33.3%	$\chi^2(1) = .52; p = .81; V = .08$

Note: SIDI = Skills for Improving Distress Intolerance; SC = Supportive Counseling; TAU = Treatment-As-Usual. Superscripted letters indicate group differences as determined by ANOVAs and chi-square tests. d = Cohen's d , used as an index of effect size for continuous outcome variables; V and C = respectively, Cramer's V and contingency coefficient (indices similar to a correlation), used as an index of effect size for categorical outcome variables. To control for the probability of type I error, the significance of the p value was set to .01.

Bold indicates a significant omnibus effect.

Table 3

Pre and post-test raw scores between groups

	SIDI		SC		TAU		Group X Time Interaction	
	Pre M (SD)	Post M (SD)	Pre M (SD)	Post M (SD)	Pre M (SD)	Post M (SD)		
CES-D	12.49 (5.55) ^a	8.63 (4.67)	12.47 (5.19) ^b	10.11 (5.85)	10.72 (5.09) ^c	9.81 (5.79)	$F(2,64) = .76, p = .47, d = .29$	
Distress Tolerance	140.81 (86.08) ^d	194.23 (97.91)	146.00 (69.39) ^e	102.96 (109.54)	165.58 (86.65) ^f	167.15 (99.74)	$F(2,63) = 5.45, p < .01, d = .84$	

^a $t(1,26) = 3.36, p < .05, d = .75$

^b $t(1,21) = 2.06, p = .05, d = 0.43$

^c $t(1,21) = .85, p = .41, d = 0.17$

^d $t(1,26) = 2.59, p < .05, d = .58$

^e $t(1,22) = -2.13, p < .05, d = -.47$

^f $t(1,21) = .097, p = .92, d = .02$

Note. SIDI = Skills for Improving Distress Intolerance; SC = Supportive Counseling; TAU = Treatment-As-Usual; DT = Distress Tolerance index; d = Cohen's d .

Bold indicates significant differences from baseline to posttreatment on a paired-sample t -test.