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Refining the Measurement of Distress Intolerance

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Abstract

Distress intolerance is an important transdiagnostic variable that has long been implicated in the development and maintenance of psychological disorders. Self-report measurement strategies for distress intolerance have emerged from several different models of psychopathology and these measures have been applied inconsistently in the literature in the absence of a clear gold standard. The absence of a consistent assessment strategy has limited the ability to compare across studies and samples, thus hampering the advancement of this research agenda. This study evaluated the latent factor structure of existing measures of DI to examine the degree to which they are capturing the same construct. Results of confirmatory factor analysis in 3 samples totaling 400 participants provided support for a single factor latent structure. Individual items of these four scales were then correlated with this factor to identify those that best capture the core construct. Results provided consistent supported for 10 items that demonstrated the strongest concordance with this factor. The use of these 10 items as a unifying measure in the study of DI and future directions for the evaluation of its utility are discussed.

Keywords

distress tolerance; distress intolerance; anxiety sensitivity; discomfort intolerance; assessment

The perceived inability to tolerate negative somatic and emotional states—distress intolerance—is associated with a broad range of symptoms and outcomes in both mental and behavioral health. Links to heterogeneous psychological disorders, such as substance use (Brown, Lejuez, Kahler, Strong, & Zvolesnky, 2005; McHugh & Otto, in press), anxiety (Keough, Riccardi, Timpano, Mitchell, & Schmidt, 2010; Vujanovic, Marshall, Gibson, & Zvolesnky, 2010), eating (Corstorphine, Mountford, Tomlinson, Waller, & Meyer, 2007; Hambrook et al., 2011), and personality disorders (Daughters, Sargeant, Bornovalova, Gratz, & Lejuez, 2008; Linehan, 1993) highlight the transdiagnostic relevance of distress intolerance (DI). In particular, DI may be associated with maladaptive avoidance-based behaviors such as agoraphobic avoidance accompanying panic disorder (White, Brown, Somers, & Barlow, 2006) and maladaptive self regulation strategies such as substance misuse (O’Cleirigh, Ironson, & Smits, 2007) and self-injury (Nock & Mendes, 2008). Intolerance of unpleasant somatic and affective states is hypothesized to amplify the experience of distress, motivating such avoidance behaviors. Accordingly, interventions

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targeting DI have demonstrated efficacy for several psychological disorders (Brown et al., 2008; Tull et al., 2007). Although related to other measures of affect, evidence suggests that DI is indeed distinct from related constructs, such as negative affect and distress intensity (e.g., Leyro, Bernstein, & Zvolensky, 2010; Schmidt, Richey, & Fitzpatrick, 2006; Simons & Gaher, 2006), and impulsive responding to distress (Weitzman, McHugh, & Otto, in press).

The development of measures to assess this construct has occurred within the framework of varied models of psychopathology. Indeed, even the definition of DI has varied, with some defining this construct behaviorally (i.e., the inability to persist toward a goal while distressed), some defining it cognitively (i.e., the perceived inability to tolerate distress), or both (see Leyro et al., 2010). The result is that a number of measures of the construct have been developed, from which no clear gold standard has emerged (McHugh et al., 2011; Otto, Powers, & Fischmann, 2005). The cost of this heterogeneous development is that there is limited ability to compare across studies and measures, despite the perspective that distress intolerance is a core process across a range of disorders (Leyro et al., 2010). Indeed, it remains unclear whether these measures are capturing the same construct. Existing self-report DI measures share little variance with other indices of DI, such as behavioral persistence measures, and measures of DI appear to be at least moderately dependent on the domain of distress around which they are formulated (McHugh et al., 2011). For example, several studies have found evidence that DI varies based on the type of distress, with strong correlations among emotional measures and somatic measures, but poor concordance between these domains (McHugh et al., 2011) and evidence for domain-specific associations between DI and clinical criterion variables (R. A. Brown, Lejuez, Kahler, & Strong, 2002; Sirota et al., 2010). This domain-specificity may partially explain the absence of association between self-report and behavioral persistence measures. The identification of a measure that performs well across distress domains would be particularly useful relative to applicability across disorders and maladaptive behaviors.

In measure development, a similar problem faced the assessment of impulsivity, which, in the late 1990s, was characterized by a large number of measures derived from disparate models of personality. To address this issue, Whiteside and Lynam (2001) administered existing measures of impulsivity to a large sample and conducted a factor analysis to attempt to understand the underlying construct(s) captured by these measures. In addition, Whiteside and Lynam (2001) evaluated the concordance between individual items from these scales with each of the four factors that emerged to identify those most strongly associated with the core construct(s) and to derive a new measure of impulsivity. The resultant UPPS impulsivity scale has since been widely used and yielded important findings with respect to the multi-dimensional nature of impulsivity (Cyders, Flory, Rainer, & Smith, 2009; R. E. Schmidt, Gay, & Van der Linden, 2008; Verdejo-Garcia et al., 2010).

The current study utilizes this same strategy to address issues in the assessment of DI. The goal was to identify the items across existing measures that are most representative of the core construct of DI, in order to better target its measurement and better reflect true variance in that construct. For this evaluation, four measures—the Anxiety Sensitivity Index, Frustration Discomfort Scale, Discomfort Intolerance Scale, and Distress Tolerance Scale (see below)—have received particular attention in the literature, and have each been applied across psychological disorders and symptoms.

The Anxiety Sensitivity Index (ASI; Peterson & Reiss, 1992) is a 16-item measure of fears of and sensitivity to anxiety symptoms and sensations. Although originally targeted to assessing the fear of anxiety sensations (Reiss, Peterson, Gursky, & McNally, 1986), the ASI also has been applied to the assessment of intolerance of a variety of somatic sensations such as pain (Ocanez, McHugh, & Otto, 2010), as well as respiratory discomfort in chronic

obstructive pulmonary disease (Simon et al., 2006) and asthma (Barone et al., 2008). The Frustration Discomfort Scale (FDS; Harrington, 2005a) is a 35-item measure of intolerance of frustration developed based on rational-emotive behavior therapy principles. The FDS has been associated with avoidance-based and maladaptive coping strategies such as procrastination (Harrington, 2005b) and self-harm (Harrington, 2005c) as well as severity of internet addiction (Ko, Yen, Yen, Chen, & Wang, 2008), drug craving (McHugh & Otto, 2009), and symptoms of depression and anxiety (Harrington, 2006). The Discomfort Intolerance Scale (DIS; N. B. Schmidt, Richey, & Fitzpatrick, 2006) is a 7-item measure of avoidance of and difficulty tolerating somatic sensations (e.g., pain). The DIS has been applied to the anxiety disorders, where it has been linked to symptoms of anxiety and is elevated among those with panic disorder (N. B. Schmidt et al., 2006). Results have been mixed with respect to the association between the DIS and anxious responding to somatic symptom inductions, with some studies providing support for this association (Bonn-Miller, Zvolensky, & Bernstein, 2009; N. B. Schmidt, et al., 2007) with others yielding only weak associations (N. B. Schmidt & Trakowski, 1999). In addition, the DIS has been applied to addictive disorders and has been linked to marijuana misuse (Buckner, Keough, & Schmidt, 2007) and motives for nicotine use (Leyro, Zvolensky, Vujanovic, & Bernstein, 2008). The Distress Tolerance Scale (DTS; Simons & Gaher, 2005) is a 15-item measure of ability to tolerate distress. The DTS is the most general of the available self-report measures in its use of the terms “distress” and “upset” instead of a specific distressing state (e.g., frustration). The DTS has been linked to symptoms of bulimia nervosa in response to negative affect (Anestis, Selby, Fink, & Joiner, 2007), marijuana and alcohol misuse (Buckner, et al., 2007) and coping motives for substance use (O’Cleirigh et al., 2007; Zvolensky et al., 2009). It is also elevated among individuals with anorexia nervosa and those with chronic fatigue syndrome (Hambrook et al., 2011).

These four measures capture the range of DI measures that have been applied usefully across areas of psychopathology, with particular links to anxious responding and addictive behaviors. In a series of studies, we examine the covariance among these measures to identify their latent factor structure. These results were then used to create a new measure that includes only the items that best capture the core construct. Specifically, individual items across measures were evaluated to identify those with the highest concordance with the latent factor(s). In identifying the items across existing measures that are most representative of the core construct, the measurement of DI may become more targeted and better reflect true variance in the construct. This analysis was first conducted in a large unselected sample and then replicated in a second unselected sample and a clinical sample to evaluate the reliability of these findings. Although measures assessing tolerance of specific cognitive constructs (e.g., ambiguity, uncertainty) have been conceptualized under the umbrella of DI measures (Leyro et al., 2010), for the purpose of our studies, we did not include these measures because they are not targeted to distressing states per se, but rather reflect states that may or may not be distressing based on individual differences in their interpretation.

Study 1

In the first study, an unselected sample was recruited using community advertisements. A sample of 300 community adults with a mean age of 36.8 years ($SD = 14.4$) completed a battery of DI measures using a web-based data collection program (Survey Monkey). The latent factor structure was first evaluated using exploratory factor analysis (EFA), and then a more restrictive confirmatory factor analysis (CFA). We conducted these procedures sequentially because of a lack of clear guidance from the literature or theoretical perspectives to determine the specification of the number of latent factors in the factor

analysis. Thus, the EFA was first conducted to estimate the number of factors to examine in the more restrictive CFA (see T.A. Brown, 2006).

Methods

Participants—Individuals age 18–80 years old with access to the internet who responded to posted advertisements were eligible to participate and were provided with instructions to access the study website. Participants who completed all study procedures were entered into a raffle with the chance to win cash prizes.

Following data collection, participants were randomly assigned to the first (Sample 1; $n = 200$) or second (Sample 2; $n = 100$) sample for data analysis. Sample 1 consisted of 154 women (77%), 44 men (22%), and 2 transgendered individuals (2%). Participants self-identified ethnicity (6.5% Hispanic/Latino) and race (83.5% Caucasian, 4.5% African American, 7.5% Asian, 4% other); one participant did not report ethnicity and race. The mean age of the sample was 35.6 years ($SD = 14.0$; range = 18–70) and the sample was highly educated, with all participants having completed high school, and 70.5% completing an undergraduate and/or graduate degree.

Sample 2 consisted of 70 women and 30 men. Participants self-identified ethnicity (3% Hispanic) and race (79% Caucasian, 9% African American, 5% Asian, 1% Native Hawaiian/Pacific Islander, 4% other); five participants did not report ethnicity and two did not report race. The mean age of the sample was 35.6 years ($SD = 13.73$; range = 18–80) and the sample was highly educated, with all participants having completed high school, and 74% completing an undergraduate and/or graduate degree.

Procedures—All study procedures were completed through a web-based data collection program (SurveyMonkey) and data collection occurred between July, 2008 and March, 2010. Participants provided informed consent within the web-based program and then proceeded to the questionnaire battery. Finally, participants provided their unique identifying code to confirm completion (for entry into the raffle). All procedures were approved by the Boston University Institutional Review Board.

Measures—The four self-report measures of DI described above were administered as part of the questionnaire battery. Favorable reliability and validity data have been reported for the ASI (Peterson & Reiss, 1992), FDS (Harrington, 2005a), DTS (Simons & Gaher, 2005), and DIS (N. B. Schmidt, et al., 2006).

The interpretation of DTS scores is reverse that for the other measures used, with higher scores reflecting *lower* intolerance. For the purpose of this analysis, the scoring for the DTS was reversed to place all measure scores in the same direction, such that higher scores reflect greater distress intolerance.

Statistical analysis—Following data collection, participants were randomly assigned to the first ($n = 200$) or second ($n = 100$) sample for data analysis. Continuous variables were screened for normality (using the Shapiro-Wilk test) and evidence of skewness, kurtosis, and univariate outliers (defined as values $> 3 SD$ from the mean). Differences between samples relative to demographic factors and study measures were evaluated using independent-samples t -tests and chi-square tests. Given the unequal sample sizes, standard deviations of each measure were evaluated for equivalence prior to these tests.

Given the lack of clear theoretical or empirical perspective to determine the number of latent factors, an exploratory factor analysis (EFA) was first conducted using maximum likelihood estimation and oblique (promax) rotation for multiple-factor solutions using SPSS (SPSS for

Windows, 2001). Measure subscales were used as indicators for the analysis. Subscales were chosen as indicators instead of individual measure items to allow (in the later confirmatory factor analysis) for correlation of error variance among subscales within the same scale. The failure to account for systematic measure covariance in this model could yield latent factors that are attributable to this method effect instead of true score variance. The number of factors was determined using the scree test. These results were then used, in combination with theoretical considerations, to inform a more restrictive confirmatory factor analysis (CFA). This was conducted using a statistical modeling program (MPlus; Muthen & Muthen, 2009) also using maximum likelihood estimation and promax rotation for multiple-factor solutions. Moreover, the error variance of subscales within each scale correlated to control for systematic measurement covariance. This same CFA model was then tested in Sample 2 to evaluate whether the findings in Sample 1 were replicated. Several indices were used to evaluate model fit in the CFA model including χ^2 , the standardized root mean square residual (SRMR), the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis index (TLI). The use of multiple fit indices is consistent with recommendations for conducting a CFA to minimize the limitations of any one index (T. A. Brown, 2006).

Following completion of the CFA, individual items from the measures administered were correlated with the latent factor(s) to determine the measure items that best captured the core of the construct (based on the strength of correlations). For this analysis, z-scores were calculated for each measure subscale (to place all measures on the same scale) and these scores were combined based on the latent factor structure to form composite scores for each factor. In order to account for the different number of subscales for each scale (which would artificially inflate correlations for items from measures with more subscales), an average of the z-scores generated for each of the subscales was calculated for each measure and then combined to form the composite score. Correlations between individual items and these scores were then calculated and the strongest items (items with correlations higher than .60) were extracted.

Results

The distribution of scores for each subscale was roughly normal, with Shapiro-Wilk scores close to 1 (all scores $>.94$) and did not evidence skewness or kurtosis, or univariate outliers. Descriptive statistics for both samples are presented in Table 1. Standard deviations of continuous demographic and DI measures were equivalent in both samples supporting the use of *t*-tests to evaluate group differences. No significant differences between samples with respect to age or any of the DI subscales were noted (*p* values range from .11–.98). There were no differences between samples with respect to sex ($\chi^2 [2, 298] = 3.17, ns$), ethnicity ($\chi^2 [1, 299] = 1.42, ns$), race ($\chi^2 [4, 293] = 5.05, ns$), or education ($\chi^2 [3, 295] = 4.52, ns$).

Sample 1—In the EFA, three eigenvalues greater than 1 were extracted (5.89, 1.42, 1.35). Examination of the scree plot identified a change in slope after the first factor; this factor accounted for 45.3% of the variance in the model. In addition, when examining the two and three factor solutions, there was evidence of possible method effects with the subscales within each measure loading onto the same factor, perhaps due to correlated error variance among subscales within each measure (T. A. Brown, 2006). Given these results, in the CFA we tested a 1-factor latent structure with error covaried among subscales for each measure (i.e., the error for each subscale was correlated with the error for the other subscales from that measure; see Brown, 2006).

Indices of model fit suggested good fit ($\chi^2 [49] = 85.86$, SRMR = .05, RMSEA = .06, TLI = .96, CFI = .97) based on the recommendations of Hu and Bentler (1999). Examination of

residuals and modification indices yielded no localized areas of strain (T. A. Brown, 2006). Scale factor loadings were mostly moderate to strong (.41–.84) and statistically significant, with one poor factor loading (DIS intolerance subscale, loading = .12, *ns*). Factor loadings are presented in Table 2.

Individual item analysis yielded 15 items highly correlated ($r = .60$ or higher) with the composite score. This included 1 item from the ASI, 8 items from the DTS, and 6 items from the FDS. The Cronbach's alpha for these 15 items was .93.

Sample 2—The 1-factor CFA with error variance correlated for each measure was repeated in Sample 2. Results from this sample replicated the results from Sample 1. Indices of model fit similarly supported good model fit ($\chi^2 [49] = 72.59$, SRMR = .06, RMSEA = .07, TLI = .95, CFI = .97), and no areas of strain were identified. Factor loadings were similar to Sample 1 with all loadings in the moderate to strong range (.47–.78) and statistically significant, with the exception of the DIS intolerance scale which exhibited a smaller, yet statistically significant, loading (.24, $p < .05$).

The individual item analysis was repeated in Sample 2. The results were very similar to Sample 1 with 16 items exhibiting correlations of .60 or greater. The Cronbach's alpha for these 16 items was .94. Five items did not overlap and 13 items were consistent across both samples.

Study 1 Discussion

In a large unselected sample, a one-factor model of DI was extracted from four candidate self-report measures that have been widely applied in the measurement of DI; this was replicated in a second unselected sample. This model exhibited strong fit to the data in both the original and replication samples. These results are consistent with an evaluation of the shared variance among these DI self-report measures that supported moderate to high correlations among these measures in both clinical and unselected samples (McHugh et al., in press).

In addition, individual items most strongly correlated with the composite score across measures were extracted. This resulted in 15 items in Sample 1 and 16 items in Sample 2, with 13 items replicated in both samples. The internal consistency reliability of these items collapsed across both samples was very strong ($\alpha = .92$).

This analysis in two unselected samples provided support for the one-factor model based on a broad range of scores from community participants that presumably capture non-clinical, sub-clinical, and clinical individuals (see range of scores in Table 1). However, given the particular relevance of the measurement of DI in clinical groups, it is important to replicate these findings in a clinical sample. Study 2 presents the results of a replication of this model in a sample of treatment-seeking patients.

Study 2

The same one factor model was tested in a clinical sample, consisting of patients diagnosed with a unipolar mood or anxiety disorder who were seeking treatment at a specialty affective disorders clinic. The aim of this analysis was to examine the reliability of the findings from Study 1 with respect to both the latent factor structure and individual items demonstrating the strongest concordance with a composite score calculated based on this factor structure.

Method

Participants—Individuals presenting for treatment at an outpatient clinic specializing in the treatment of anxiety and unipolar mood disorders were recruited for this study. Potential participants had completed an initial structured diagnostic evaluation (Anxiety Disorders Interview Schedule for *DSM-IV*: Lifetime Version; DiNardo, Brown, & Barlow, 1994) as part of clinic procedures and met Diagnostic and Statistical Manual for Mental Disorders, 4th Edition, Text Revision (*DSM-IV-TR*; American Psychiatric Association, 1994) criteria for an anxiety or unipolar mood disorder. Individuals age 18–80 years old with access to the internet were eligible to participate. Interested patients were emailed instructions to access the study procedures. Participants who completed all study procedures were entered into a raffle with the chance to win cash prizes.

One hundred participants were enrolled in the study including 65 women, 34 men, and 1 transgendered individual with a mean age of 31.4 years ($SD = 11.7$, range = 18–69). The sample was mostly Caucasian (90%), followed by other race (5%), Asian (3%), and African American (2%). Eight participants identified as Hispanic/Latino. One participant did not report race or ethnicity. The sample was highly educated, with 69% having completed college or graduate education, 28% completing some college, and all completing high school or an equivalent. Participants were asked to self-report diagnosis based on results of their diagnostic intake assessment. Based on this report, 33% met a diagnosis for panic disorder or panic disorder with agoraphobia, 32% for social phobia, 50% for generalized anxiety disorder, 9% for obsessive-compulsive disorder, 0% for posttraumatic stress disorder, 5% for specific phobia, 13% for major depressive disorder, 5% for dysthymia, 11% for other anxiety disorder, 4% for other depressive disorder, and 7% for other disorder (e.g., somatoform disorder). Fifty-three percent reported 1 diagnosis, 28% reported 2 diagnoses, and 17% reported 3 or more diagnoses; 2% did not respond to the diagnosis question.

Procedures and statistical analysis—Following recruitment, all procedures from Study 1 were replicated. The 1-factor CFA model tested and replicated in Study 1 was tested in this sample. All model specifications were maintained and individual items were examined as in Study 1.

Results

The distribution of scores for each subscale was evaluated for normality and one scale evidenced minor deviation from normality (Shapiro-Wilk test $> .80$), but evidenced no skewness or kurtosis. No outliers were identified. Given that maximum likelihood estimation is robust to minor deviations from normality (Chou & Bentler, 1995), analyses proceeded as planned. Descriptive statistics are presented in Table 1.

Fit indices for the CFA supported good model fit ($\chi^2 [49] = 64.12$, SRMR = .05, RMSEA = .06, TLI = .97, CFI = .98) and no localized areas of strain were identified. Scale factor loadings were moderate to strong (.52–.92) and statistically significant, with the exception of the DIS intolerance subscale (loading = .37, $p < .001$). Factor loadings are presented in Table 2.

Individual item analysis yielded 20 items with correlations of .60 or higher of which 10 overlapped with the results of Samples 1 and 2 from Study 1. Internal consistency reliability for the 20 items was .93. The 10 overlapping items across the 3 samples were retained as the 10 items that best capture the core DI construct. These items and their correlations with the latent factor in the three samples are presented in Table 3.

Study 2 Discussion

In this study, we replicated the findings from Study 1 in a clinical sample. A one factor latent structure demonstrated good model fit in the CFA and individual item analysis yielded a similar list of items to those from the two samples in Study 1. The replication of these findings in a clinical sample suggests that this latent factor structure is robust across a wide range of values including those characterizing clinical samples in which intolerance of distress is elevated.

General Discussion

Using the four most widely applied measures of DI—each based on different theoretical models—we found a one-factor solution with all factor loadings in an acceptable range (i.e., $> .40$) and good overall model fit in both unselected and clinical samples. This single factor solution was replicated across three large samples, including a total of 400 participants, suggesting that the degree of concordance of these measures is high. This finding is consistent with previous investigations suggesting strong overlap among self-report measure of DI (McHugh et al., 2011), despite support for multi-factorial solutions in investigations of individual measures (thus resulting in the subscales for each of the four measures evaluated).

These findings differ from a prior investigation of the latent factor structure of the ASI, DTS, and DIS, which suggested that these measures reflected related, but distinct constructs (Bernstein, Zvolensky, Vujanovic, & Moos, 2009). However, the current study adds to previous studies in several ways. First, our study controlled for method effects related to shared measurement strategies (e.g., response sets) of subscales within each measure, unlike the previous study, which did not account for potential shared error variance within each measure. Additional covariation due to a shared measurement strategy and not the latent construct can yield misleading results in factor analysis; specifically, it can lead to the identification of additional factors that better represent shared covariance due to the measurement approach (see T. A. Brown, 2006; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Bernstein et al.'s use of only EFA (and not CFA) precluded model specification to correct for this potential method effect. Second, in the current study, the use of maximum likelihood estimation allows for the evaluation of model fit (the ability of the model to recreate the observed covariance of the indicators). The estimator used in the Bernstein et al. (2009) study (principle factors) does not allow for an evaluation of model fit, and thus the interpretability of the model is limited because there is no index of the degree to which the model is consistent with the observed covariance among indicators (T. A. Brown, 2006). Finally, the current study included a broader set of samples relative to Bernstein et al. (2009), who excluded individuals with Axis I disorders; however, like previous studies could exhibit selection bias that could impact generalizability. Nonetheless, additional study of the relationships and potential redundancies of these measures is needed to better understand DI and its potential facets.

Across the three samples, 10 items demonstrated the strongest concordance with the underlying factor, and thus represent the items that best capture this construct across measures in the samples studied. Examination of these items suggests that peripheral items included on DI measures—such as items measuring acceptance of distress (e.g., “I am ashamed of myself when I feel distressed or upset”)—were less strongly associated with the core construct. The content best reflecting this construct includes negative affective response to distress (e.g., “It scares me when I am nervous”) and strong action tendencies to remove this distress (e.g., “I’ll do anything to stop feeling distressed or upset”). Thus, considering both the data collected in this study as well as theoretical considerations regarding the nature of DI, these items appear to be strongly representative of DI. In a separate study examining the use of these 10 items as a measure of DI, there was further evidence for strong internal

consistency reliability as well as strong concurrent validity with both self-report and behavioral measures of DI (across several types of distress) and evidence for elevations in clinical relative to healthy samples (McHugh & Otto, in press), providing further support for the construct validity of these 10 items as an index of DI. Additional evaluation of construct validity, particularly relative to other measurement strategies and relevant clinical outcomes is needed to determine the utility of this measure.

This finding raises the issue of the distinction between sensitivity to distress and tolerance of distress, which has been perhaps the greatest source of inconsistency with respect to definitions of DI (McHugh et al., 2011). Specifically, some models define DI more broadly as a cognitive factor reflecting the perceived inability to handle distress (Simons & Gaher, 2005), whereas others take a more behavioral tolerance (i.e., persistence while distressed) perspective (R. A. Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005). Our study suggests that sensitivity to distress and intolerance of distress are very highly correlated, and thus may not reflect distinct constructs.

If sensitivity and intolerance do indeed reflect distinct constructs, the discrimination of these constructs in self-report measures may not be feasible. The ability of respondents to distinguish sensitivity (e.g., “I dislike distress;” “I feel nervous when I experience distress”) from tolerance (e.g., “I can’t handle distress;” “I try to get rid of distress as soon as possible”) is likely limited. Future research evaluating laboratory paradigms for clarifying this distinction will be needed to determine the theoretical and clinical utility of distinguishing between distress sensitivity and distress intolerance. Our current results suggest that these two concepts may best be captured as a single construct, at least when self-report measurement is being utilized. Indeed, the 10 items identified in this study are consistent with definitions of DI both from a cognitive/emotional (anxious responding to distress) and behavioral (action tendency to avoid distress) perspective.

Consistent with previous work (e.g., Bernstein et al., 2009), the DIS exhibited the lowest factor loadings with the latent factor and no items emerged from this scale that demonstrated strong concordance with this factor. The DIS was developed specifically as a measure of uncomfortable physical symptoms (N. B. Schmidt et al., 2006), and thus differs somewhat from other measures that tend to target affect. However, this did not emerge as a distinct factor in the factor analysis, implying that this is not necessarily a separate construct. Moreover, other measures include either items that are also somatic in nature (the ASI) or use general definitions of distress that may be interpreted as either somatic or emotional (the DTS).

The results from the studies reported in this manuscript provide further support that the current self-report measures of DI share substantial overlap. Given no clear gold standard measure at this time, the extraction of the best performing items across these measures may provide a refinement of the existing self-report strategies. A separate issue is the inconsistent performance of self report measures with respect to their ability to predict behavioral or *in vivo* response to distress. For example, McHugh et al. (2011) found a lack of association between self-report and behavioral measures of DI across four samples. This lack of concordance may be due to the heterogeneity of items within these measures. For example, some of the measures used in the current study include items that may capture related, but peripheral, constructs, such as emotional acceptance. The degree to which these measures are overly inclusive of distinct emotional constructs may partially explain the failure of self-report and behavioral persistence measures to cohere. We believe that in extracting the most core items, this new measure may better capture the essence of DI that is also reflected in behavioral persistence measures. Thus, although the current refinement of these measures is limited by the measures from which it was derived, we believe that this new measure may

improve upon existing self-report measures by retaining only the items most directly reflective of DI. Whether these 10 items perform better than the measures from which they derives (e.g., with respect to criterion validity) will require further evaluation. However, a preliminary study provided support for its correlation with behavioral measures across types of distress (McHugh & Otto, in press).

This study has provided an initial step toward informing the measurement of DI via self-report methods. Although there are numerous benefits to self-report measurement, including the ease of administration and feasibility for use in service provision settings for clinical purposes, improving the measurement of DI will require the consideration of other methods of measurement (e.g., behavioral measures). There are limitations of both self-report and behavioral measures and thus the utilization of multiple methods and novel methods (e.g., McHugh, Hearon, Halperin, & Otto, 2011) for the measurement of DI will be needed to advance this research agenda. In particular, studies to understand the reasons for the failure of self-report and behavioral measures to cohere are needed. Of note, the degree to which self-report and behavioral measures map onto clinical outcomes has varied, with some suggesting that self-report measures are better indices of psychological functioning (e.g., Bernstein, Marshall, & Zvolensky, 2011) and others suggesting that behavioral measures better predict symptoms and other outcomes (e.g. R. A. Brown et al., 2009). There are several limitations to our studies. First, all data collection was conducted via a web-based program and thus was potentially subject to selection bias based on comfort with the internet. In order to prevent participants from completing the study multiple time to increase the likelihood of winning the lottery, we used participant contact information (collected so that we could contact raffle winners) to track completion of the study. However, we cannot rule-out the possibility that a participant completed the study more than once by providing a fake name and two different contact phone numbers/email addresses. Second, this study did not include other methods of measurement and thus the evaluation of the validity of this new measure with respect to other criteria (i.e., further evaluation of construct validity) was not possible. In addition, the strategy employed in this study is only one of several potential strategies for measure development. Finally, the stability of this model over time cannot be determined in this cross-sectional study; further evaluation in prospective designs is needed. The continued study of this refined measure is needed to further evaluate this particular measure and its utility in the study of DI.

In summary, this study of three samples totaling 400 participants provided consistent support for a one factor latent structure of the four major DI measures and identified 10 core items across these measures that may best capture this construct. Preliminary examination of these items provided support for the concurrent validity of this measure relative to both behavioral DI measures and clinical measures (McHugh & Otto, in press). Further evaluation of this strategy, particularly relative to its application across distress domains and across psychological disorders and maladaptive behaviors is needed. At this time, a measure that can be utilized across domains of distress can help to provide much-needed consistency across investigations to advance this important research agenda.

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Highlights

1. Distress intolerance is an important transdiagnostic vulnerability factor.
2. Measurement of distress intolerance is hampered by inconsistency across studies.
3. Measures of distress intolerance appear to load on 1 latent factor.
4. Use of 10 items drawn from existing measures may provide a good alternative to use of multiple measures.

Table 1

Descriptive Statistics for Study 1 and Study 2

Variable	Study 1			Study 2		
	Sample 1			Sample 2		
	mean (SD)	range		mean (SD)	range	
age	35.6 (14.0)	18–70		31.4 (11.7)	18–80	18–69
ASI	20.3 (10.7)	1–60		26.9 (11.7)	0–60	3–52
DIS	17.5 (6.1)	5–35		15.3 (6.8)	6–35	3–29
DTS	2.4 (0.9)	1–4.7		3.1 (0.9)	1–4.8	1–5
FDS	78.1 (17.8)	34–135		83.6 (22.1)	28–114	28–140

Note. ASI = Anxiety Sensitivity Index; DIS = Discomfort Intolerance Scale; DTS = Distress Tolerance Scale; FDS = Frustration Discomfort Scale

Table 2

Factor Loadings (SE) in the 1-Factor Solution

Subscale	Study 1		Study 2
	Sample 1	Sample 2	
ASI physical	.64 (.05) **	.70 (.06) **	.55 (.08) **
ASI cognitive	.70 (.04) **	.75 (.05) **	.70 (.06) **
ASI social	.53 (.06) **	.48 (.08) **	.52 (.08) **
DIS intolerance	.12 (.07)	.24 (.10) *	.37 (.09) **
DIS avoidance	.43 (.06) **	.47 (.08) **	.53 (.08) **
DTS tolerance	.71 (.05) **	.72 (.06) **	.66 (.06) **
DTS appraisal	.83 (.03) **	.85 (.05) **	.72 (.06) **
DTS absorption	.68 (.05) **	.76 (.06) **	.64 (.07) **
DTS regulation	.65 (.05) **	.70 (.07) **	.68 (.06) **
FDS discomfort intolerance	.55 (.06) **	.56 (.08) **	.73 (.06) **
FDS entitlement	.41 (.07) **	.49 (.08) **	.65 (.07) **
FDS emotional intolerance	.84 (.03) **	.78 (.05) **	.92 (.04) **
FDS achievement	.49 (.06) **	.49 (.08) **	.66 (.07) **

Note. ASI = Anxiety Sensitivity Index; DIS = Discomfort Intolerance Scale; DTS = Distress Tolerance Scale; FDS = Frustration Discomfort Scale.

*
p < .05.

**
p < .01

Table 3

Items with the Strongest Factor Loadings

Item	Scale	Study 1		Study 2
		Sample 1	Sample 2	
It scares me when I am nervous.	ASI	0.64	0.66	0.71
I can't handle feeling distressed or upset.	DTS	0.68	0.66	0.71
Other people seem to be able to tolerate feeling distressed or upset better than I can.	DTS	0.62	0.65	0.64
Being distressed or upset is always a major ordeal for me.	DTS	0.62	0.72	0.7
My feelings of distress or being upset scare me.	DTS	0.65	0.6	0.66
I'll do anything to stop feeling distressed or upset.	DTS	0.6	0.61	0.62
When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels.	DTS	0.62	0.69	0.62
I must be free of disturbing feelings as quickly as possible; I can't bear if they continue.	FDS	0.67	0.65	0.77
I can't stand situations where I might feel upset.	FDS	0.71	0.68	0.75
I can't bear disturbing feelings.	FDS	0.71	0.68	0.71
Cronbach's alpha		0.91	0.91	0.92

Note. ASI = Anxiety Sensitivity Index; DTS = Distress Tolerance Scale; FDS = Frustration Discomfort Scale