A novel method for assessing distress intolerance: Adaptation of a measure of willingness to pay

R. Kathryn McHugh*, Bridget A. Hearon, Daniella M. Halperin, Michael W. Otto

Department of Psychology, Boston University, 648 Beacon Street, 5th Floor, Boston MA 02215, USA

ABSTRACT

Background and Objectives: Distress intolerance is a core element of many models of psychopathology and is related to a range of disorders and maladaptive behaviors. However, research on distress intolerance has been hampered by inconsistency in its assessment. Moreover, recent perspectives suggest that distress intolerance varies based on the domain of distress, highlighting the need for a measure that can capture intolerance across types of distress. This paper introduces a novel measure for distress intolerance: an adaptation of the willingness to pay (WTP) measure, which provides a consistent metric for assessing distress intolerance across domains of distress.

Methods: The WTP Distress Intolerance (WTP-DI) measure was administered to two samples of participants and feasibility and validity were evaluated.

Results: Evidence from unselected and clinical samples provide evidence for the feasibility and discriminant and concurrent validity of this measure.

Limitations: Testing WTP-DI in larger samples and across additional domains of distress is needed.

Conclusions: The WTP-DI measure provides a new measure of distress intolerance that addresses the primary limitations of existing measures and has potential to serve as a cross domain measure to facilitate comparison across types of distress.

1. Introduction

Distress intolerance (DI) is defined as the perceived inability to withstand distressing states and is hypothesized to be a central element of many psychological disorders (see for review Leyro, Zvolensky, & Bernstein, 2010). DI is hypothesized to amplify these states (McHugh et al., in press; Zvolensky & Otto, 2007), thereby increasing motivation for avoidance-based coping strategies, such as agoraphobic avoidance (e.g., White, Brown, Somers, & Barlow, 2006), substance use (e.g., Kushner, Thuras, Abrams, Brekke, & Stritar, 2001), and self-injury (e.g., Nock & Mendes, 2008) that may contribute to disorder onset and maintenance. Accordingly, many cognitive-behavioral treatments target the reduction of DI (e.g., Brown et al., 2008; Hayes, Strosahl, & Wilson, 1999; Linehan, 1993; Otto, Safren, & Pollack, 2004). Despite the importance of assessing DI to both research and clinical agendas, there currently is no consensus regarding its measurement, and existing measures are limited by few validation studies, low shared variance across measures, and a failure to account for the potential variability in tolerance based on the type of distress. In this article, we propose a novel strategy for assessing DI that provides a single metric for measurement across varied domains.

1.1. Issues in DI assessment

Recent evidence has suggested that DI is distress domain-specific, or varies based on the type of distress (e.g., McHugh & Otto, in press; Sirota et al., 2010). For example, McHugh et al. (in press) evaluated the shared variance among DI measures and found that behavioral measures that induced emotional distress (e.g., frustration) were strongly associated with each other, but were not associated with those that induced somatic distress (e.g., pain). Moreover, there was evidence for method variance, with self-report and behavioral measures sharing little variance, even within similar domains. The domain-specificity of DI underscores the need for measures that are applicable across types of distress in order to facilitate comparisons across distress domains as well as across populations and studies. However, current self-report measures treat distress as a unitary construct or focus on one type of distress (e.g., frustration). Likewise, behavioral measures are limited by their induction of only one type of distress as well as other determinants of persistence (e.g., motivation).
The assessment of DI is subject to the same challenges as measures of emotion regulation. Aldao, Nolen-Hoeksema, and Schweizer (2010) highlighted three particular problems with such measurement that, with only subtle changes, can be applied to DI: (1) the ability to report on one’s perceived ability to tolerate distressing states requires awareness of both one’s own distress and response to distress; (2) DI is very closely tied to the experience of the distress itself and thus distinguishing between the nature and intensity of distress and one’s tolerance may be particularly challenging; and (3) there is potential for shared item content between emotional symptoms and DI items.

The purpose of this paper is to describe a novel strategy for the assessment of DI that can be utilized across distress domains and that circumvents many of the challenges to designing measures of emotion regulation. We describe an adaptation of the widely used willingness to pay (WTP) measure from economic research for the measurement of DI.

1.2. Willingness to pay

Several methods are available in economics for evaluating the utility of non-market goods, resources, and services. One value elicited in such methods is an individual’s willingness to pay for the outcome of interest. WTP provides a metric for the evaluation of individual or group perceptions of utility in hypothetical scenarios for which such data would otherwise be difficult or impossible to attain (e.g., Arrow et al., 1993; Portney, 1994). For example, in psychology, this method has been applied to the burden of disease and valuation of treatment for conditions such as depression (Morey, Thacher, & Craighead, 2007) and schizophrenia (Lang, 2005). Among methods for elicited WTP values, the contingent valuation method (CVM) or stated-preference model involves asking respondents to identify the value that they would hypothetically be willing to pay. CVM can also elicit other values, such as willingness to accept—or the highest value at which a respondent would accept a particular outcome.

The administration format (interview, self-report) and content (yes/no, actual monetary responses) of measures of WTP varies across studies with pros and cons associated with various methods of administration. Overall, WTP has demonstrated favorable validity (e.g., Foreit & Foreit, 2003; Philips, Whyes, & Avis, 2006) and reliability (e.g., Foreit & Foreit, 2003; Loomis, 1990; Kealy, Montgomery, & Dovidio, 1990; Teisl, Boyle, McCollum, & Reiling, 1995).

Applications of WTP provide information about individual and group valuation of goods and services that may be difficult to measure because they lack a meaningful metric. By extension, WTP may provide an index of the value of tolerating versus avoiding/removing distress.

1.3. Adapting willingness to pay

The WTP measure addresses two of the major limitations of existing DI measures by (1) providing a flexible method that balances the benefit of behavioral measures (e.g., the ability to measure in vivo reaction to distress) with the benefit of self-report measures (e.g., the lessened contribution of confounding factors such as demand characteristics or other motivations to continue a distressing task) and (2) providing a consistent metric that can be utilized across types of distress and across investigations to facilitate comparison. The same WTP questions can be applied to any type of somatic (e.g., pain, respiratory discomfort) or emotional (e.g., anxiety, frustration, sadness) distress domain. Self-report measures could also capture levels of DI across types of distress; however, assessing a range of types of distress in a self-report measurement would result in a particularly lengthy measure and would not capture in vivo response to distress.

This format also circumvents some of the major challenges of measuring emotional variables by (1) requiring less emotional awareness because respondents are rating their valuation of removing a state rather than describing the state or their response to it, (2) asking specifically about the value of removing an experience, thus minimizing confusion with rating the intensity of the experience itself, and (3) not sharing item content with measures of the experience of distress.

We developed an adapted version of WTP for distress intolerance (WTP-DI; see Appendix). This measure assesses how much a respondent would be willing to pay to avoid distress following the induction of that distressing state. Items use a forced-choice format in which participants chose from several monetary values expressed as proportion of monthly income (0% to >15% of monthly income). This measure was designed to be utilized following the elicitation of a distressing state in order to evaluate in vivo response to these states and to provide the participant with a context for determining ratings. Thus, the wording of the measure was designed such that it could be applied to any type of distress. Proportion of monthly income was selected as the metric to minimize the impact of income on responding, consistent with previous studies (Damschroder, Ubel, Riis, & Smith, 2007). Although in previous applications of WTP in mental illness (e.g., estimating WTP to remove depression; Morey, Thatcher, & Craighead, 2007) actual dollar value elicited is meaningful, in this application, we focus on relative WTP values. In other words, we conceptualize the units of WTP as important relative to differences between groups and between distress domains within individuals.

Below we describe two studies utilizing the WTP-DI with the aim of evaluating the feasibility and utility of such measurement relative to other measures of DI.

2. Study 1

The WTP-DI measure was administered to 39 participants who were enrolled in a study examining the association between affect and eating behaviors in overweight individuals. Rates of measure completion and respondent ease of use ratings were used to assess feasibility of use of the measure. In addition, convergent and discriminant validity was assessed by the correlations between WTP-DI and self-report and behavioral indices of DI.

For this initial investigation, completion rates higher than 90% and a majority of favorable ratings (at least slightly easy) on a scale of ease of use were considered support for measure feasibility. We hypothesized that the WTP-DI would exhibit concurrent validity with self-report and a behavioral persistence DI measures as evidenced by correlations reflecting a medium effect size or larger ($r \geq .24$). As this study employed two mood inductions (frustration and sadness), we hypothesized that these correlations would be

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1. This version of WTP-DI could also be adjusted with respect to the time period of interest. We have experimented with various time periods in initial versions and did not find reliable differences. We prefer this current version because it is the clinical conceptualization that best characterizes syndromes (i.e., behaviors initiated to avoid the development or maintenance of a distressing state).

2. One concern traditionally in the application of WTP is that the “payment card” format (such as that used in this study, where responses are framed for the participant) may constrain the WTP values through the use of pre-determined values. Specifically, a frame that is overly narrow limits the ability to detect significant individual or group differences. However, given that we were able to detect such differences suggest that our frames are broad enough so that important individual differences were captured.
2.1. Method

2.1.1. Participants

Individuals age 18 and older were screened to identify those who were overweight (Body Mass Index > 25) and non-depressed as judged by a Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) score less than 14. Thirty-nine participants (19 women) provided informed consent and were enrolled in the study. The mean age of the sample was 39 years (SD = 15.38, range = 19–66). The majority of the sample was non-Hispanic (82.1%) with 56.4% self-identified as Caucasian, 28.2% as African-American, 5.1% as Asian, and 10.3% as other race.

2.1.2. Procedure

Participants first completed a battery of self-report questionnaires followed by mood induction procedures and administration of the WTP-DI. Frustration was induced using a computer task (see below) and sadness was then induced as participants watched two brief movie clips that have been validated as sadness induction stimuli (Gross & Levenson, 1995).

2.1.3. Measures

The WTP-DI was administered by study staff. Respondents were instructed to provide ratings of willingness to pay to avoid distress based on the type of distress they were experiencing at the time (e.g., pain) and not desire to avoid the stimulus (e.g., being cold) using a forced-choice option for selecting one of seven valuation amounts. These valuation amounts were treated as scores on a 0–6 scale as per other commonly used measures in the field (e.g., Clinical Global Impression Scale severity or improvement ratings). For example, an individual who reported a WTP of 5% of income had a score of 3. Respondents rated measure difficulty on a 1–5 Likert scale.

Additionally, three self-report and one behavioral measure of DI were administered. The Anxiety Sensitivity Index (ASI; Peterson & Reiss, 1992) is a self-report questionnaire that assesses fears of anxiety-related symptoms. The ASI has demonstrated good reliability and validity in adult samples (Peterson & Reiss, 1992) and internal consistency reliability in this sample was strong (α = .91). The Distress Tolerance Scale (DTS; Simons & Gaheer, 2005) is a self-report measure that assesses emotional distress tolerance. The DTS has been shown to have high internal consistency and test–retest reliability (Simons & Gaheer, 2005) and internal consistency reliability in this sample was strong (α = .92). The Frustration Discomfort Scale (FDS; Harrington, 2005) is a self-report measure that assesses frustration intolerance beliefs. Data on psychometric properties of the FDS indicates strong internal reliability and discriminant validity (Harrington, 2005). The discomfort intolerance (α = .84) and emotional intolerance (α = .74) scales were used in the analysis.

The Computerized Mirror Tracing Persistence Task (MTPT-C; Strong et al., 2003) is a computer-based task that requires participants to trace a red dot along the shape of a star using a mouse, which has been programmed to move the dot in the opposite direction. When a tracing mistake is made a loud buzzer sounds and the dot returns to the starting position. Participants were informed that they could end the task at any time and time to discontinuation was used as a measure of task persistence. The task automatically ended after 7 min.

2.2. Results

All participants who enrolled in the study completed the WTP-DI resulting in no missing data. Participants reported high levels of ease with the measure, with ratings of somewhat or very easy by 66.6% of participants. No participant endorsed the measure as very difficult. The duration of administration was approximately 2–3 min.

Results of a manipulation check (examining change in self-reported distress comprised of ratings of anxiety, irritability, frustration, and difficulty concentrating) confirmed that the MTPT-C successfully increased distress (t(258) = 6.04, p < .001). WTP-DI scores ranged from 0 to 6 (i.e., 0% to >15% of income), with a mean rating of 1.9 (SD = 1.9). The mean value rating reflected a DI valuation of “2% of monthly income.” Consistent with hypotheses, WTP-DI was associated with FDS scale scores in the range of a medium effect size with results approaching significant for the discomfort intolerance scale (r = .31, p = .06) and a subtle trend for emotional intolerance (r = .27, p = .10). The correlation was of a similar magnitude for the DTS (r = −.38, p < .05) and of a smaller magnitude for the ASI (r = .17, ns). The correlation with the MTPT-C was small (r = −.10) and non-significant. See Table 1.

2.3. Study 1 discussion

This pilot study provided preliminary support for the feasibility of WTP-DI as measured by completion rates (no missing data points) and highly favorable difficulty of use ratings (more than half of participants reported that the measure was “very easy”). In evaluating concurrent validity with self-report measures, medium effect size associations were found for 2 of the 3 measures administered (due to the small sample size in this preliminary analysis, only 1 of these associations reached statistical significance). Contrary to hypotheses, there was a modest and non-significant association between WTP-DI scores and the MTPT-C. It is of note that the MTPT-C measure also correlated poorly with other DI measures in the study. Importantly, unlike some previous evaluations of DI, no incentive was provided to participants to enhance motivation to engage in the task. In Study 2, this association was evaluated again in a larger sample with the use of incentives for task engagement. Additionally, Study 1 was limited by the combination of frustration and sadness induction, thus precluding the comparison of WTP-DI across domains of distress.

3. Study 2

In Study 2, a clinical sample and a comparison sample were recruited and the WTP-DI measure was administered across four domains of distress. This study design allowed for several important tests for evaluating WTP, including (1) evaluation of criterion validity as judged by association with clinical status, (2) evaluation of concurrent and discriminant validity relative to both behavioral persistence and self-report DI measures, and (3) testing the validity

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTP-DI</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>MTPT-C</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ASI</td>
<td>.17</td>
<td>.10</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>DTS</td>
<td>–38*</td>
<td>–17</td>
<td>–12</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>FDS-DI</td>
<td>31</td>
<td>20</td>
<td>39*</td>
<td>25</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>FDS EI</td>
<td>.27</td>
<td>.06</td>
<td>.59**</td>
<td>.42**</td>
<td>.64**</td>
<td>–</td>
</tr>
</tbody>
</table>

Note. WTP-DI = Willingness to Pay: Distress Intolerance, MTPT-C = Computerized Mirror Tracing Persistence Task, ASI = Anxiety Sensitivity Index, DTS = Distress Tolerance Scale, FDS-DI = Frustration Discomfort Scale, FDS EI = Frustration Discomfort Scale Emotional Intolerance subscale. Higher scores on the MTPT-C and DTS are associated with lower DI.

*p < .05, **p < .01.
of the application of WTP across distress domains. In addition, feasibility of the measure administration and associations with education and income were evaluated.

We hypothesized that (1) the feasibility and acceptability of WTP-DI would be high, consistent with Study 1, (2) WTP would distinguish clinical groups in hypothesized directions (i.e., with healthy control participants demonstrating the lowest WTP scores and participants with a substance use disorder demonstrating the highest scores), (3) WTP-DI for each distress domain would be strongly associated with the behavioral persistence measure for that domain (in the range of a medium effect size or larger) and would demonstrate smaller correlations with other persistence measures, and (4) WTP-DI within each domain would be moderately correlated with the self-report measures (with higher correlations for those with some specificity to the distress domain).

### 3.1. Method

#### 3.1.1. Participants

Participants were recruited for a study examining DI in individuals diagnosed with illicit substance dependence. A group with a current Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV; American Psychiatric Association, 1994) diagnosis of drug dependence and a comparison group were recruited and equated based on proportion of the sample that was female and presence of an emotional disorder (see Table 2). Inclusion criteria included basic computer skills, ability to read and provide informed consent, and absence of a current or past diagnosis of bipolar disorder or a psychotic disorder. Participants in the substance dependence (SUD) group were recruited from urban methadone maintenance clinics. Participants for the healthy comparison (HC) subgroup were included if they were free of any current or past Axis I diagnosis. Participants for the affective disorder (AD) subgroup were included if they met criteria for a current unipolar mood or anxiety disorder and reported no history of a substance use disorder.

Participants in this analysis included 25 individuals with current substance dependence and 30 participants selected based on the presence or absence of an affective disorder (n = 19 in the AD subgroup, n = 11 in the HC subgroup). Of these 55 participants, 76% were male. The majority reported race as Caucasian (86%) and ethnicity as not of Spanish origin, Hispanic, or Latino (96%).

#### 3.1.2. Procedures

Following provision of informed consent, participants were administered a clinical interview, the Structured Clinical Interview for DSM-IV Disorders (SCID-IV; First, Spitzer, Gibbon, & Williams, 1996). Participants then completed a battery of self-report questionnaires and four distress inductions each followed by the administration of the WTP-DI measure. The four distress inductions included two somatic (pain, respiratory distress) and two emotional (sadness, frustration) inductions. Pain was induced using the cold pressor test. Participants were instructed to submerge their non-dominant hand in a container of water maintained at 0–5°C and to keep their hand in the water for as long as possible. Time to discontinuation was used as a measure of tolerance of pain. Respiratory distress was induced via breath holding. Participants were instructed to exhale and then hold their breath for as long as possible. Two trials were completed and the longer duration was used as the data point for respiratory discomfort tolerance. Emotional inductions were repeated from Study 1 including administration of two movie clips validated in previous studies to induce sadness and the MTPT-C. The current study differed in the use of the sadness measure, with participants having the option to discontinue the movie clips. As only 1 participant discontinued early, these data were unable to be analyzed as a persistence measure. Self-report measures of DI described in Study 1 were also used in this study and all demonstrated strong internal consistency reliability (α ranged from .87–.92 for all measures).

#### 3.2. Results

Results of the manipulation check for the MTPT-C identified a significant increase in distress from pre to post task: \( t(51) = -7.30, \ p < .001 \). Sixty-six percent of participants endorsed a 5 (i.e., neutral) or lower mood and 32% reported lower than neutral mood following the sadness induction. There were no significant correlations between household income and any of the WTP-DI scores. There was an association between education level and WTP-DI for the frustration induction (\( r = -.33, \ p < .05 \)) and the pain induction (\( r = -.32, \ p < .05 \)), but no association for other items.

#### 3.2.1. Feasibility and ease of use

Feasibility of administering the WTP-DI was again supported by no missing data points and very favorable ease of use ratings. Ratings were somewhat or very easy for 81% of participants following the pain induction, 67% following the respiratory distress induction, 74% for the sadness induction, and 70% for the frustration induction. The duration of administration was approximately 2–3 min for each distress domain.

#### 3.2.2. WTP-DI and clinical status

Fig. 1 presents the WTP-DI scores by diagnosis. As hypothesized, WTP-DI scores were highest for the clinical groups, with mean scores ranging from 1.7–2.5 (i.e., between 1% and 5% of income) across all inductions for the SUD group, .95–1.3 (i.e., 0–2% for the AD group, and .36–.64 (i.e., <1%) for the HC group. The main effect of the ANOVAs for group differences in WTP-DI for pain (\( F[2, 51] = 6.24, \ p < .01 \)) and frustration (\( F[2, 51] = 4.78, \ p < .05 \)) were significant. Post-hoc tests with Bonferroni correction indicated that the SUD group reported significantly higher WTP scores than both the AD (pain: mean difference = 1.42, \( p < .05 \); frustration: mean difference = 1.44, \( p < .05 \)) and HC (pain, mean difference = 2.16, \( p < .01 \); frustration: mean difference = 1.75, \( p < .05 \)) groups; there were no significant differences between the AD and HC groups. There was no significant main effect for respiratory discomfort and

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3 As an incentive to increase motivation to persist during the tasks, participants were instructed that if they were among the top performers on the persistence tasks that they would be entered into a raffle to win an additional cash prize.

### Table 2

Study 2 Sample Current Diagnoses.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Group</th>
<th>n (SUD n = 25)</th>
<th>n (AC n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any affective disorder</td>
<td>SUD</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>SUD</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Mood disorder</td>
<td>SUD</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Any substance dependence</td>
<td>SUD</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Opioid dependence</td>
<td>SUD</td>
<td>25</td>
<td>n/a</td>
</tr>
<tr>
<td>Sedative dependence</td>
<td>SUD</td>
<td>9</td>
<td>n/a</td>
</tr>
<tr>
<td>Cocaine dependence</td>
<td>SUD</td>
<td>10</td>
<td>n/a</td>
</tr>
<tr>
<td>Stimulant dependence</td>
<td>SUD</td>
<td>1</td>
<td>n/a</td>
</tr>
<tr>
<td>Alcohol dependence</td>
<td>SUD</td>
<td>4</td>
<td>n/a</td>
</tr>
<tr>
<td>Hallucinogen dependence</td>
<td>SUD</td>
<td>1</td>
<td>n/a</td>
</tr>
<tr>
<td>Cannabis dependence</td>
<td>SUD</td>
<td>6</td>
<td>n/a</td>
</tr>
<tr>
<td>&gt;1 substance dependence</td>
<td>SUD</td>
<td>24</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Note: SUD – substance use disorder, AC – affective comparison.
sadness in the ANOVAs. For sadness the differences between the SUD and HC group and the AD and HC groups were in the magnitude of a medium to large effect size (d = .71 and .64, respectively). Similarly, the differences in respiratory discomfort between the SUD and HC (d = .79) and AD and HC groups (d = .44) reached a medium to large effect size. Education was not a significant covariate in any of the four models and did not impact model effect sizes.

3.2.3. Concurrent and discriminant validity

Correlations between WTP-DI scores for each of the four distress domains and the other DI measures are presented in Table 3. WTP-DI scores were associated with task discontinuation in the range of a medium to large effect size for the pain (r = −.30, p < .05) and respiratory distress (r = −.30, p < .05) domains, with more modest results (small to medium effect sizes) for the frustration (r = −.16) domain.

As hypothesized, self-report measures with some specificity to distress domain were more strongly correlated with the relevant domain of WTP-DI (the FDS with frustration WTP-DI and the ASI with respiratory discomfort WTP-DI). Other correlations between WTP-DI and self-report measures were more modest, with the exception of the ASI, which was strongly correlated across all four domains of WTP-DI scores.

3.2.4. Association among WTP-DI measures

Correlations among WTP-DI scores for the four inductions are presented in Table 4. The highest concordance was noted between the WTP scores in response to somatic inductions (pain and respiratory discomfort WTP-DI). Other correlations between domain of WTP-DI (the FDS with frustration WTP-DI and the ASI with respiratory distress WTP-DI). Other correlations between domains, with more modest results (small to medium effect sizes) for the frustration (r = −.16) domain.

As hypothesized, self-report measures with some specificity to distress domain were more strongly correlated with the relevant domain of WTP-DI (the FDS with frustration WTP-DI and the ASI with respiratory discomfort WTP-DI). Other correlations between WTP-DI and self-report measures were more modest, with the exception of the ASI, which was strongly correlated across all four domains of WTP-DI scores.

Table 3

<table>
<thead>
<tr>
<th>Measure</th>
<th>Behavioral Persistence</th>
<th>Self-report Persistence</th>
<th>ASI</th>
<th>DIS</th>
<th>DTS</th>
<th>FDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>−.30</td>
<td>−.30</td>
<td>.17</td>
<td>.39</td>
<td>−.16</td>
<td>.27</td>
</tr>
<tr>
<td>Breath Holding</td>
<td>−.30</td>
<td>−.30</td>
<td>.52</td>
<td>.31</td>
<td>−.29</td>
<td>.27</td>
</tr>
<tr>
<td>Sadness</td>
<td>.44**</td>
<td>.46**</td>
<td>.52**</td>
<td>.31</td>
<td>.54**</td>
<td>.88**</td>
</tr>
<tr>
<td>Frustration</td>
<td>−.43**</td>
<td>−.42**</td>
<td>.59**</td>
<td>.31**</td>
<td>.34**</td>
<td>.55**</td>
</tr>
</tbody>
</table>

Note. WTP-DI = Willingness to Pay; Distress Intolerance, ASI = Anxiety Sensitivity Index, DIS = Discomfort Intolerance Scale, DTS = Distress Tolerance Scale, FDS = Frustration Discomfort Scale. Persistence scores reflect the persistence measure for each domain (cold pressor test, breath holding, and Computerized Mirror Tracing Persistence Task).

Table 4

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pain</td>
<td>−</td>
<td>.62**</td>
<td>.17</td>
<td>.43**</td>
</tr>
<tr>
<td>2. Respiratory Discomfort</td>
<td>.55**</td>
<td>−</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sadness</td>
<td>.17</td>
<td>.15</td>
<td>−</td>
<td>.59**</td>
</tr>
<tr>
<td>4. Frustration</td>
<td>.43**</td>
<td>.42**</td>
<td>.55**</td>
<td>−</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01

3.3. Study 2 discussion

Feasibility ratings as assessed by measure completion and ratings of ease of use were favorable, replicating the findings of Study 1 in a clinical sample. The validity of WTP-DI was supported in several ways. First, evaluation of group differences yielded higher WTP scores among individuals with an Axis I disorder relative to those without. Individuals with a diagnosis of substance dependence demonstrated particularly high WTP across domains, consistent with findings of elevated DI in this population (e.g., Daughters, Lejuez, Kahler, Strong, & Brown, 2005). Second, the WTP-DI demonstrated expected associations with other measures of DI, including both self-report and behavioral persistence measures. Evidence for higher correlations between WTP-DI domains and self-report measures with some specificity to domain were also found. Specifically, there were particularly strong associations between the DI and pain, the ASI and respiratory discomfort, the DTS and frustration, and the FDS and frustration. The ASI was highly correlated with all four domains, providing support for this as a measure with particular applicability across distress domains. Interestingly, frustration WTP-DI was associated with the strongest concurrent validity across self-report measures and other WTP-DI domains. It is of note that this was also the only domain that was not significantly associated with the corresponding behavioral persistence task.

This study also provided the first test of a common metric for the evaluation of DI across distress domains. The WTP-DI provides the opportunity to examine true concordance among these domains because the same rating can be applied across scales. Results here indicated that the highest concordance was evidenced by WTP scores within broader domains (somatic versus emotional), but there was also some association between frustration and the somatic measures. The opportunity to develop such profiles of DI across distress domains is unique to this measure and provides the opportunity to evaluate both individual and group differences in these profiles and their associated clinical features (e.g., substance use).

4. General discussion

This article described the novel adaptation of a measure drawn from economics (willingness to pay) as a measure of the valuation of escape and avoidance of distress. In two studies, WTP Distress Intolerance (WTP-DI) demonstrated feasibility for the measurement of DI as indicated by very favorable ease of use ratings from participants and an absence of missing data points. Notably, WTP-DI scores exhibited moderate to strong correlations with both behavioral and self-report measures of DI. The lack of shared variance between self-report and behavioral persistence measures is a major limitation of existing measures of DI (McHugh et al., in press); thus, a measure that appears to share variance across methods is particularly promising.
The ability to use the same metric across types of distress is a strength of this measure; it provides the opportunity to compare
both individual and group differences in profiles of DI. This single
metric allows us to ask questions such as: is the profile of DI across
distress domains different in different groups, are certain domains
of DI related, and are certain profiles of DI across domains associ-
ated with specific maladaptive behaviors or clinical presentations?
For example, Study 2 found that individuals with substance
dependence are particularly elevated with respect to frustration
intolerance relative to other groups. In addition, Study 2 raises the
issue that frustration intolerance is similar to intolerance of pain
and respiratory discomfort. In addition to comparisons within
studies, WTP-DI may be a tool for comparing across studies,
addressing a major limitation of the study of DI: the lack of
consistent measurement across studies.

A potential limitation of the use of WTP is bias based on income.
However, in this study, no associations between income and WTP
scores for any of four distress inductions were found. There was an
association between education and WTP scores in response to the
frustration and pain inductions; however, when education was
entered as a covariate in analysis of diagnostic group differences, it
did not emerge as a significant contributor to the model for any
distress domain. Nonetheless, additional studies evaluating the
impact of income, education, and other sociodemographic factors
on WTP reports are needed. An association between education and
DI was found in study of smokers (Siroti et al., 2010); hence, it will
be important to evaluate whether such sociodemographic variables
impact WTP specifically or whether there may be true associations
between such factors and DI.

There are several limitations and important areas for future
research. One limitation is that distress inductions were self-
terminated behavioral persistence measures of DI. An advantage
of this approach is the objective measure of persistence. A liability is
that participants potentially undergo different durations/intensities
of distress from the induction, due to the ability to terminate the task
at will. In addition, behavioral persistence measures may also be
affected by factors other than distress tolerance (e.g., insufficient
incentive to complete the task independent of rising distress,
impulsivity, and skill-based deficits). Nonetheless, these tasks have
functioned well in the literature for relevant prediction (e.g., Brown
et al., 2009). In the present study, we sought to illustrate the
concordance of the WTP-DI across the varying characteristics of self-
report and behavioral persistence measures of DI. It is tempting to
attend to the individual strengths and weaknesses of any one of
these tasks (e.g., despite the fact that the frustration WTP-DI scores
were strongly associated with other measures of DI across different
domains, it was not associated with the frustration persistence
measure), but such specific analysis is beyond the scope of our
purpose here — showing the general predictive strength of WTP-DI
across the range of commonly used measures of DI. Nonetheless, it is
important to note that a persistence measure from a sadness
induction task is not typically utilized; our data suggest that, at least
for the paradigm used, this is not a useful approach given the
absence of variability on this measure.

Accordingly, a strength of the WTP-DI is that it can be applied to
type of distress that can be elicited, regardless of whether
a behavioral persistence measure exists (or is feasible) for that
domain. Moreover, a relevant next step for the study of DI is to
clarify how DI interacts with such factors as perceived incentives
for persistence, urgency/impulsivity for task termination, and
emotional awareness.

A second issue concerns the specific wording around and
selection of WTP values. In traditional applications of WTP, the
actual dollar valuation is of primary value. It is used to identify, for
example, the true valuation of allocation of resources to treatment
(e.g., how much would you be willing to pay to remove your
depression; Morey et al., 2007). In our application, it is the relative
valuation on the WTP scale that is important as an index of DI. Our
use of a proportion of income index is appropriate as a measure of
relative valuation, even though it may challenge computation of an
actual dollar valuation amount. Nonetheless, this important
departure from the traditional WTP literature needs to be noted,
along with the tentative evidence for the independence of this
rating method (based on proportion of income) from income effects
noted in the literature (Damschroder et al., 2007).

Finally, our data may be limited by possible carry over effects in
Study 2 from repeated distress inductions. In order to minimize the
impact of such effects on results, induction order was counter-
balanced; however, we acknowledge our results include estimates of
DI taken in the context of multiple stressors.

The development of a cross domain measures has several benefits
for the advancing the study of distress intolerance. Having a unitary
measure that can provide a metric across domains is important for
facilitating comparisons among types of distress intolerance. The
WTP interview is brief and easy to administer, and thus may be
a particularly scalable tool in both clinical and research settings.
Hence, our results to date encourage the further evaluation and
application of this measure and its ability to provide a flexible, simple
cross domain measure of intolerance of distress. Future research on
the applicability of this measure in different populations and with
different domains of distress is needed as well as the consideration of
other measures of valuation (e.g., elicitation of willingness to accept
distress as a measure of experiential avoidance).

Conflict of interest/Role of funding

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Appendix. Willingness to Pay: Distress Intolerance

1. Now, imagine that you could pay money now to NEVER have
feelings of distress like those you felt today. What proportion of
your monthly income would you pay to be free of these feelings
each month during your life? Please select below the most you
would be willing to pay to be guaranteed to be free of this level
of distress each month. When answering this question
remember that whatever you pay will reduce the amount of
money you have to spend on other things. Some examples of
the proportion of monthly income that people tend to spend on
goods and service include: 8% for food each month, and 30% for
housing each month.

___ 0% of my monthly income
___ 1% of my monthly income
___ 2% of my monthly income
___ 5% of my monthly income
___ 10% of my monthly income
___ 15% of my monthly income
___ More than 15% of my monthly income
2. How sure are you that you would pay this amount if we asked you to do so right now?
1 – totally sure
2 – very sure
3 – pretty sure
4 – not very sure
5 – not at all sure

3. Overall, how difficult were these questions for you to answer?
1 – very difficult
2 – somewhat difficult
3 – neither difficult nor easy
4 – somewhat easy
5 – very easy

References


