

MEASURING DISTRESS TOLERANCE: DEVELOPMENT AND VALIDATION OF
THE MULTIDIMENSIONAL DISTRESS TOLERANCE SCALE

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by
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Abstract

MEASURING DISTRESS TOLERANCE: DEVELOPMENT AND VALIDATION OF THE MULTIDIMENSIONAL DISTRESS TOLERANCE SCALE

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Previous research has identified distress tolerance (DT) as a transdiagnostic vulnerability factor with clinical utility, though varying conceptualizations of DT have impeded effective communication about the construct across research. To address this gap in the literature, Zvolensky et al. (2010) proposed a hierarchical model consisting of five distinct but related domains that have been shown to be distinct in empirical tests. However, at this time, there is no efficient method of measuring the DT domains. Thus, Bardeen et al. (2013) posited that a short, multidimensional measure of DT may help to advance DT research. Results of Study 1 demonstrated, through principal components analysis, four distinct factors comprised of four of the dimensions originally proposed by Zvolensky et al. (2010) with one dimension falling short of previously established guidelines. The resulting Multidimensional Distress Tolerance Scale (MDTS) was composed of 20 items with five items from each of the four DT dimensions included in the model. The second study confirmed the four-factor hierarchical structure of the MDTS using confirmatory factor analysis. Results of Study 2 also provided initial evidence of adequate psychometric properties for the MDTS. These studies represent vital steps in improving the efficiency and

reliability of measuring DT for future research.

Keywords: distress tolerance, assessment, uncertainty, ambiguity, discomfort

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Measuring Distress Tolerance: Development
and Validation of the Multidimensional Distress Tolerance Scale

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Abstract

Previous research has identified distress tolerance (DT) as a transdiagnostic vulnerability factor with clinical utility, though varying conceptualizations of DT have impeded effective communication about the construct across research. Zvolensky et al. (2010) proposed a hierarchical model consisting of five distinct but related domains that have been shown to be distinct in empirical tests. However, at this time, there is no efficient method of measuring the DT domains. Thus, Bardeen et al. (2013) posited that a short, multidimensional measure of DT may help to advance DT research. Results of Study 1 demonstrated, through principal components analysis, four distinct factors comprised of four of the dimensions originally proposed by Zvolensky et al. (2010) with one dimension falling short of previously established guidelines. The resulting Multidimensional Distress Tolerance Scale (MDTS) was composed of 20 items with five items from each of the four DT dimensions included in the model. The second study confirmed the four-factor hierarchical structure of the MDTS using confirmatory factor analysis. Results of Study 2 also provided initial evidence of adequate psychometric properties for the MDTS. These studies represent vital steps in improving the efficiency and reliability of measuring DT for future research.

Keywords: distress tolerance, assessment, uncertainty, ambiguity, discomfort

Measuring Distress Tolerance: Development and Validation of the Multidimensional Distress Tolerance Scale

Distress Tolerance (DT), or the ability to tolerate aversive cognitive, emotional, or physical states, is a transdiagnostic risk factor for the development and maintenance of various forms of psychopathology (Simons & Gaher, 2005; Zvolensky, Vujanovic, Bernstein, & Leyro, 2010). Research suggests that individuals with low DT are prone to using maladaptive coping strategies when faced with distress, including rigid efforts to control or avoid discomfort-inducing emotions and situations, which can inadvertently reinforce and maintain their maladaptive behavior (Leyro, Zvolensky, & Bernstein, 2010; Zvolensky & Hogan, 2013). Such patterns of behavior are believed to lead to the development of various forms of psychopathology, including anxiety, depressive, eating, and substance use disorders (Bardeen, Fergus, & Orcutt, 2013; Laposa, Collimore, Hawley, & Rector, 2015; Zvolensky et al., 2010). However, despite promising findings, researchers have employed several related but distinct conceptualizations of DT, which has affected the coherence of the literature and potential utility of the concept.

Although conceptualizations of DT have been varied, definitions generally include a combination of one or more cognitive and/or behavioral facets related to an individual's perceived capacity to endure aversive physical and/or emotional states, and behavioral demonstrations of this capacity when exposed to distressing stimuli (Leyro et al., 2010). The focus on separate cognitive and behavioral elements of DT has often led to the implementation of inconsistent methodological approaches. Whereas studies assessing behavioral tolerance have often operationalized DT as persistence in distress- or discomfort-inducing activities, such as cold pressor challenges, carbon dioxide inhalation, or mirror

tracing tasks, studies of the cognitive component have generally relied on self-report measures. In addition to assessment differences, research suggests that behavioral measures of DT often exhibit relatively low correlations with self-report indices, though measures of DT that use the same modality often correlate (McHugh et al., 2011; McHugh & Otto, 2012).

In an effort to assess both components of DT, the Distress Tolerance Scale (DTS), which is the most widely used self-report scale for measuring DT, was developed. Specifically, the DTS includes items designed to assess a perceived capacity and a behavioral capacity to tolerate DTS (Zvolensky et al., 2010), with questions that ask respondents to rate their ability to tolerate feelings of “distress” or “upset.” Although DTS scores have been shown to correlate with a number of outcomes, including various forms of psychopathology such as PTSD and eating disorders (Ameral, Palm Reed, Cameron, & Armstrong, 2014), some researchers have questioned whether the DTS accurately assesses the full DT construct. Specifically, although the term DT was originally used to refer to one’s ability to tolerate negative emotional states in general (Simons & Gaher, 2005), it has since been used to refer to a broader collection of emotional and physical states (e.g., pain, uncertainty, anxiety, sadness, frustration). In addition, factor analytic studies of DT suggest that the two component conceptualization of DT (i.e., perceived and behavioral capacity) is inadequate and does not accurately represent the latent structure of DT phenomena (Bardeen et al., 2013). As a result, recent research has begun to consider alternative models for measuring DT that better reflect DT theory and the multifaceted nature of the conjectured DT construct.

Hierarchical Model of Distress Tolerance

Zvolensky et al. (2010) posited one alternative model in which DT is conceptualized as being comprised of five forms of tolerance, including tolerance of uncertainty, ambiguity,

frustration, emotional distress, and physical discomfort. By breaking DT up into five factors, the predictive utility of the various facets of DT can be tested and specific intolerances can be identified and possibly targeted in treatment.

Tolerance of uncertainty is the ability of an individual to endure uncertain, unclear, or unknown situations of an emotional, cognitive, or behavioral nature (Buhr & Dugas, 2002). Individuals who are highly intolerant of uncertainty may find uncertainty so aversive that they prefer the possibility of negative outcomes to uncertain ones (Bardeen et al., 2013; Dugas, Schwartz, & Francis, 2004). Tolerance of ambiguity is closely related to tolerance of uncertainty and refers to the ability to withstand vague situations and stimuli that can be interpreted in more than one way (Furnham & Ribchester, 1995). Although measures of tolerance of ambiguity have been questioned for the validity of their psychometric properties, the concept has been repeatedly shown to predict worry (Leyro et al., 2010). Tolerance of frustration is defined as an individual's ability to endure frustration in the context of instant gratification and fairness, the ease of life, achievement/tasks, and negative emotions (Bardeen, et al., 2013; Harrington, 2005). Tolerance of frustration has been found to be related to a number of behavioral variables, such as self-harm and greater levels of prospective anxiety (Zvolensky et al., 2010).

Tolerance of emotional distress is the most similar factor to the original conceptualization of DT put forth by Simons and Gaher (2005), and refers to an individual's perceived capacity to tolerate feelings of "distress" or "upset." Intolerance of emotional distress has been shown to predict a variety of psychological conditions, including posttraumatic stress, substance use, and bulimia (Zvolensky et al., 2010). Finally, tolerance of physical discomfort refers to an individual's ability to endure sensations of physical

discomfort (Schmidt, Richey, & Fitzpatrick, 2006). Intolerance of physical sensations suggests that an individual would practice escape or avoidance techniques to circumscribe the physical discomfort (Schmidt et al., 2006). Research suggests that intolerance of physical discomfort is predictive of various psychological outcomes, including panic disorder, intense symptoms of anxiety, and quality of life among individuals with chronic pain conditions (Zvolensky et al., 2010).

The first study to directly test the validity of Zvolensky et al.'s (2010) hierarchical DT model was conducted by Bardeen and his colleagues (2013). Specifically, Bardeen et al. administered eight measures of the five proposed dimensions of DT to 830 individuals recruited from Amazon's Mechanical Turk (MTurk). The measures of DT included the Intolerance of Uncertainty Scale (Buhr & Dugas, 2002), the Intolerance of Uncertainty Index-A (Carleton, Gosselin, & Asmundson, 2010), the Tolerance of Ambiguity Scale-12 (Herman, Stevens, Bird, Mendenhall, & Oddou, 2010), the Multiple Stimulus Types Ambiguity Test (McLain, 1993), the Frustration Discomfort Scale (Harrington, 2005), the Discomfort Intolerance Scale (Schmidt, Richey, & Fitzpatrick, 2006), the Somatosensory Amplification Scale (Speckens, Spinhoven, Sloekers, Bolk, & van Hermet, 1996), and the Distress Tolerance Scale (Simons, & Gaher, 2005). An initial exploratory factor analysis of total and subscale scores of the aforementioned measures provided preliminary support for the proposed dimensions of the hierarchical model, and a general DT factor did not appear to be responsible for the relationships between each of the dimensions (Bardeen et al., 2013).

Although the study by Bardeen et al. (2013) represents an important first step in evaluating the utility of the hierarchical DT model proposed by Zvolensky et al. (2010), the study is limited in several respects. First, the study submitted total and subscale scores, rather

than individual items, on each of the measures to factor analysis. Thus, it is possible that measurement error associated with the use of distinct measures with separate directions and unique response scales may have contributed to the factor analytic findings. Further, as noted by Bardeen and colleagues, several of the measures used in their study exhibited relatively weak internal consistency (e.g., alphas below .80), which may have affected their results. Finally, even if the factorial structure of the proposed hierarchical DT model is accurate and comprised of five distinct dimensions, at present there is not an efficient way of measuring the broad DT construct along with each of its dimensions. Rather, in the absence of a comprehensive measure of the five-factor DT model, it would be necessary for researchers and clinicians to administer a cumbersome number of measures and items.

To date, one article has been published documenting an attempt to develop and validate a measure of DT based on the hierarchical, five-factor model. Specifically, Bebane, Flowe, & Maltby (2015) described two studies in which they created and assessed the factor structure of a 20-item measure. In the first study, the authors administered five commonly used measures of DT-related constructs (Distress Tolerance Scale, Discomfort Intolerance Scale, Tolerance of Ambiguity Scale, Frustration Distress Scale, and Intolerance of Uncertainty Scale) and submitted all of the items from the measures to an exploratory factor analysis. Results indicated that eight factors emerged with eigenvalues above 1.0, though the authors narrowed those down to five factors based on the scales that had items with “good to excellent” loadings (i.e., $> .55$; Tabachnick & Fidell, 2007). The five factors were consistent with the five-factor model proposed by Zvolensky et al. (2010), and the authors selected four items from each scale to create an abbreviated, 20-item measure of DT. In the second study, the authors created standardized directions and a seven-point response scale for the 20 items,

administered the new scale to a second sample, and conducted a series of CFAs to determine the best model fit for the data. Results indicated that a bifactor model, representing a general DT factor and five group factors, provided the best fit for the data, thereby providing further support for the five-factor model.

Although Bebane et al. (2015) attempted to address several concerns observed in previous research, such as the influence of measure variance resulting from administering items from several measures with different response formats and directions, the study had several notable limitations. For example, differences in item structure/wording across the measures remained and may have influenced the results. In addition, items for some of the scales were reverse-scored whereas others were not, which suggests that measurement variance may have influenced the findings. Specifically, items representing the Tolerance of Ambiguity factor were all reverse scored, whereas none of the items on the Intolerance of Uncertainty factor were reverse scored. Further, it appears that the positively worded items selected for the Tolerance of Ambiguity factor may not provide a broad measure of the tolerance of ambiguity construct, particularly as it relates to potential forms of psychopathology (e.g., worry). For example, the face validity of items such as “A good teacher is one who makes you wonder about your way of looking at things” appears questionable, particularly as they would relate to forms of psychopathology typically associated with ambiguity intolerance. Finally, the research by Bebane et al. (2015) focused on the factor structure of the new measure and did not include assessment of other important psychometric properties, such as convergent and discriminant validity.

Given concerns regarding the 20-item measure developed by Bebane et al. (2015), the present research presents two studies describing the development and validation of a new

measure of DT modeled after the five-facet conceptualization of DT. In Study 1, the initial development of an item pool and multidimensional measure of DT is described, along with assessment of the internal consistency and convergent/discriminant validity of the measure. Study 2 presents a confirmatory factor analysis of the new Multidimensional Distress Tolerance Scale (MDTS) and an assessment of its predictive validity for anxiety-related psychopathology.

Study 1

Method

Participants. Participants were recruited from Amazon Mechanical Turk. To be included in the study, participants were required to be 18 years of age or older, located in the United States, report English as their first language, and accurately respond to three validity items embedded in the survey (e.g., I have not slept more than an hour in my life). Of the participants who completed the informed consent process ($N = 710$), approximately 39% answered at least one validity item incorrectly or did not finish the survey. The final sample ($N = 431$) was 69.5% female and had an average age of 39.51 ($SD = 12.49$). Participants self-identified as 79.1% White/Non-Hispanic, 6.2% African American or Black, 4.6% Hispanic or Latino, 6.2% Asian, 0.6% American Indian or Alaskan Native, and 3.4% multiracial.

Procedure. The study consisted of an online survey beginning with an electronic informed consent process (see Appendix A) approved by the Institutional Review Board for the Protection of Human Subjects at Appalachian State University (see Appendix B). Participants who completed the survey successfully received small cash reward (\$0.10). After completing the informed consent process, participants completed the pool of prospective items as well as the embedded validity items and questions about demographic

information. The survey in its entirety took participants approximately 10-15 minutes to complete.

Prospective Item and Scale Development

A total of 85 prospective items for the MDTS were constructed to be consistent in content with items from the commonly used measures of the five proposed facets of DT utilized in previous research (Bardeen et al., 2013). Items were placed on a 5-point Likert scale with responses ranging from 1 = “Strongly Disagree” to 5 = “Strongly Agree,” and respondents were asked rate each item using the following directions: “Below are some statements that may or may not describe you. Please rate the extent to which you agree with each statement.” The pool of prospective items was administered in random order.

Planned Analyses

An item-level principal components analysis (PCA) was conducted with Promax rotation on 85 items developed based on the measures utilized by previous researchers (Bardeen et al., 2013). Inter-item and item-total correlations were examined for each of the five proposed dimensions of DT, and approximately 7-10 non-redundant items were retained for each dimension. Factor structures were considered for both four and five factor solutions. Final factors were selected if eigenvalues were greater than one (Floyd & Widaman, 1995). The five items with the highest loadings on each factor without cross loadings above .35 were retained to create the Multidimensional Distress Tolerance Scale (Cudeck & O’Dell, 1994). An examination of the scree plot for each potential factor structure was also considered in selecting the final MDTS items (see Figure 1). Cronbach’s alphas were examined for each subscale to ensure that the items exhibited appropriate levels of internal consistency (alphas > .70).

Results

A PCA of the 85 prospective items identified four factors having eigenvalues greater than 1.0 (Factor 1 [Physical] = 12.21, Factor 2 [Frustration] = 2.29, Factor 3 [Ambiguity] = 1.32, Factor 4 [Emotion] = 1.23) with one factor (Uncertainty) with an eigenvalue of .86. The five factors accounted for approximately 72% of the total variance (Factor 1 = 48.4%, Factor 2 = 9.6%, Factor 3 = 5.7%, Factor 4 = 4.6%, Factor 5 = 3.8%). The factor loadings for both four-factor (eigenvalues > 1) and five-factor solutions were generally well patterned with items from each subscale loading on separate factors with low cross-loadings (see Table 1). Each subscale demonstrated strong internal consistency (Physical $\alpha = .92$, Frustration $\alpha = .91$, Ambiguity $\alpha = .89$, Emotion $\alpha = .89$, Uncertainty $\alpha = .90$). The factor loadings for the final MDTS scale are displayed in Table 1.

Study 2

A second study was conducted to test the model fit established in Study 1 and examine the validity of the proposed MDTS. Confirmatory factor analysis (CFA) was utilized to verify the factor structure from Study 1. Criterion-related validity was examined using previously validated measures of anxiety and related disorders, and construct validity was assessed using existing measures of the DT components.

Method

Participants. Participants were recruited from Amazon Mechanical Turk. To be included in the study, participants were required to be over the age of 18, located in the United States, report English as their first language, and accurately respond to validity items embedded in the survey (e.g., I will select ‘very much’ to demonstrate I am paying attention). Of the participants who completed the informed consent process ($N = 554$), approximately

56% answered at least one validity item incorrectly or did not finish the survey. An additional 10 participants were excluded from the final analysis due to missing items. The final sample ($N = 229$) was 61.9% female and had an average age of 40.20 ($SD = 12.46$). Participants self-identified as 78.2% White/Non-Hispanic, 7.5% African American or Black, 6.3% Hispanic or Latino, 4.6% Asian, .8% American Indian or Alaskan Native, and 2.5% multiracial.

Procedure. The study consisted of an online survey beginning with an electronic informed consent process (see Appendix C) approved by the Institutional Review Board for the Protection of Human Subjects at Appalachian State University (see Appendix D). Participants were recruited via Amazon MTurk and received small cash reward (\$0.40). After completing the informed consent process, participants completed the proposed MDTs, embedded validity items, and a battery of validated measures of various anxiety disorders and measures of DT related constructs. Participants also completed demographic information and responded to items regarding previous diagnoses. The order of the measures was counterbalanced across participants. The survey in its entirety took participants approximately 15-20 minutes to complete.

Additional Measures.

Multidimensional Distress Tolerance Scale. The Multidimensional Distress Tolerance Scale (MDTS) is a 20-item scale designed to measure an individual's ability to tolerate distress related to physical pain, frustration, negative emotion, and ambiguity. Participants reported to what degree they agreed to each item on a 5-point scale ranging from "strongly agree" to "strongly disagree." The subscale related to tolerance of negative emotion included items such as "I can't tolerance my unpleasant emotions" and "When I feel

anxious or sad, it is unbearable.” Items assessing tolerance of physical pain included “I cannot bear much physical discomfort” and “I have a low tolerance for pain.” Tolerance of distress related to frustration was assessed with items like “If a task starts to seriously frustrate me, I am likely to quit” and “I tend not to persist very long in tasks that cause me to feel frustrated.” Tolerance of distress related to ambiguity was assessed with items such as “I prefer to avoid situations that can be interpreted in more than one way” and “Problems that have more than one clear answer annoy me.” The MDTS demonstrated excellent internal consistency in the current sample ($\alpha = .94$).

Intolerance of Uncertainty Scale. The Intolerance of Uncertainty Scale (IUS) (see Appendix E) is a 12-item measure intended to evaluate an individual’s ability to tolerate uncertain situations (Carleton, Norton, & Asmundson, 2007). The IUS measures both anticipatory and inhibitory anxiety as subsets of the overall measure. Participants reported how much they agreed to each statement on a five-point scale ranging from “not at all characteristic of me” to “entirely characteristic of me.” Anticipatory items consisted of statements like “Unforeseen events upset me greatly” and “I can’t stand being taken by surprise.” Items loading on the inhibitory factor included statements like “Uncertainty keeps me from living a full life” and “When I am uncertain I can’t function very well.” Internal consistency for the IUS is considered excellent ($\alpha = .94$), and it has acceptable levels of convergent and discriminant validity when assessing for worry, depression, and anxiety. The IUS demonstrated excellent internal consistency in the current sample ($\alpha = .94$).

Distress Tolerance Scale. The Distress Tolerance Scale (DTS) is a 15-item measure designed to assess an individual’s perceived ability to tolerate emotional distress (Simons & Gaher, 2005). The DTS measures four different types of emotional distress. Items assessing

perceived ability to tolerate emotional distress include items like “I can’t handle feeling distressed or upset.” Subjective appraisal of distress is assessed with items such as “My feelings of distress or being upset scare me.” Attention absorption by negative emotions is measured by items like “When I feel distress or upset, all I can think about is how bad I feel.” Efforts to regulate emotion and avoid distress are measured by items like “I’ll do anything to stop feeling distressed or upset.” Participants rate each of the items on a five-point scale ranging from “strongly agree” to “strongly disagree.” Research has demonstrated adequate internal consistency for each of the four domains (DTS-T $\alpha = .82$; DTS-AP $\alpha = .86$; DTS-AB $\alpha = .86$; DTS-R $\alpha = .83$) and good discriminant validity when assessing for anxiety and depression. Internal consistency for the overall measure was high in the current sample ($\alpha = .93$).

Frustration Discomfort Scale. The Frustration Discomfort Scale (FDS) is a 28-item multidimensional measure intended to assess an individual’s ability to withstand frustration in four different areas (Harrington, 2005). The FDS measures entitlement with items such as “I can’t bear it if other people stand in the way of what I want.” Discomfort intolerance is assessed with items like “I can’t stand having to push myself at tasks.” The domain of achievement is assessed with items like “I can’t tolerate any lapse in my self-discipline.” Emotional tolerance is measured with items such as “I can’t bear disturbing feelings.” Individuals respond to items on a five-point scale ranging from “absent” to “very strong.” The FDS has demonstrated adequate internal consistency in each of the four domains (FDS-E $\alpha = .87$; FDS-DI $\alpha = .89$; FDS-A $\alpha = .85$; FDS-ET $\alpha = .87$) and the discriminant validity has been found to be adequate in relation to tools for assessing self-esteem. Internal consistency for the FDS in the current sample was excellent ($\alpha = .96$).

Discomfort Intolerance Scale. The Discomfort Intolerance Scale (DIS) is a five-item measure designed to assess an individual's ability to tolerate uncomfortable physical sensations (Schmidt et al., 2006). Individuals respond to items on a seven-point scale ranging from zero ("not at all like me") to six ("extremely like me"). The DIS includes items such as "I have a high pain threshold" and "When I begin to feel physically uncomfortable, I quickly take steps to relieve the discomfort." Items load on two factors that are conceptualized as ability to tolerate discomfort and pain and avoidance of physical discomfort (Schmidt et al., 2006). Both factors show acceptable levels of internal consistency (DIS-T $\alpha = .91$; DIS-A $\alpha = .72$) and the measure demonstrates adequate levels of convergent and discriminant validity between measures of depression and anxiety. In the current sample, each of the factors and the overall scale demonstrated adequate internal consistency (DIS-T $\alpha = .89$; DIS-A $\alpha = .72$; DIS Total $\alpha = .74$).

Intolerance of Uncertainty Index-A. The Intolerance of Uncertainty Index-A (IUI-A English version) is a 15-item measure of how unacceptable an individual finds uncertainty in a general sense (Carleton et al., 2010). Items on part A of the IUI include statements such as "I have difficulty tolerating life's uncertainties" and "I have difficulty dealing with the possibility that something unexpected may occur." Participants respond to items on a five-point scale ranging from 1 ("not at all characteristic of me") to 5 ("entirely characteristic of me"). The IUI-A has demonstrated excellent internal consistency ($\alpha = .96$) as well as adequate convergent and discriminant validity with measures of anxiety and depression. The scale demonstrated excellent internal consistency in the current sample ($\alpha = .96$).

Multiple Stimulus Types Ambiguity Test. The Multiple Stimulus Types Ambiguity Test (MSTAT) is a measure intended to assess tolerance of ambiguity (McLain, 1993).

Participants respond to 22 items on a seven-point scale ranging from “strongly disagree” to “strongly agree.” Items include statements such as “I find it difficult to respond when faced with an unexpected event” and “Some problems are so complex that just trying to understand them is fun.” Internal consistency for the MSTAT has been established as high ($\alpha = .91$). Convergent and discriminant validity have been shown to be adequate between the MSTAT and measure of ambiguity, risk-taking, and dogmatism. Internal consistency in the current sample was excellent ($\alpha = .92$).

Tolerance of Ambiguity Scale-12. The Tolerance of Ambiguity-12 (TAS) is a scale designed to measure intolerance of ambiguity with 12 items (Herman et al., 2010). Individuals respond to items such as “I can enjoy being with people whose values are different from mine” and reverse-scored items like “I avoid settings where people don’t share my values.” Responses on a five-point scale range from “strongly disagree” to “strongly agree.” The TAS-12 has improved internal consistency ($\alpha = .76$) over its predecessor, but further psychometric data is limited. Internal consistency in the current sample was low ($\alpha = .65$).

Somatosensory Amplification Scale. The Somatosensory Amplification Scale (SSAS) is a 10-item measure of sensitivity to normal bodily sensations and neutral stimuli (Speckens et al., 1996). Individuals respond to items like “When I bruise myself, it stays noticeable for a long time” and “Sudden loud noises really bother me” on a five-point scale. Previous research has shown internal consistency for the SSAS to be adequate ($\alpha = .76$), and has also demonstrated appropriate discriminant and convergent validity between measures of somatization, anxiety, and depression. Internal consistency in the current sample was adequate ($\alpha = .83$).

Panic Disorder Severity Scale. The Panic Disorder Severity Scale (PDSS) is a seven-item measure that assesses the severity of panic disorder symptoms (Shear et al., 1997). Individuals respond to items on a five-point scale ranging from zero (i.e., no symptoms) to four (i.e., extreme severity of symptoms). Items include questions such as “How many panic and limited symptoms attacks did you have during the week?” The PDSS has demonstrated adequate convergent and discriminant validity when compared to other measures of anxiety disorders. Internal consistency for the scale is high ($\alpha = .88$) and was also high in the current sample ($\alpha = .92$).

Mobility Inventory for Agoraphobia. The purpose of the Mobility Inventory for Agoraphobia (MI) is to assess avoidance behaviors and frequency of panic attacks (Chambless, Caputo, Jasin, Gracely, & Williams, 1985). Individuals complete 30 items in which they rate avoidance behaviors in different locations and situations on a five-point scale ranging from “never avoided” to “always avoided.” Respondents are asked to rate their avoidance both when accompanied (AAC) and when alone (AAL). Frequency of panic attacks is assessed by having respondents indicate the total number of panic attacks they have had in the last seven days. The internal consistency on both subscales was very high (AAC $\alpha = .95$; AAL $\alpha = .96$). Internal consistency was also high in the current sample (AAC $\alpha = .92$; AAL $\alpha = .93$). Both subscales showed adequate convergent and discriminant validity when compared to clinical severity ratings of generalized anxiety disorder, social phobia, and specific phobia on the Anxiety Disorders Interview Schedule (ADIS) (Chambless et al., 2011).

Social Phobia Inventory. The Social Phobia Inventory (SPIN) is intended to measure anxiety related to social anxiety in terms of physiological symptoms of anxiety, fear,

and avoidance (Connor et al., 2000). The SPIN consists of 17 items which are rated on a five-point scale ranging from 0 to 4. The SPIN is divided into three subscales that evaluate fear (e.g., “fear of embarrassment”), avoidance (e.g., “avoids speeches”), and physiological symptoms (e.g., “bothered by blushing”). The SPIN has demonstrated excellent internal consistency ($\alpha = .94$) as well as acceptable convergent and discriminant validity between measures of social phobia and other anxiety disorders. The SPIN also demonstrated excellent internal consistency in the current sample ($\alpha = .95$).

General Anxiety Disorder-7. The General Anxiety Disorder-7 (GAD-7) (see Appendix F) provides a brief assessment of generalized anxiety disorder symptomology and severity (Spitzer, Kroenke, Williams, & Löwe, 2006). Participants respond to seven items on a four-point scale ranging from “not at all” to “nearly every day” based on how often they were both by each symptoms in the past two weeks. Individuals respond to statements like “trouble relaxing” and “feeling nervous, anxious, or on edge.” Internal consistency is considered to be excellent ($\alpha = .92$) for this measure. Internal consistency for the current sample was also excellent ($\alpha = .94$). Convergent and divergent validity for the GAD-7 with other measures of anxiety were also acceptable.

Obsessive-Compulsive Inventory-Revised. The Obsessive-Compulsive Inventory-Revised (OCI-R) is an 18-item measure designed to assess symptoms of obsessive-compulsive disorder (Foa et al., 2002). Respondents rate how much specific experiences distressed them over the last month on a five-point scale ranging from “not at all” to “extremely.” Items are organized into six subscales based on common symptom categories (Foa et al., 2002). Items on the hoarding subscale include statements such as “I have saved up so many things that they get in the way.” The washing subscale includes items like “I

wash my hands more often than necessary.” Items such as “I repeatedly check doors, windows, drawers, etc.” are included on the checking subscale. Statements like “I get upset if objects are not arranged properly” are included on the ordering subscale. Neutralizing subscale items include statements such as “I feel I have to repeat certain numbers.” Obsessing subscale items include statements like “I find it difficult to control my own thoughts.” The internal consistency for the OCI-R is considered excellent ($\alpha = .90$) and was excellent in the current sample as well ($\alpha = .92$). Convergent validity has been shown to be adequate while discriminant validity for the scale is quite high when compared to measures of obsessive and compulsive behaviors and other anxiety disorders, respectively.

PTSD Checklist-Civilian Version. The PTSD Checklist-Civilian Version (PCL-Civilian) (see Appendix H) is a 17-item measure designed to assess number and severity of symptoms of posttraumatic stress disorder (Weathers, Litz, Huska, & Keane, 1994). Individuals rate how bothered they are by specific symptoms on a five-point scale ranging from “not at all” to “extremely.” Items on the PCL correspond to DSM-IV diagnostic criteria. Internal consistency for the PCL is high ($\alpha = .95$). When compared to measures of panic, somatization, anxiety and depression, convergent validity for the scale has been shown to be adequate, and initial research has shown discriminant validity to be good as well, though further research is needed. Internal consistency was excellent in the current sample ($\alpha = .97$).

Short Health Anxiety Inventory. The Short Health Anxiety Inventory (SHAI) is designed to assess health related anxiety independent of actual health using 18 items (Salkovskis, Rimes, Warwick, & Clark, 2002). Respondents select the statement that best describes them from a group of four statements for each item. Items cover broad ideas such

as hearing about an illness and thinking you have it and worrying about dying. Research has shown that internal consistency for the SHAI to range from adequate ($\alpha = .74$) to excellent ($\alpha = .96$). In the current sample, internal consistency was high ($\alpha = .92$). The scale shows adequate levels of convergent and discriminant validity as well between other measures of health-related anxiety and measures of social and generalized anxiety, respectively.

Levenson Self-Report Psychopathy Scale. The Levenson Self-Report Psychopathy Scale (LPS) is a 26-item measure designed to measure both primary and secondary psychopathic traits (Levenson, Kiehl, & Fitzpatrick, 1995). Participants respond to items on a four-point scale ranging from “disagree strongly” to “agree strongly.” Individuals respond to statements like “Making a lot of money is my most important goal” and “I enjoy manipulating other people’s feelings.” In previous research, internal consistency for the LPS has ranged from low ($\alpha = .60$) to adequate ($\alpha = .70$). The LPS demonstrated adequate internal consistency in the current sample ($\alpha = .84$). The scale has shown adequate levels of convergent validity with measures of narcissism, antagonism, and diminished perception of social responsibility.

Results

A confirmatory factor analysis was conducted using MPLUS to assess the fit of the factor structure identified in Study 1 (Muthén & Muthén, 1998-2012). The hierarchical model presented by Zvolensky et al. (2010) was tested as well as single factor and four factor models. Goodness of fit cutoffs followed the suggestions of Hu and Bentler (1998, 1999) with cutoff values of 0.95 for the comparative fit index (CFI) and Tucker-Lewis index (TLI), 0.06 for the root-mean-square error of approximation (RMSEA), and 0.08 for the standardized root mean square residual (SRMR).

Four-Factor Lower-Order CFA

A four-factor model was tested and included only the factors with eigenvalues above one (i.e., factors with items related to frustration, emotional pain, ambiguity, and physical pain). Factors were allowed to correlate in the final four-factor model, though another model test was conducted without allowing factors to correlate resulting in significantly reduced model fit. Results from the CFA indicated that all the factor loadings were significant ($ps < .001$). The model fit for the four-factor model was adequate based on previously established cut-off values, though the chi-square test was significant all other fit indices met or exceeded the guidelines $\chi^2 (164, N = 229) = 289.14, p < .001, RMSEA = .058$ with a 90% confidence interval of .047 to .069, CFI = .96, TLI = .95, and SRMR = .046. Correlations between the latent constructs of the model ranged from .38 to .65 and are presented in Table 3.

Five-Factor Lower Order CFA

A five-factor model based on the theoretical model proposed by Zvolensky et al. (2010) was also tested. Factors were allowed to correlate in the five-factor model. All of the factor loadings were significant ($ps < .001$). Results of the CFA indicated that the five-factor model met some established cut-off values but were not as favorable as fit indices for the four-factor model $\chi^2 (265, N = 229) = 522.03, p < .001, RMSEA = .065$ with a 90% confidence interval of .057 to .073, CFI = .94, TLI = .93, and SRMR = .048. The correlations between the latent constructs of the model are presented in Table 3.

Single-Factor Lower-Order CFA

A model allowing each of the five proposed DT components to load onto a single latent factor was considered with all five possible factors being allowed to correlate. Results from the CFA indicated that all of the factor loadings were significant ($ps < .001$). However,

the model fit was not adequate based on the established cutoff values χ^2 (275, N = 229) = 1574.64, $p < .001$, RMSEA = .144 with a 90% confidence interval of .137 to .151, CFI = .70, TLI = .67, and SRMR = .098.

Criterion-Related Validity

Means and standard deviations are reported for the MDTS subscales, MDTS total score, and for each additional measure included in the study (see Table 2).

Bivariate correlations were conducted between MDTS subscale scores and measures of panic disorder, social anxiety disorder, agoraphobia, generalized anxiety disorder, obsessive-compulsive disorder, health anxiety, and posttraumatic stress disorder to assess criterion-related validity. All MDTS subscales were significantly correlated with each of the anxiety measures, except the MDTS Physical subscale and the PCL-C (see Table 3).

Correlations between the MDTS subscales and total score and the Levenson-Psychopathy Scale were also examined to ensure adequate discriminant validity. Results indicated that all MDTS subscales were significantly related to the LPS, suggesting that the discriminant validity of the MDTS may not be adequate (see Table 3).

Given that bivariate correlations suggested an overarching relationship between the MDTS subscales and anxiety outcomes, multiple hierarchical regressions were conducted to further explore the relationship between individual MDTS subscales and each anxiety outcome. For each anxiety-related outcome, demographic variables (i.e., age and gender) were entered in Step 1 and MDTS subscales were entered in Step 2. Tests for multicollinearity indicated that a low level of multicollinearity was present across the each of the models. Overall, after controlling for age and gender, the MDTS emotion subscale accounted for a significant portion of the variance for each of the anxiety outcomes except

health anxiety and obsessive-compulsive disorder (see Table 4). Additionally, the MDTS frustration subscale accounted for a significant portion of the variance for social anxiety as measured by the SPIN while the MDTS physical subscale represented a significant portion of the variance for obsessive and compulsive symptoms as measured by the OCI-R.

Construct Validity

Construct validity was also examined via correlations between the subscale score on each MDTS factor and the total score on at least one well-established measure of the relevant construct (e.g., the total score on the Intolerance of Physical Discomfort subscale of the proposed MDTS and the total score on the Discomfort Intolerance Scale). Results indicated that each of the subscales significantly correlated with at least one established measure of the underlying construct they were intended to measure (see Table 5). More specifically, higher scores on the MDTS physical subscale were associated with higher scores on the SASS, $r(229) = .47, p < .001$ and higher scores on the DIS, $r(229) = .74, p < .001$. Higher scores on the MDTS frustration subscale were associated with higher scores on the FDS, $r(229) = .56, p < .001$. The MDTS ambiguity subscale was also related to relevant construct with higher scores being associated with higher MSTAT scores, $r(229) = .71, p < .001$, and with higher TAS scores, $r(229) = .51, p < .001$. The MDTS emotion subscale was significantly related to the DTS scores, $r(229) = .59, p < .001$. This provides initial evidence of adequate convergent validity for some the MDTS subscales. Each factor demonstrated adequate internal consistency (Factor 1 $\alpha = .91$, Factor 2 $\alpha = .91$, Factor 3 $\alpha = .88$, Factor 4 $\alpha = .91$).

Discussion

The intent of this sequence of studies was to develop an assessment tool that was able to efficiently measure each of the proposed facets of DT. Previous research has indicated that

each of the facets of DT shows some evidence of being useful in studying the development and maintenance of anxiety disorders and anxiety related symptoms such as worry. Given its utility, researchers have attempted to create a short, easy to administer measure of DT using existing measures. However, while previous research has been useful in establishing the possibility of a multidimensional model of DT, there have been methodological concerns that have only allowed limited conclusions. Further, although Bebane et al. (2015) produced a usable measure of DT including all five proposed facets, validity data on their measure was not collected.

The results of the current series of studies indicated that, in the first sample, a four-factor is the best fit for the data based on previously established guidelines (eigenvalues > 1), though some previous research has utilized less stringent guidelines to achieve a five-factor model (Bardeen et al., 2013). In the second study, a four-factor model encompassing items related to tolerance of physical discomfort, frustration, ambiguity, and emotional pain was the best fit for the data based on the established cut-off values. As such, the final MDTS consisted of 20 items related to these four facets of DT. Results also indicated that each of the subscales correlated significantly with a battery of established measures of anxiety disorders, except the physical subscale with the PCL-C. These results suggest that the subscales may have predictive validity for anxiety disorders, though correlations did not suggest that individual subscales have specific utility in measuring specific anxiety disorders. Regression analyses suggested that the MDTS subscale measuring tolerance of emotional distress may account for the predictive validity of the MDTS for anxiety disorders above and beyond the other subscales. Notably, results indicated that the MDTS may not have adequate discriminant validity given that each of the subscales except the physical subscale were

significantly correlated with an established measure of psychopathy. Finally, results of the second study provided initial evidence that the final version of the MDTS may have sufficient convergent validity given that each subscale was significantly correlated with at least one established measure of the complementary DT facet, though the emotion subscale demonstrated a negative relationship with its complementary construct.

The failure of this study to confirm a five-factor solution consistent with the model suggested by Zvolensky et al. (2010) is somewhat unexpected given that previous studies have confirmed five-factor models (Bardeen et al, 2013; Bebane et al., 2015). However, previous researchers who have confirmed those models utilized less stringent cutoffs (i.e., eigenvalues > 0.7) as well as differences in measurement (e.g., reverse coded scales) that may have affected the final DT model. Although the four-factor model confirmed in this series of studies fails to account for intolerance of uncertainty, it does meet the guidelines frequently utilized in the field (e.g., eigenvalues > 1 , CFA cut-offs suggested by Hu & Bentler, 1998,1999). In general, the results of this project confirmed previous research suggesting that DT facets are variably related to anxiety outcomes. Considered with earlier research, these results reconfirm the idea that DT is a valuable concept in anxiety research, though there is limited information available about how the underlying DT facets are related to anxiety disorders. Given that the DTS is commonly utilized as a measure of DT in current research, the significance of the MDTS emotion subscale in predicting anxiety outcomes in this study was not entirely unexpected. It would likely be useful to further assess the predictive value of each MDTS subscale in order to determine the relative utility of each construct in understanding anxiety disorders.

It is pertinent to address several limitations present in this series of studies, which, if addressed in future research, could provide a more useful information about DT and its underlying constructs. First, the sample size for each of these studies would likely benefit from being increased. Recommendations made by Cattell (1978) suggested that three to six participants per variable is adequate for factor analysis, but more recent recommendations suggest that at least seven participants per item would provide a more stable model (Mundfrom, Shaw, & Tian Lu, 2005). The first study had an approximately five to one ratio of participants to items analyzed in the principal components analysis while the second study achieved a nine to one ratio of participants to items. Increasing sample size in future analyses of the hierarchical model of DT may provide a more stable basis for further analysis.

Another limitation of the current study was the sole reliance on self-report measures. While this has been noted as a limitation in previous research, it was beyond the scope of this project to utilize behavioral measures of distress tolerance (Bardeen et al., 2013). The inclusion of behavioral measures of DT (e.g., cold pressor task, mirror tracing task) would provide an objective measure of DT to base future assumptions on as well as accounting for a wider breadth of the DT facets. Relatedly, some of the established self-report measures of DT facets that were utilized to generate MDTS trial items had limited psychometric information available or lacked strong psychometric qualities. For example, the TAS, a measure of tolerance of ambiguity, had adequate internal validity ($\alpha = .76$) but lacked any other psychometric data. It is important to note that items were generated based on these existing measures, but they were not exactly the same and the process with which the final items were selected from the item pool in study one may have eliminated some problematic items.

An important limitation that could be addressed in future research was the use of only one measure to establish discriminant validity for the MDTS. Further, the measure utilized (i.e., Levenson-Psychopathy scale) has demonstrated mixed psychometric properties. Among the undesirable properties are a tendency to demonstrated low internal validity, a somewhat unstable factor structure, and a somewhat unexpected pattern of correlating with measures of anxiety (Christian & Sellbom, 2016). In addition to problems with measurement, psychopathy may not be the best construct to establish divergent validity because research on the relationship between psychopathy and anxiety remains equivocal (Derefinko, 2015). Therefore, future studies may be improved with the inclusion of measures of other constructs (e.g., depression) to establish discriminant validity for the MDTS.

Regardless of these limitations, this series of studies contributes to the literature by continuing the work of other researchers in creating a multidimensional measure of DT while accounting for concerns related to measurement bias. Future research in this area could continue to refine the measurement of DT in order to provide clearer models from which DT research can be understood. The inclusion of behavioral measures in future research will be vital in fully understanding the multi-faceted nature of DT and its underlying concepts, and may provide a clearer explanation for how these constructs are related to anxiety and related psychopathology.

Despite the popularity of research examining the facets of DT as underlying contributors to the development and maintenance of anxiety disorders, researchers have not settled on consistent methods for measuring DT constructs. Given that previous research has supported DT as a useful construct in understanding anxiety disorders and related constructs such as worry, future research should continue to refine the measurement and explore further

properties of the underlying constructs. If current limitations are addressed the MDTS could be a useful measure for assessing at least four of the proposed facets of DT efficiently and reliably. Further, if future researchers find the MDTS to be both valid and reliable, this tool could facilitate research examining the facets together rather than separately, enabling researchers to draw conclusions using smaller assessment batteries and to compare conclusions across studies more easily.

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Appendix A

We are conducting a brief, 5-10 minute survey to learn more about people's thoughts and emotions. Your participation is voluntary and you may decide to stop at any time for any reason. Your responses will be kept anonymous.

IMPORTANT NOTICE - In order to participate and be compensated for this survey, you must pay careful attention to each item and respond in an open and honest manner. The survey includes several items designed to ensure participants respond carefully, accurately, and consistently. If you respond to survey items in a random, careless or inattentive fashion, you will receive an error message, and you will not receive compensation or approval for your work. Only complete this work task if you are willing to attend closely to the survey content.**

You will receive \$0.10 for your completion of the survey.

If you have any questions or concerns about the nature of this research or the survey please contact:

Joshua J. Broman-Fulks, Ph.D.
asupsyresearch@gmail.com

By continuing to the survey, you are acknowledging that:

- You have read, understood, and agree to the above information.
- You provide consent to participate under the terms above.

Thank you for your valuable contributions to this important research!

Appendix B

To: Kelsey Thomas
Psychology
CAMPUS EMAIL

From: Monica Molina, IRB Associate Administrator
Date: 10/05/2016
RE: Notice of IRB Exemption

STUDY #: 17-0085
STUDY TITLE: Measuring Tolerance of Distress II

Exemption Category: (2) Anonymous Educational Tests; Surveys, Interviews or Observations

This study involves minimal risk and meets the exemption category cited above. In accordance with 45 CFR 46.101(b) and University policy and procedures, the research activities described in the study material are exempt from further IRB review.

All approved documents for this study including consent forms, can be accessed by logging into IRBIS. Use the following directions to access approved study documents.

1. Log into IRBIS
2. Click "Home" on the top toolbar
3. Click "My Studies" under the heading "All My Studies"
4. Click on the IRB number for the study you wish to access
5. Click on the reference ID for your submission
6. Click "Attachments" on the left-hand side toolbar
7. Click on the appropriate documents you wish to download

Study Change: Proposed changes to the study require further IRB review when the change involves:

- an external funding source,
- the potential for a conflict of interest,
- a change in location of the research (i.e., country, school system, off site location),
- the contact information for the Principal Investigator,
- the addition of non-Appalachian State University faculty, staff, or students to the research team, or
- the basis for the determination of exemption. Standard Operating Procedure #9 cites examples of changes which affect the basis of the determination of exemption of page 3.

Investigator Responsibilities: All individuals engaged in research with human participants are responsible for compliance with University policies and procedures, and IRB determinations. The Principal Investigator (PI), or Faculty Advisor if the PI is a student, is ultimately responsible for ensuring the protection of research participants; conducting sound ethical research that complies with federal regulations, University policy and procedures; and maintaining study records. The PI should review the IRB's list of PI responsibilities.

To Close the Study: When research procedures with human participants are completed, please send the Request for Closure of IRB Review form to irb@appstate.edu.

If you have any questions, please contact the Research Protections Office at (828)-262-2692 (Robin).

Best wishes with your research.

Websites for Information Cited Above

Note: If the link does not work, please copy and paste into your browser, or visit <https://researchprotections.appstate.edu/human-subjects>.

1. Standard Operating Procedure #9:

<http://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/IRB20SOP920Exempt%20Review%20Determination.pdf>

2. PI responsibilities: <http://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/PI20Responsibilities.pdf>

3. IRB forms: <http://researchprotections.appstate.edu/human-subjects/irb-forms>

CC:

Joshua Broman-Fulks, Psychology

Appendix C

You are being invited to take part in a research study about emotions and cognitions. If you take part in this study, you will be one of about 300 people to do so. By doing this study we hope to learn more about what emotions people experience and what they are thinking when they experience them.

The research procedures will be conducted online on the Amazon Mechanical Turk (MTurk) website.

You will be asked to answer questions about your emotions and the types of thoughts you have when you feel specific emotions. The questions may ask about your emotions in specific situations, or in a more general sense. Similarly, the questions may ask about thoughts you have when you are feeling a specific emotion or thoughts you have about emotions generally.

You cannot volunteer for this study if under 18 years of age or if English is not your first language.

What are possible harms or discomforts that I might experience during the research?

To the best of our knowledge, the risk of harm for participating in this research study is no more than you would experience in everyday life.

What are the possible benefits of this research?

Participants who complete the survey through MTurk will be compensated with a payment of \$0.40. In addition to the personal benefit gained from your participation, the information gained by doing this research may help others in the future by helping to identify methods for identifying and understanding emotions.

Will I be paid for taking part in the research?

We will pay you for the time you volunteer while being in this study. Participants must complete the entirety of the study in order to receive payment. If an individual does not complete the entirety of the study, they will receive no payment.

How will you keep my private information confidential?

Please be aware that any work performed on Amazon MTurk can potentially be linked to information about you on your Amazon public profile page, depending on the settings you have for your Amazon profile. We will not be accessing any personally identifiable information about you that you may have put on your Amazon public profile page. We will store your MTurk worker ID separately from the other information you provide to us. Your worker ID may be used to facilitate payment. The anonymous data collected from this study will be kept indefinitely and may be used for future research.

Who can I contact if I have questions?

The people conducting this study will be available to answer any questions concerning this research, now or in the future. If you have any questions or concerns about the nature of this research or the survey please contact:

Joshua J. Broman-Fulks, Ph.D.
bromanfulksj@appstate.edu

If you have questions about your rights as someone taking part in research, contact the Appalachian Institutional Review Board Administrator at 828-262-2692 (days), through email at irb@appstate.edu or at Appalachian State University, Office of Research and Sponsored Programs, IRB Administrator, Boone, NC 28608.

Do I have to participate? What else should I know?

Your participation in this research is completely voluntary. If you choose not to volunteer, there will be no penalty and you will not lose any benefits or rights you would normally have. If you decide to take part in the study you still have the right to decide at any time that you no longer want to continue. There will be no penalty and no loss of benefits or rights if you decide at any time to stop participating in the study.

****It is extremely important that you pay careful attention to each item and respond in an open and honest manner. The survey includes several items designed to ensure participants respond carefully, accurately, and consistently. If you respond to survey items in a random, careless or inattentive fashion, or you do not meet the criteria for the study outlined above, you will receive an error message, and you will not receive compensation or approval for your work. Only complete this work task if you are willing to attend closely to the survey content.****

You will receive \$0.40 for your completion of the survey.

All survey responses will be kept anonymous and will not be linked to your identifying information. This survey should take approximately 15-20 minutes to complete.

By continuing to the survey, you are acknowledging that:

- **You are at least 18 years old.**
- **English is your native language.**
- **You have not participated in this survey before.**
- **You have read, understood, and agree to the above information.**
- **You provide consent to participate under the terms above.**

Thank you for your valuable contributions to this important research!

Appendix D

To: Kelsey Thomas
Psychology
CAMPUS EMAIL

From: Monica Molina, IRB Associate Administrator
Date: 10/06/2016
RE: Notice of IRB Exemption

STUDY #: 17-0086
STUDY TITLE: Measuring Tolerance of Distress III

Exemption Category: (2) Anonymous Educational Tests; Surveys, Interviews or Observations

This study involves minimal risk and meets the exemption category cited above. In accordance with 45 CFR 46.101(b) and University policy and procedures, the research activities described in the study material are exempt from further IRB review.

All approved documents for this study including consent forms, can be accessed by logging into IRBIS. Use the following directions to access approved study documents.

1. Log into IRBIS
2. Click "Home" on the top toolbar
3. Click "My Studies" under the heading "All My Studies"
4. Click on the IRB number for the study you wish to access
5. Click on the reference ID for your submission
6. Click "Attachments" on the left-hand side toolbar
7. Click on the appropriate documents you wish to download

Study Change: Proposed changes to the study require further IRB review when the change involves:

- an external funding source,
- the potential for a conflict of interest,
- a change in location of the research (i.e., country, school system, off site location),
- the contact information for the Principal Investigator,
- the addition of non-Appalachian State University faculty, staff, or students to the research team, or
- the basis for the determination of exemption. Standard Operating Procedure #9 cites examples of changes which affect the basis of the determination of exemption of page 3.

Investigator Responsibilities: All individuals engaged in research with human participants are responsible for compliance with University policies and procedures, and IRB determinations. The Principal Investigator (PI), or Faculty Advisor if the PI is a student, is ultimately responsible for ensuring the protection of research participants; conducting sound

ethical research that complies with federal regulations, University policy and procedures; and maintaining study records. The PI should review the IRB's list of PI responsibilities.

To Close the Study: When research procedures with human participants are completed, please send the Request for Closure of IRB Review form to irb@appstate.edu.

If you have any questions, please contact the Research Protections Office at (828)-262-2692 (Robin).

Best wishes with your research.

Websites for Information Cited Above

Note: If the link does not work, please copy and paste into your browser, or visit <https://researchprotections.appstate.edu/human-subjects>.

1. Standard Operating Procedure #9:

<http://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/IRB20SOP920Exempt%20Review%20Determination.pdf>

2. PI responsibilities: <http://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/PI20Responsibilities.pdf>

3. IRB forms: <http://researchprotections.appstate.edu/human-subjects/irb-forms>

CC:

Joshua Broman-Fulks, Psychology

Appendix E

Intolerance of Uncertainty Scale

Carleton, Norton, & Asmundson, 2007

Please circle the number that best corresponds to how much you agree with each item.

1	2	3	4	5
Not at all characteristic of me	A little characteristic of me	Somewhat characteristic of me	Very characteristic of me	Entirely characteristic of me

1. Unforeseen events upset me greatly.
2. It frustrates me not having all the information I need.
3. Uncertainty keeps me from living a full life.
4. One should always look ahead so as to avoid surprises.
5. A small unforeseen event can spoil everything, even with the best of planning.
6. When it's time to act, uncertainty paralyzes me.
7. When I am uncertain I can't function very well.
8. I always want to know what the future has in store for me.
9. I can't stand being taken by surprise.
10. The smallest doubt can stop me from acting.
11. I should be able to organize everything in advance.
12. I must get away from all uncertain situations.

Appendix F

General Anxiety Disorder – 7

Spitzer, Kroenke, Williams, & Löwe, 2006

0	1	2	3
Not at all	Several days	More than half of the days	Nearly every day

1. Feeling nervous, anxious, or on edge
2. Not being able to stop or control worrying
3. Worrying too much about different things
4. Trouble relaxing
5. Being so restless that it is hard to sit still
6. Becoming easily annoyed or irritable
7. Feeling afraid as if something awful might happen

Appendix G

Obsessive Compulsive Inventory – Revised

Foa et al., 2002

The following statements refer to experiences that many people have in their everyday lives. Circle the number that best describes HOW MUCH that experience has DISTRESSED or BOTHERED you during the PAST MONTH. The numbers refer to the following verbal labels:

0	1	2	3	4
Not at all	A little	Moderately	A lot	Extremely

1. I have saved up so many things that they get in the way.
2. I check things more often than necessary.
3. I get upset if objects are not arranged properly.
4. I feel compelled to count while I am doing things.
5. I find it difficult to touch an object when I know it had been touched by strangers or certain people.
6. I find it difficult to control my own thoughts.
7. I collect things I don't need.
8. I repeatedly check doors, windows, drawers, etc.
9. I get upset if others change the way I have arranged things.
10. I feel I have to repeat certain numbers.
11. I sometimes have to wash or clean myself simply because I feel contaminated.
12. I am upset by unpleasant thoughts that come into my mind against my will.
13. I avoid throwing things away because I am afraid I might need them later.
14. I repeatedly check gas and water taps and light switches after turning them off.
15. I need things to be arranged in a particular way.
16. I feel that there are good and bad numbers.
17. I wash my hand often and longer than necessary.
18. I frequently get nasty thoughts and have difficulty in getting rid of them.

Appendix H

Posttraumatic Stress Disorder Checklist – Civilian

Weathers, Litz, Huska, & Keane, 1994

Instruction to patient: Below is a list of problems and complaints that veterans sometimes have in response to stressful life experiences. Please read each one carefully, put an “X” in the box to indicate how much you have been bothered by that problem in the last month.

1	2	3	4	5
Not at all	A little bit	Moderately	Quite a bit	Extremely

1. Repeated, disturbing memories, thoughts, or images of a stressful experiences from the past?
2. Repeated, disturbing dreams of a stressful experience from the past?
3. Suddenly acting or feeling as if a stressful experience were happening again (as if you were reliving it)?
4. Feeling very upset when something reminded you of a stressful experience from the past?
5. Having physical reactions (e.g., heart pounding, trouble breathing, or sweating) when something reminded you of a stressful experience from the past?
6. Avoid thinking or talking about a stressful experience from the past or having feelings related to it?
7. Avoid activities or situations because they remind you of a stressful experience from the past?
8. Trouble remembering important parts of a stressful experience from the past?
9. Loss of interest in things that you used to enjoy?
10. Feeling distant or cut off from other people?
11. Feeling emotionally numb or being unable to have loving feelings for those close to you?
12. Feeling as if your future will somehow be cut short?
13. Trouble falling or staying asleep?
14. Feeling irritable or having angry outbursts?
15. Having difficulty concentrating?
16. Being “super alert” or watchful on guard?
17. Feeling jumpy or easily startled?

Table 1

Principal Component Analysis Factor Loadings for Final Multidimensional Distress Tolerance Scale

Item	Factor			
	1	2	3	4
I cannot bear much physical discomfort.	.87			
I do not tolerate physical discomfort very well.	.88			
I have a low tolerance for pain.	.90			
Pain is unbearable to me.	.76			
I am more sensitive to pain than most people I know.	.71			
If a task starts to seriously frustrate me, I am likely to quit it.		.88		
When I am confronted with a problem that seems too complicated for me to solve, I prefer to skip it and go on to something easier.		.88		
I tend not to persist very long in tasks that cause me to feel frustrated.		.86		
If I know a task is going to frustrate me, I generally try to avoid it.		.71		
I can't stand having to persist in activities that seem too difficult for me.		.73		
I prefer to avoid situations that can be interpreted in more than one way.			.83	
I would prefer problems that have a clear right or wrong answer over problems that can be viewed from more than one perspective.			.71	
I prefer to avoid problems that do not have a clear answer.			.68	
I dislike problems that have to be viewed from multiple perspectives.			.74	
Problems that have more than one correct answer annoy me.			.90	
I can't tolerate my unpleasant emotions.				.72
When I feel distressed or upset, I can't focus on anything other than how bad I feel.				.61
Other people seem to be able to tolerate their negative emotions better than I can.				.62
When I feel anxious or sad, it is unbearable.				.85
Feeling sad or anxious is always a major ordeal for me.				.79

Note: Factor 1 = Tolerance of Physical Discomfort, Factor 2 = Tolerance of Frustration, Factor 3 = Tolerance of Ambiguity, Factor 4 = Tolerance of Emotional Discomfort

Table 2

Means and Standard Deviations for Subscale and Total Scores

Scale	<i>M</i>	<i>SD</i>
MDTS Physical	11.48	4.93
MDTS Frustration	13.50	4.97
MDTS Ambiguity	13.71	4.69
MDTS Emotion	12.84	5.30
MDTS Four Factor Total Score	51.50	15.97
GAD-7	12.31	5.70
OCI-R	31.33	12.19
PDSS	9.80	4.42
SPIN	38.73	17.04
PCL	32.76	16.80
MIA	54.60	20.90
SHAI	79.87	8.08
LPS	30.04	7.34
IUIA	50.39	19.43
IUS	29.40	11.32
SASS	25.10	8.09
DIS	21.91	7.04
FDS	70.30	24.18
TAS	46.45	9.10
MSTAT	83.47	21.52
DTS	41.27	14.22

Note: MDTS = Multidimensional Distress Tolerance Scale, GAD-7 = Generalized Anxiety Disorder 7, OCI -R = Obsessive-Compulsive Inventory – Revised, PDSS = Panic Disorder Severity Scale, SPIN = Social Phobia Inventory, PCL-C = Posttraumatic Stress Disorder Checklist – Civilian, MIA = Mobility Inventory for Agoraphobia, SHAI = Short Health Anxiety Inventory, LPS = Levenson Psychopathy Scale, DIS = Discomfort Intolerance Scale, FDS = Frustration Discomfort Scale, MSTAT = Multiple Stimulus Type Ambiguity Test, DTS = Distress Tolerance Scale, IUS = Intolerance of Uncertainty Scale, TAS = Tolerance of Ambiguity Scale, SASS = Somatosensory Amplification Scale, IUI-A Intolerance of Uncertainty Index-A, *M* = Mean, *SD* = Standard Deviation

Table 3

Correlations between MDTS subscales and validated measures of anxiety symptomology

Scale Name	1	2	3	4	5	6	7	8	9	10	11	12	13
MDTS													
1 Physical Subscale	-	.38**	.39**	.53**	.72**	.28**	.37**	.13*	.28**	.11	.31**	.35**	.15*
MDTS													
2 Frustration Subscale		-	.64**	.65**	.83**	.42**	.35**	.26**	.58**	.28**	.40**	.37**	.16*
MDTS													
3 Ambiguity Subscale			-	.56**	.80**	.35**	.37**	.16*	.44**	.23**	.33**	.33**	.25**
MDTS													
4 Emotion Subscale				-	.86**	.69**	.53**	.48**	.64**	.40**	.48**	.52**	.24**
MDTS													
5 Four-Factor Total Score					-	.57**	.54**	.34**	.61**	.32**	.49**	.51**	.26**
6 GAD_7						-	.64**	.67**	.61**	.52**	.51**	.55**	.26**
7 OCI-R							-	.54**	.51**	.49**	.49**	.57**	.36**
8 PDSS								-	.40**	.50**	.49**	.46**	.29**
9 SPIN									-	.41**	.52**	.42**	.19*
10 PCL-C										-	.43**	.32**	.21*
11 MIA											-	.42**	.13*
12 SHAI												-	.30**
13 LPS													-

Note: MDTS = Multidimensional Distress Tolerance Scale, GAD-7 = Generalized Anxiety Disorder 7, OCI -R = Obsessive-Compulsive Inventory – Revised, PDSS = Panic Disorder Severity Scale, SPIN = Social Phobia Inventory, PCL-C = Posttraumatic Stress Disorder Checklist – Civilian, MIA = Mobility Inventory for Agoraphobia, SHAI = Short Health Anxiety Inventory, LPS = Levenson Psychopathy Scale

$p < .05^*$, $p < .001^{**}$

Table 4

Results of step two a hierarchical multiple regression of age, gender, and MDTS subscale on measures of anxiety symptomology

Model	Predictor variables	b	SE	β	<i>t</i>	<i>p</i>	ΔR^2	F Change
1 (PDSS)	(constant)	8.47	1.44	-	5.88**	<.001		
	Age	-.05	.02	-.14	-2.37*	.018		
	Gender	-.00	.54	.00	.00	.999		
	MDTS-Physical	-.12	.06	-.13	-1.90	.058		
	MDTS-Frustration	-.01	.08	-.01	-.09	.921		
	MDTS-Ambiguity	-.11	.08	-.12	-1.40	.163		
	MDTS-Emotion	.50	.09	.59	5.66**	<.001		
						.20	12.45**	
2 (SPIN)	(constant)	11.78	4.63	-	2.54	.012		
	Age	-.16	.07	-.12	-2.33	.021		
	Gender	2.26	1.74	.06	1.30	.196		
	MDTS-Physical	-.38	.20	-.11	-1.91	.058		
	MDTS-Frustration	.83	.25	.24	3.34*	.001		
	MDTS-Ambiguity	-.22	.26	-.06	-.85	.395		
	MDTS-Emotion	1.02	.28	.31	3.64**	<.001		
						.39	34.17**	
3 (MIA)	(constant)	18.56	6.73	-	2.76*	.006		
	Age	-.03	.10	-.02	-.31	.756		
	Gender	4.84	2.53	.11	1.91	.057		
	MDTS-Physical	.27	.29	.06	.93	.353		
	MDTS-Frustration	.27	.36	.06	.75	.455		
	MDTS-Ambiguity	-.20	.38	-.04	-.52	.603		
	MDTS-Emotion	.66	.41	.17	1.62	.107		
						.23	14.32**	
4 (GAD 7)	(constant)	5.87	1.54	-	3.82**	<.001		
	Age	-.06	.02	-.02	-2.80*	.006		
	Gender	.34	.58	.03	.59	.550		
	MDTS-Physical	-.12	.07	-.10	-1.74	.083		
	MDTS-Frustration	-.02	.08	-.01	-.18	.856		
	MDTS-Ambiguity	-.08	.09	-.07	-.96	.336		
	MDTS-Emotion	.63	.09	.59	6.84**	<.001		
						.38	34.50**	
5 (OCI-R)	(constant)	23.17	3.63	-	6.38**	<.001		
	Age	-.25	.06	-.25	-4.50**	<.001		
	Gender	-.73	1.37	-.03	-.53	.595		
	MDTS-Physical	.37	.16	.15	2.40*	.017		
	MDTS-Frustration	-.07	.19	-.03	-.40	.722		
	MDTS-Ambiguity	.17	.20	.07	.84	.400		
	MDTS-Emotion	.40	.22	.26	1.83	.069		
						.26	19.27**	

Model	Predictor variables	b	SE	β	<i>t</i>	<i>p</i>	ΔR^2	F Change
6 (SHAI)	(constant)	69.60	2.56	-	27.20**	<.001		
	Age	-.05	.04	-.08	-1.37	.172		
	Gender	.51	.96	.03	.53	.594		
	MDTS-Physical	.16	.11	.10	1.49	.138		
	MDTS-Frustration	.07	.13	.05	.55	.581		
	MDTS-Ambiguity	.05	.13	.03	.40	.691		
	MDTS-Emotion	.62	.13	.41	4.78**	<.001	.24	19.25**
7 (PCL-C)	(constant)	19.70	5.16	-	3.40*	.001		
	Age	-.10	.09	-.08	-1.18	.239		
	Gender	2.13	2.18	.06	.97	.331		
	MDTS-Physical	-.40	.25	-.12	-1.61	.108		
	MDTS-Frustration	.12	.31	.04	.39	.696		
	MDTS-Ambiguity	.19	.32	.05	.60	.549		
	MDTS-Emotion	1.47	.35	.46	4.21**	<.001	.14	7.36**

Note: MDTS = Multidimensional Distress Tolerance Scale, GAD-7 = Generalized Anxiety Disorder 7, OCI -R = Obsessive-Compulsive Inventory – Revised, PDSS = Panic Disorder Severity Scale, SPIN = Social Phobia Inventory, PCL-C = Posttraumatic Stress Disorder Checklist – Civilian, MIA = Mobility Inventory for Agoraphobia, SHAI = Short Health Anxiety Inventory, LPS = Levenson Psychopathy Scale

$p < .05^*$, $p < .001^{**}$

Table 5

Correlations between MDTS subscales and established measures of DT facets

		1	2	3	4	5	6	7	8	9	10	11	12
1	MDTS Physical Subscale	-	.38**	.39**	.53**	.74**	.33**	.30**	.32**	.34**	.26**	.47**	.37**
2	MDTS Frustration Subscale		-	.64**	.65**	.33**	.56**	.65**	.34**	.53**	.36**	.40**	.55**
3	MDTS Ambiguity Subscale			-	.56**	.30**	.47**	.71**	.41**	.59**	.51**	.39**	.63**
4	MDTS Emotion Subscale				-	.43**	.66**	.57**	.59**	.70**	.38**	.51**	.72**
5	DIS					-	.33**	.31**	.30**	.31**	.26**	.39**	.36**
6	FDS						-	.38**	.52**	.64**	.30**	.51**	.66**
7	MSTAT							-	.37**	.61**	.60**	.33**	.63**
8	DTS								-	.51**	.28**	.37**	.56**
9	IUS									-	.50**	.50**	.78**
10	TAS										-	.27*	.45**
11	SASS											-	.47**
12	IUI-A												-

Note: MDTS = Multidimensional Distress Tolerance Scale, DIS = Discomfort Intolerance Scale, FDS = Frustration Discomfort Scale, MSTAT = Multiple Stimulus Type Ambiguity Test, DTS = Distress Tolerance Scale, IUS = Intolerance of Uncertainty Scale, TAS = Tolerance of Ambiguity Scale, SASS = Somatosensory Amplification Scale, IUI-A Intolerance of Uncertainty Index-A

$p < .05^*$, $p < .001^{**}$

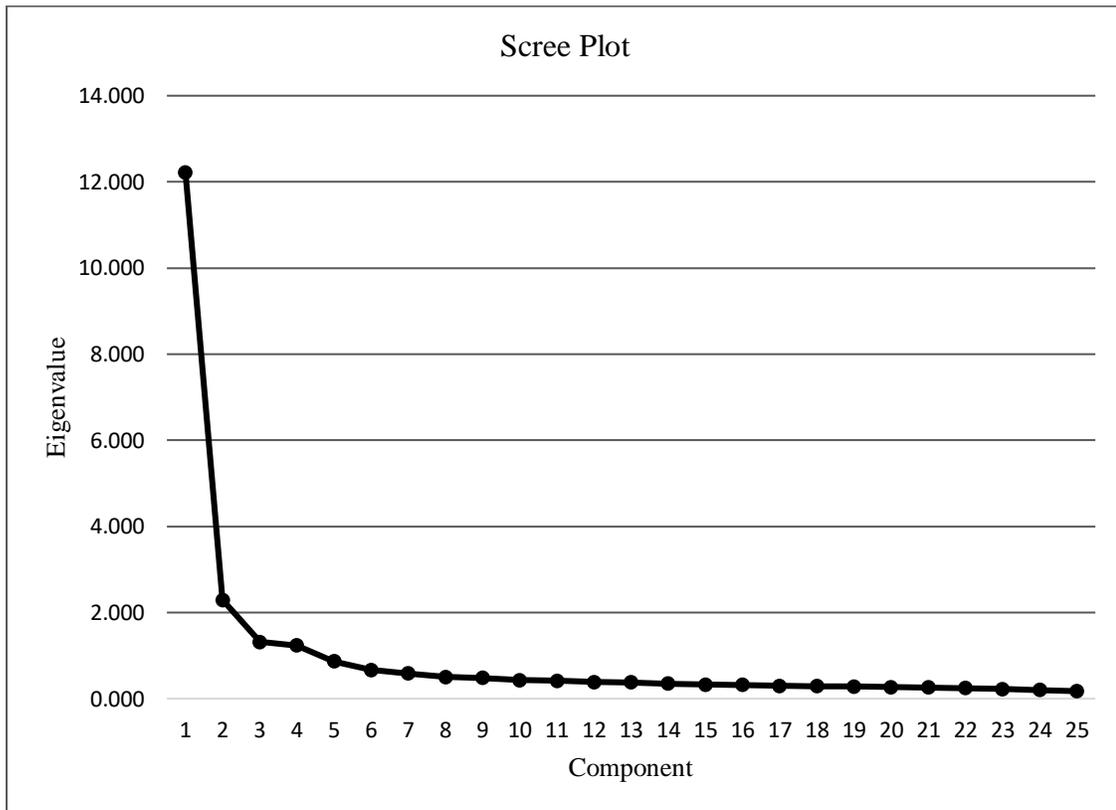


Figure 1. Scree plot for the principal components analysis with promax rotation as described in Study 1.

Vita

Kelsey Nicole Thomas was born in Augusta, Georgia, to Jochen and Krysti Thomas. She graduated from Pine Forest High School in North Carolina in 2011. The following autumn, she entered Appalachian State University to study psychology; and in May 2015, she was awarded the Bachelor of Arts degree. In the fall of 2015, she accepted a position to study clinical psychology at Appalachian State University and began to work toward a Master of Arts degree. Ms. Thomas currently resides in Boone, North Carolina.