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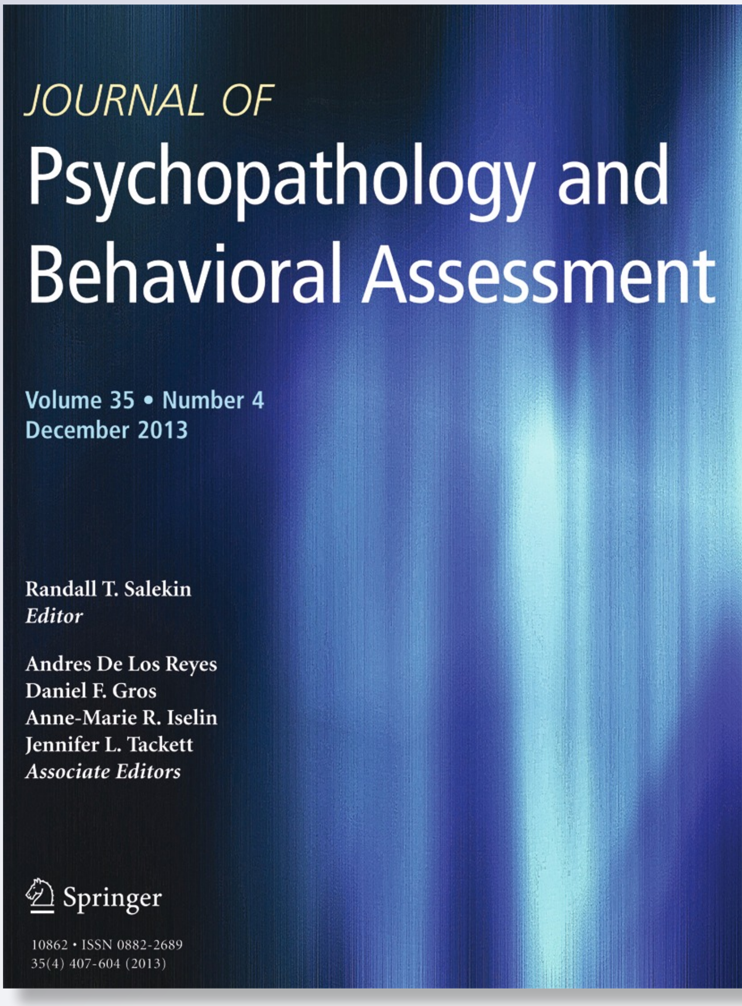

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Testing a Hierarchical Model of Distress Tolerance

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Abstract Distress tolerance (DT) has been suggested as an individual difference factor with transdiagnostic importance. To date, determining the transdiagnostic status of DT has been limited due to the lack of consensus regarding the construct's conceptualization. Zvolensky et al. (Current Directions in Psychological Science 19:406–410, 2010) developed a hierarchical model of DT that seeks to unify different conceptualizations of DT that have emerged across literatures (i.e., intolerance of uncertainty, ambiguity, frustration, physical sensations, and negative emotional states). Through exploratory and confirmatory factor analyses, the present study provided the first known empirical test of Zvolensky et al.'s hierarchical experiential distress (in)tolerance model in a large community sample of adults (N=830). Results indicated that the five lower-order DT constructs are factorially distinct. The magnitude of the latent relations among the DT constructs is consistent with the proposition that all five lower-order constructs belong to the same domain. The fit of Zvolensky et al.'s five-factor higher-order model suggests that a higher-order DT construct accounts for the interrelations among the latent factors. Overall, results are consistent with Zvolensky et al.'s hierarchical DT model. Findings provide an important step in clarifying the nature of DT and provide a platform from which cross-study comparisons may be made.

Keywords Distress tolerance · Assessment · Uncertainty · Ambiguity · Frustration · Discomfort · Negative emotions

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Distress tolerance (DT) has been defined as the perceived and/or actual capability to tolerate aversive emotional and physical experiences (e.g., negative affective states, physical discomfort; Brown et al. 2005; Leyro et al. 2010). DT has recently received a great deal of attention as an individual difference variable involved in the development and maintenance of a wide array of problematic outcomes. Specifically, individuals with lower DT may be more likely to use regulatory strategies that are often described as maladaptive (e.g., avoidance) in response to distress-evoking stimuli. In turn, the use of such strategies likely maintains and exacerbates distress. In contrast, individuals with relatively higher levels of DT may be more likely to use more adaptive regulatory strategies (e.g., flexible and deliberate control of attention) in the face of distress-evoking stimuli, thus resulting in an eventual habituation to the previously distressing experience (Zvolensky et al. 2010). This rationale is consistent with evidence that lower DT appears important to the phenomenology of anxiety disorders (e.g., generalized anxiety, obsessive-compulsive, social anxiety, panic; Carleton et al. 2012), depression (Buckner et al. 2007), borderline personality disorder (Gratz et al. 2006), eating disorders (Anestis et al. 2011), and substance use disorders (Richards et al. 2011).

Given its potential transdiagnostic importance, a number of clinical interventions have been developed that, either directly or indirectly, relieve psychological suffering by increasing the ability to tolerate aversive emotional and physical experiences (e.g., dialectical behavior therapy [DBT;

Linehan 1993], acceptance and commitment therapy [ACT; Hayes et al. 1999], Unified Protocol [Barlow et al. 2004]). In particular, a brief treatment (6 sessions) specifically designed to increase DT was shown to be effective in significantly reducing depressive symptoms in patients with substance use disorders in a residential treatment program (Bornovalova et al. 2012). Moreover, the brief DT treatment, in comparison to supportive counseling and treatment-as-usual, evidenced higher rates of clinically significant improvement in DT (Bornovalova et al. 2012).

Despite its clinical utility and potential transdiagnostic importance, at present, there is a lack of consensus regarding the conceptualization of DT. In one study, McHugh and Otto (2012) used a largely data-driven approach in an attempt to clarify the conceptualization of the DT construct. These researchers developed a 10-item measure that purportedly assesses the core construct of DT. The items for this measure were identified through both an exploratory and confirmatory factor analysis (EFA, CFA, respectively) of four existing measures that McHugh and Otto contended were representative of the range of DT constructs. These measures assessed intolerance of frustration, physical discomfort, negative emotions, and anxiety sensitivity. Although informative, McHugh and Otto's conceptualization of DT diverges from other conceptualizations of DT found in the existing literature in a number of important ways. For example, the bulk of the items (i.e., six) in McHugh and Otto's 10-item measure assess intolerance of negative emotions, which, as is described in more detail below, is conceptualized as just one-of-the-five core dimensions of DT in other conceptual models (Zvolensky et al. 2010). Moreover, McHugh and Otto suggested anxiety sensitivity as a component of DT, whereas other researchers view anxiety sensitivity as being distinct from DT (Leyro et al. 2010). The distinctiveness of anxiety sensitivity from DT is supported by empirical research showing differential concurrent relations between these constructs and anxiety-related sensations and behaviors (Bonn-Miller et al. 2009), as well as substance use behaviors (Zvolensky et al. 2009).

In an alternative conceptualization of DT, Zvolensky et al. (2010) identified five core dimensions of DT based on Leyro et al.'s (2010) theoretical review of the extant DT literature. These five dimensions are indicative of intolerance of distinct types of emotional and/or physical experiences, including (a) uncertainty, (b) ambiguity, (c) frustration, (d) physical discomfort, and (e) negative emotion. These dimensions are briefly presented below to orient readers to the operational definition of each dimension. Readers interested in a more in-depth review of these five dimensions should refer to Leyro et al.'s review.

Dugas and Robichaud (2007) defined intolerance of uncertainty as "a dispositional characteristic resulting from negative beliefs about uncertainty and its implications" (p. 24). Individuals with relatively high levels of intolerance of uncertainty dislike uncertainty to such an extent that they prefer known negative outcomes to uncertain ones (Dugas et al. 2004). Intolerance of ambiguity has been defined as the inability to tolerate stimuli perceived as complex, vague, or subject to more than one conflicting interpretation (McLain 1993). Intolerance of frustration is an individual difference variable that largely originated from Harrington's (2005) Frustration-Discomfort Scale. Harrington's measure assesses the perceived capacity for withstanding frustration in the contexts of (a) instant gratification and fairness, (b) the ease of life, (c) achievement/tasks, and (d) negative emotions. Intolerance of physical discomfort has been conceptualized as the perceived inability to withstand uncomfortable bodily sensations (Schmidt et al. 2006). As noted by Leyro et al., discomfort intolerance refers to bodily sensations that are uncomfortable, rather than being specific to one type of internal stimuli (e.g., pain tolerance, anxiety sensitivity). Finally, intolerance of negative emotion is an individual difference variable that originated from Simons and Gaher's (2005) measure of DT, which Leyro et al. contend best captures one's perceived capacity for tolerating negative emotions that result from aversive cognitive or physical processes.

Within Zvolensky et al.'s (2010) conceptualization of DT, a higher-order factor, labeled "experiential (in)tolerance," is viewed as a common uniting factor among the five DT dimensions presented above. In other words, although the type of distress represented in these DT dimensions may differ, all of the dimensions share the overarching theme of differences in the ability to tolerate experiential distress. This common uniting factor purportedly accounts for the interrelations among the five DT dimensions. Unfortunately, despite its promise for helping to clarify our understanding of the DT construct, the tenability of Zvolensky et al.'s hierarchical model has yet to be examined in the extant literature. The lack of empirical data surrounding Zvolensky et al.'s model represents a significant gap in the literature, as it is difficult to compare competing models of DT when the structure of one of the models has yet to be validated. Moreover, clarifying the nature of DT through empirical research is necessary for determining its transdiagnostic importance. For example, as noted, intolerance of uncertainty and intolerance of negative emotional states both are conceptualized by Zvolensky et al. as distinct dimensions of DT. However, these two dimensions have historically been examined within separate literatures. Specifically, intolerance of uncertainty has been most commonly examined in relation to generalized anxiety disorder and obsessive-compulsive disorder, whereas intolerance of negative emotional states has been most commonly examined in relation to borderline personality disorder and substance-related problems (Leyro et al. 2010). The result of isolating relations between certain putative DT dimensions and specific forms of psychopathology is a literature base from which one is unable to compare across studies. Validating the structure of Zvolensky et al.'s model can help increase confidence that different dimensions of DT are in fact representative of the same overarching construct.

The Present Study

The present study sought to provide the first known empirical test of Zvolensky et al.'s (2010) hierarchical experiential distress (in)tolerance model. Before testing the higher-order model, an EFA was used to confirm the distinctiveness of the five lower-order dimensions. Confirming the distinctiveness among the lower-order dimensions is especially important because "the extent to which various measures of distress tolerance genuinely measure the same underlying construct remains unclear" (Richards et al. 2011, p. 184). Moreover, researchers have questioned whether some of the dimensions within Zvolensky et al.'s model are in fact distinguishable. For example, the operational definitions of intolerance of uncertainty and intolerance of ambiguity are similar and have often been used interchangeably (Grenier et al. 2005). Next, a higher-order CFA approach was used to confirm the findings from the EFA and test whether an overarching general factor accounted for the interrelations among the lower-order DT dimensions. As noted by Brown (2006), "a goal of higher order factor analysis is to provide a more parsimonious account for the correlations among lower order factors" (p. 321). Given that all five lower-order DT dimensions are putatively distinct (Leyro et al. 2010), but belong to the same domain, we predicted that the five DT dimensions would be factorially distinguishable, but would all significantly correlate. Following Zvolensky et al.'s model, we further predicted that a higher-order experiential distress (in)tolerance construct would account for the interrelations among the latent DT dimensions.

Method

Participants

Participant recruitment took place using Amazon Mechanical Turk, an online labor market where researchers can recruit community adults to complete questionnaires in exchange for payment. Participants (N=993) completed the informed consent process via a secure online survey program. Of these, 24 participants failed to provide enough item-level responses to calculate any of the variables of interest, and thus, were removed from the sample. The quality of data collected via Amazon Mechanical Turk has been demonstrated in a number of studies (e.g., Behrend et al. 2011; Buhrmester et al. 2011; Paolacci et al. 2010). However, to allay concerns regarding data quality, and ensure participants were being attentive, three catch questions were embedded in the online survey (e.g., "While watching television, have you ever had a fatal heart attack?, Please select 'Much' if you are paying attention right now."; Oppenheimer et al. 2009; Paolacci et al. 2010). Approximately 14 % (n=139) of the reduced sample (n=969) failed to meet our a-priori benchmark of answering two-out-of three catch questions correctly (Bardeen, Fergus, Orcutt, in press) and were thus excluded from the present study. The final sample (N=830) was 60.5 % female and had an average age of 34.1 years (SD=12.5). In regard to race, 81.2 % of the sample self-identified as White, 6.7 % as Black, 6.4 % as Asian, 1 % as American Indian or Alaska Native, 2.9 % endorsed "other", while 1.8 % preferred not to respond. Additionally, 6.9 % of participants identified as Hispanic.

To conduct the proposed analyses (EFA and CFA), the sample was randomly halved. Sample 1 (n=415) was 60.5 % female and had an average age of 33.9 years (SD=12.5). In regard to race, 81.9 % of the sample self-identified as White, 6.5 % as Black, 7.2 % as Asian, 1 % as American Indian or Alaska Native, 2.2 % endorsed "other", while 1.2 % preferred not to respond. Additionally, 6.5 % of participants identified as Hispanic. Sample 2 (n=415) was 60.5 % female and had an average age of 34.3 years (SD=12.6). In regard to race, 80.2 % of the sample self-identified as White, 7.0 % as Black, 5.5 % as Asian, 1 % as American Indian or Alaska Native, 3.6 % endorsed "other", while 2.4 % preferred not to respond. Additionally, 7.2 % of participants identified as Hispanic. Race and ethnicity were collapsed into a single dummy-coded variable (coded as White and Non-Hispanic [n=622, 74.9 %] versus all others [n=208, 25.1 %]). The two samples did not differ significantly on age ($t_{(828)}$=0.67, p=.67), race ($\chi^2_{(1)}$=0.10, p=.75), and gender ($\chi^2_{(1)}$=1.83, p=.40).

Self-Report Measures for Each Lower-Order Construct

Uncertainty

The Intolerance of Uncertainty Index-Part A (IUI-A; original French version: Gosselin et al. 2008; English version: Carleton et al. 2010) is a 15-item measure that assesses intolerance of uncertainty (e.g., "I find it intolerable to have to deal with unpredictable situations"). The IUI-A has shown adequate psychometric properties, including internal consistency, retest reliability over a 5-week interval, and convergent and discriminant validity (Carleton et al. 2010; Gosselin et al. 2008). In the present study, internal consistency for the IUI-A was adequate (α=.96) and the IUI-A total score served as an indicator for the uncertainty construct.

The Intolerance of Uncertainty Scale (IUS; original French version: Freeston et al. 1994; English version: Buhr and Dugas 2002) is a 27-item measure of intolerance of uncertainty. Through exploratory and confirmatory factor analysis, a two-factor model of the IUS was shown to be superior to the one-factor model (Sexton and Dugas 2009). The IUS-I dimension represents the degree to which one believes that uncertainty reflects poorly on them and will result in negative outcomes (e.g., "Being uncertain means that a person is disorganized") and the IUS-U dimension represents the degree to which one believes that an uncertain future is unfair and distressing (e.g., "Uncertainty makes me uneasy, anxious, or stressed"). The two-factor IUS has demonstrated high internal consistency and concurrent validity (Sexton and Dugas 2009). In the present study, internal consistency for the IUS-I and IUS-U was adequate (IUS-I α=.96; IUS-U α=.93). and each of these scales served as indicators for the uncertainty construct.

Ambiguity

The Multiple Stimulus Types Ambiguity Tolerance-I (MSTAT-I; McLain 1993) is a 22-item measure that assesses intolerance of ambiguity (e.g., "I try to avoid problems which don't seem to have only one best solution"). The MSTAT-I has demonstrated adequate psychometric properties, including internal consistency and convergent and discriminant validity (McLain 1993). In the present study, internal consistency for the MSTAT-I was adequate (α=.91) and the MSTAT-I was used in the present study as an indicator for the ambiguity construct.

The Tolerance of Ambiguity Scale—12 (TAS-12; Herman et al. 2010), a revised version of Budner's (1962) 16-item TAS, is a 12-item measure that assesses intolerance of ambiguity (e.g., "A good job is one where what is to be done and how it is to be done are always clear"). Herman et al. contend that their revised version of the TAS addresses limitations in Budner's original TAS (e.g., low internal consistency); however, psychometric data for the TAS-12 is limited. In the present study, internal consistency for the TAS-12 was adequate (α=.76) and the TAS-12 served as an indicator for the ambiguity construct.

Physical Discomfort

The Somatosensory Amplification Scale (SSAS; Barsky et al. 1990) is a 10-item (e.g., "Even something minor, like an insect bite or splinter, really bothers me") measure that assesses "the tendency to experience somatic and visceral sensation as unusually intense, noxious, and disturbing" (Barsky et al. 1990, p. 323). The SSAS has shown adequate psychometric properties, including internal consistency, retest reliability over approximately 10 weeks (Barsky et al. 1990), and convergent validity (Fergus and Valentiner 2010). In the present study, internal consistency for the SSAS was adequate (α=.76) and the total score served as an indicator for the physical discomfort construct.

The Discomfort Intolerance Scale (DIS; Schmidt et al. 2006) is a 5-item measure that assesses the degree to which participants believe they can withstand uncomfortable bodily sensations. The DIS consists of two factors, discomfort intolerance (DIS-I; e.g., "I can tolerate a great deal of physical discomfort") and discomfort avoidance (DIS-A; e.g., "I take extreme measures to avoid feeling physically uncomfortable"). DIS-I assesses one's ability to withstand pain and discomfort and DIS-A assesses the degree to which one avoids pain and discomfort. The DIS has demonstrated adequate psychometric properties, including internal consistency, retest reliability over approximately twelve weeks, and convergent and discriminant validity (Schmidt et al. 2006). In the present study, internal consistency for both DIS scales was adequate (DIS-I α=.88; DIS-A α=.74) and the DIS-I and DIS-A served as indicators for the physical discomfort construct.

Frustration

The Frustration Discomfort Scale (FDS; Harrington 2005) is a 28-item measure that assesses one's perceived capacity for withstanding frustration across four domains (i.e., entitlement [FDS-E; e.g., "I can't stand it if other people act against my wishes"], discomfort intolerance [FDS-DI; e.g., "I can't stand having to push myself at tasks"], achievement [FDS-A; e.g., "I can't stand feeling that I'm not on top of my work"], emotional intolerance [FDS-EI]). Because items from the FDS-EI scale (e.g., "I can't bear disturbing feelings") are too closely aligned with the negative emotion construct, as measured via the Distress Tolerance Scale (e.g., "I can't handle feeling distressed or upset"), FDS-EI was not used as an indicator of the frustration tolerance construct. The FDS has shown adequate psychometric properties, including internal consistency and discriminant validity (Harrington 2005). In the present study, internal consistency for the three FDS scales was adequate (FDS-E α=.87; FDS-DI α=.89; FDS-A α=.85) and each of these scales served as an indicator for the frustration construct.

Negative Emotion

The Distress Tolerance Scale (DTS; Simons and Gaher 2005) is a 15-item measure that assesses the degree to which participants believe they can withstand the distress associated with negative emotional states. The DTS is made up of four factors: (1) Tolerance (i.e., the ability to tolerate negative emotions [DTS-T; e.g., "Feeling distressed or upset is unbearable to me"]), (2) Appraisal (i.e., perception of negative emotions as distressing [DTS-AP; e.g., "I am ashamed of myself when I feel distressed or upset"]), (3) Absorption (i.e., inability to concentrate on anything else when emotional distress is present [DTS-AB; e.g., "My feelings of distress are so intense that they completely take over"]), and (4) Regulation (i.e., degree of effort to alleviate emotional distress [DTS-R; e.g., "I'll do anything to stop feeling distressed or upset"]). The DTS has demonstrated adequate psychometric properties, including internal consistency of the total and subscale scores, retest reliability over a 6-month period, and convergent and discriminant validity (Simons and Gaher 2005). In the present study, internal consistency for all four DTS scales was adequate (DTS-T α=.82; DTS-AP α=.86; DTS-AB α=.86; DTS-R α=.83) and each of the four DTS scales served as an indicator for the negative emotion construct.

Procedure

For this institutional review board approved study, informed consent and questionnaires were completed using a secure online survey program. Participants were told, via informed consent, that they would be asked to complete questionnaires related to mood, attention, and self-regulation if they chose to participate. Participants could complete the study from any computer with internet access. Questionnaires were presented in random order across participants. It took participants an average of 32.4 min (*SD*=20.59) to complete study questionnaires (participants with completion times >2.5 SDs from the mean were removed from this analysis [*n*=18]). Participants were paid $0.50 upon study completion, an amount which is consistent with precedence for paying Mechanical Turk workers in similar questionnaire studies (Buhrmester et al. 2011).

Data Analytic Strategy

The EFA of the DT dimensions consisted of principal factors extraction with oblique rotation on the respective measure subscale scores. Although factors have often been chosen based on having eignevalues greater than 1.0, some have suggested that this criterion is overly restrictive, and a more liberal eigenvalue of 0.7 should be used (Jolliffe 2002). These criteria were both used in the present study; the EFA was run twice using each eigenvalue cut-point to identify the number of factors. Identification of different factor structures allowed for a more comprehensive comparison of alternate DT models using CFA. Factor loadings were interpreted based on Comrey and Lee's (1992) suggestion that loadings greater than .71 are excellent, .63 are very good, .55 are good, .45 are fair, and .32 are poor.

Following the EFA, a higher-order CFA approach, following Brown (2006) and using Amos software (Version 19; Arbuckle 2010), was used to further test the latent structure of the DT construct put forth by Zvolensky et al. (2010), as well as any competing first-order model(s) identified via the EFA. Following Brown, lower-order CFA measurement models were initially used to confirm the fit of the first-order models before evaluating the fit of a second-order model. The metric of each latent construct was set by constraining one of the unstandardized factor loadings, between the latent construct and manifest indicator, to 1.0. Indicators exhibiting unreliability (factor loadings <.32; Tabachnick and Fidell 2007) were trimmed from the models. Upon fitting an adequate first-order model, a higher order CFA was used to test whether a second-order factor could account for the latent correlations among the lower-order constructs. Within this model, first-order factor correlations were removed from the baseline first-order model and direct effects from the second-order factor to each of the first-order factors were added. Maximum likelihood estimation was used to test all of the CFA models.

CFA models were evaluated using standard goodness-of-fit indices, including the comparative fit index (CFI), non-normed fit index (NNFI), and root mean square error of approximation (RMSEA). For the CFI and NNFI, values >.90 indicate adequate fit (Bentler 1990; Jöreskog et al. 2000; Meyers et al. 2006). For the RMSEA index, values <.05 indicate excellent fit, values from .05 to .08 indicate adequate fit (Browne and Cudeck 1993), and values from .08 to .1 indicate mediocre/acceptable fit, whereas values >.10 indicate inadequate fit (Meyers et al. 2006). The chi-square difference test was used to examine whether there was a significant difference in model fit (Kline 2011). However, because chi-square difference testing with large sample sizes may indicate significant differences when differences in parameter estimates are trivial in magnitude (Cheung and Rensvold 2002), RMSEA 90 % confidence intervals (CIs) were also compared. Overlapping 90 % RMSEA CIs between models may suggest non-significant differences in model fit (Wang and Russell 2005). In addition, the change in CFI (ΔCFI) was also examined to compare models (Kline 2011). A ΔCFI value of less than or equal to .002 suggests trivial differences in model fit (Meade et al. 2008).

Results

Exploratory Factor Analysis

Four factors were extracted with eigenvalues greater than 1.0 (7.04, 1.87, 1.25, 1.09) and one factor exceeded the eigenvalue threshold of .70 (.71). These five factors accounted for the following variance: factor 1=46.9 %, factor 2=12.5 %, factor 3=8.3 %, factor 4=7.3 %, factor 5=4.8 %. The pattern of loadings for both the four-factor (only those indicators with eigenvalues>1.0) and five-factor models (indicators with eigenvalues >0.7) showed well defined structures (see Tables 1 and 2, respectively). For the four-factor model, subscales representing intolerance of uncertainty and ambiguity loaded on the same factor,

Table 1 Factor loadings for the 4-factor solution

Subscale	Factor 1 Frustration	Factor 2 Negative emotion	Factor 3 Physical discomfort	Factor 4 Uncertainty & ambiguity
IUS-I	.32	.13	.03	**−.53**
IUS-U	.34	.08	−.02	**−.62**
IUI-A	.35	.17	−.04	**−.55**
MAT	−.16	.06	.03	**−.88**
TAS	.01	−.03	.05	**−.68**
FDS-A	**.76**	.10	−.08	.01
FDS-E	**.75**	.02	−.02	−.23
FDS-D	**.53**	.07	.10	−.35
DTS-R	.06	**.70**	.01	.07
DTS-AB	−.04	**.90**	.01	−.03
DTS-AP	−.03	**.82**	.01	−.09
DTS-T	−.06	**.89**	−.01	.01
DCI-A	.36	.11	**.46**	.04
DCI-I	−.18	.02	**.62**	−.06
SAS	.44	−.04	**.48**	−.08

n=415 (Sample 1). Items loading on each factor are bolded

while the remaining subscales loaded on their respective factors (i.e., intolerance of frustration, negative emotion, and physical discomfort). For the five-factor model, all subscales loaded on their respective factors. Factor correlations for both models are presented in Table 3. Both the four- and five-factor models from the EFA were retained for the subsequent CFAs.

Four-Factor Lower-Order CFA

All factors were allowed to correlate and there were no secondary loadings. Results from the CFA indicated that all of the factor loadings were significant ($ps<.001$). However, one indicator exhibited unreliability (i.e., DIS-Intolerance subscale: factor loading=.21), and thus, was trimmed from

Table 2 Factor loadings for the 5-factor solution

Subscale	Factor 1 Uncertainty	Factor 2 Negative emotion	Factor 3 Ambiguity	Factor 4 Physical discomfort	Factor 5 Frustration
IUS-I	**.77**	.09	.10	.05	.04
IUS-U	**.76**	.05	.19	−.01	.09
IUI-A	**.56**	.16	.21	−.02	.19
MAT	.22	.10	**.72**	.03	−.06
TAS	.02	−.01	**.69**	.05	.15
FDS-A	.08	.08	−.04	−.04	**.72**
FDS-E	.01	.01	.19	.01	**.86**
FDS-D	.19	.07	.22	.13	**.52**
DTS-R	−.15	**.70**	.03	.01	.15
DTS-AB	.12	**.88**	−.03	.02	−.06
DTS-AP	.21	**.80**	−.02	.02	−.09
DTS-T	−.05	**.88**	.04	−.01	−.01
DCI-A	.15	.09	−.11	**.48**	.23
DCI-I	−.10	.03	.12	**.62**	−.15
SAS	.24	−.06	−.05	**.52**	.28

n=415 (Sample 1). Items loading on each factor are bolded

Table 3 Factor correlations among factors of both the four and five-factor models from exploratory factor analysis

Four-factor model	1	2	3	4	
1. Uncertainty/ambiguity	–				
2. Frustration	−.49	–			
3. Negative emotion	−.50	.36	–		
4. Physical discomfort	−.30	.20	.26	–	
Five factor model	1	2	3	4	5
1. Uncertainty	–				
2. Ambiguity	.45	–			
3. Frustration	.59	.30	–		
4. Negative emotion	.43	.37	.33	–	
5. Physical discomfort	.28	.27	.23	.24	–

n=415 (Sample 2)

the model. This adjustment resulted in a reduction from three to two indicators to represent the physical discomfort construct. Although three indicators or more per construct is preferable, two indicators per construct is acceptable (i.e., just-identified; Kline 2011). The model was re-estimated and all factor loadings were adequate in size (standardized coefficients from .47 to .94). The model fit was adequate, χ^2 (71, n=415)=323.63, p<.001, RMSEA=.093 with a 90 % confidence interval of .083 to .103, CFI=.94, and NNFI=.92. All of the fit indices met or exceeded the specified guidelines. The correlations among the latent constructs of this model are presented in Table 4.

Five-Factor Lower-Order CFA

All factors were allowed to correlate and there were no secondary loadings. Results from the CFA indicated that all of the factor loadings in this model were significant (ps<.001). As above, the DIS-Intolerance subscale exhibited unreliability (i.e., factor loading=.22), and thus, was trimmed from the model. The model was re-estimated and all factor loadings were adequate in size (standardized coefficients from .61 to .94). The model fit was adequate, χ^2 (67, N=415)=230.95, p<.001, RMSEA=.077 with a 90 % confidence interval of .066 to .088, CFI=.96, and NNFI=.95. All of the fit indices met or exceeded the specified guidelines. The correlations among the latent constructs of this model are presented in Table 4.

Table 4 Latent correlations among factors of both the four and five-factor models

Four-factor model	1	2	3	4	
1. Uncertainty/ambiguity	–				
2. Frustration	.75	–			
3. Negative emotion	.46	.37	–		
4. Physical discomfort	.72	.67	.26	–	
Five factor model	1	2	3	4	5
1. Uncertainty	–				
2. Ambiguity	.69	–			
3. Frustration	.75	.51	–		
4. Negative emotion	.46	.39	.37	–	
5. Physical discomfort	.71	.50	.67	.26	–

n=415 (Sample 2). All coefficients are statistically significant at p<.001

When comparing the four- and five-factor lower-order models, all of the fit indices were more favorable for the five-factor model relative to the four-factor mode. Moreover, chi-square difference testing, χ^2_D=92.68 (df=4, p<.001) and a ΔCFI>.002, suggested that the five-factor model provided a significantly better fit to the data in comparison to the four-factor model. However, overlapping 90 % RMSEA CIs were observed, thus suggesting the possibility of a non-significant difference in model fit. Overall, based on the model comparisons, the five-factor model was considered to provide a significantly better fit to the data in comparison to the four-factor model.

One-Factor Lower-Order CFA

A more parsimonious one-factor lower-order model, consisting of all of the DT indicators loading on a single latent construct, was also considered. None of the fit indices met or exceeded the specified guidelines, χ^2 (77, n=415)=1580.28, p<.001, RMSEA=.217 with a 90 % confidence interval of .208 to .227, CFI=.63, and NNFI=.56. In addition, chi-square difference testing, as well as evidence of non-overlapping 90 % RMSEA CIs and ΔCFIs>.002, indicated that both the five-factor [χ^2_D=1349.33 (df=10, p<.001)] and four-factor [χ^2_D=1256.65 (df=6, p<.001)] lower-order models provided a significantly better fit to the data in comparison to the one-factor model. Based on the tested lower-order CFA models, the five-factor model was retained for the subsequent higher-order CFA.

Higher-Order CFA

The higher-order CFA provided an adequate fit to the data, χ^2 (72, n=415)=246.03, p<.001, RMSEA=.076 with a 90 % confidence interval of .066 to .087, CFI=.96, and NNFI=.95. All of the fit indices met or exceeded the specified guidelines. As seen in Fig. 1, the factor loadings on the higher-order factor were all significant (p<.001). The chi-square difference test, χ^2_D=15.08 (df=5, p<.05), indicated that the five-factor first-order model provided a significantly better fit to the data compared to the higher-order model; however, as mentioned above, the chi-square difference test is prone to type I error when used in large samples. Further,

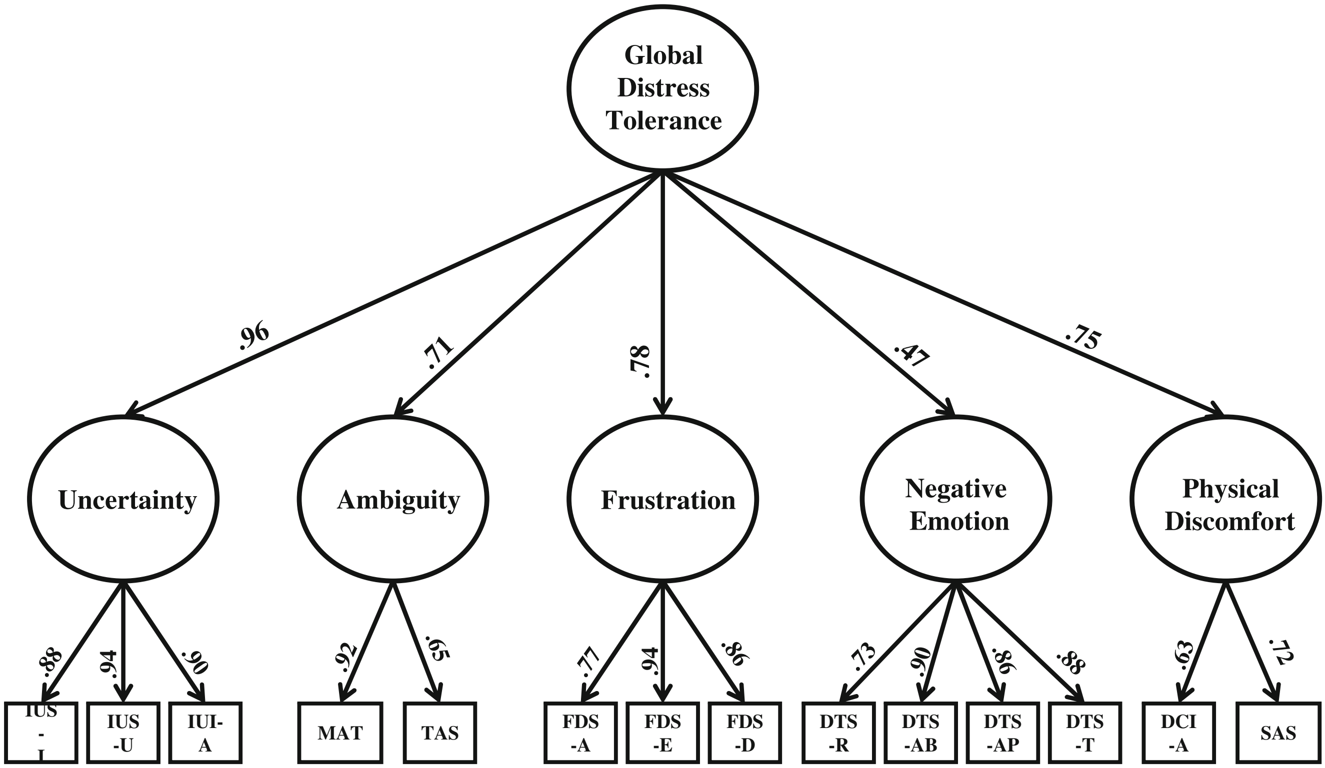

Fig. 1 Factor loadings on the higher-order experiential distress intolerance model (Zvolensky et al. 2010)

the fit indices from the higher-order model were comparable to the five-factor lower-order model. Finally, the overlapping 90 % RMSEA CIs and the ΔCFI<.002 suggested a non-significant difference in fit between the two models. Overall, the higher-order CFA did not appear to provide a significant decrement in model fit relative to the five-factor first-order model.

Discussion

Researchers have suggested DT as an individual difference factor with transdiagnostic importance (e.g., Leyro et al. 2010; McHugh and Otto 2012; Zvolensky et al. 2010). However, several different measures, representing conceptually distinct constructs, have been used to represent DT in the extant literature. Although a great deal of evidence suggests that these various constructs play a role in the maintenance of a wide variety of problematic outcomes, to the extent that these constructs do not represent the same higher-order DT construct, an argument for the trandiagnostic status of DT would not be particularly compelling. In other words, the current lack of consensus regarding the conceptualization of DT makes it difficult to compare findings across studies and determine the transdiagnositic status of the DT construct. On the basis of this rationale, Zvolensky et al. provided a model of DT that clearly specifies the content domain of the construct. However, the tenability of Zvolensky et al.'s model had yet to be empirically evaluated. The present study sought to address this gap in the extant literature by evaluating Zvolensky et al.'s DT model using EFA and CFA.

Overall, results provide preliminary evidence in support of Zvolensky et al.'s (2010) hierarchical experiential distress (in)tolerance model. First, as predicted, results indicated that the five DT constructs are factorially distinct, and thus, best conceptualized as unique dimensions of DT. In addition, an examination of correlations among the lower-order DT constructs showed that all five lower-order constructs were significantly correlated, with medium to large effects for all associations. The magnitude of the latent relations among the DT constructs is consistent with the proposition that all five lower-order constructs belong to the same domain. Further, the fit of the higher-order model suggests that the higher-order experiential distress (in)tolerance model accounted for the interrelations among Zvolensky et al.'s five DT dimensions. Overall, these results are consistent with Zvolensky et al.'s DT model, in which each of the five identified DT dimensions share the overarching theme of difficulties tolerating experiential distress.

The present findings provide an important step in understanding the nature of DT. As described by Leyro et al. (2010), "explicating the nomological net of distress tolerance will facilitate a clearer understanding of its shared and/or unique role in the development and maintenance of psychopathology" (p. 592). With the present results helping to further inform our understanding of the latent structure of DT, an important next step is to complete prospective research examining relations among, as well as the incremental contribution between, the hierarchical experiential distress (in)tolerance construct and theoretically related constructs (e.g., anxiety sensitivity, experiential avoidance, emotion dysregulation) in predicting various forms of psychopathology. Clarifying relations among DT and related constructs will allow researchers to further expand the nomological network of regulatory processes underlying psychopathology.

In addition to examining Zvolensky et al.'s (2010) overarching distress (in)tolerance construct, it will be important to examine differential relations of the lower-order factors to various forms of psychopathology, as well as examining their incremental contribution. To date, specific lower-order DT constructs seem to be examined almost exclusively in relation to specific forms of psychopathology. For example, as noted by Leyro et al. (2010), intolerance of uncertainty has been studied most often in relation to generalized anxiety disorder, discomfort intolerance has received the most attention in relation to panic disorder, and intolerance of negative emotions is examined frequently in relation to a number of pathological conditions (e.g., borderline personality disorder, substance use disorders). Adopting this disorder-specific approach does not allow for a comprehensive understanding of the transdiagnostic importance of each of the five DT dimensions targeted in the present research.

Study limitations must be acknowledged. First, our exclusive reliance on self-report may have resulted in inflation of the magnitude of relations of study variables. However, given the relatively large magnitude of effects, study findings should be relatively robust, and thus, this assessment limitation is not likely to have resulted in spurious effects. When possible, multiple measures were used to assess Zvolensky et al.'s (2010) five DT dimensions. Unfortunately, only a single measure was identified to assess certain dimensions (e.g., intolerance of frustration). As such, it is possible that idiosyncrasies of particular operationalizations of the targeted dimensions might have impacted observed relations. Moreover, measurement selection largely paralleled suggestions made by Leyro et al. (2010), with the exception of the intolerance of ambiguity dimension. The measures of this DT dimension reviewed by Leyro et al. generally evidenced poor reliability (internal consistency) or were too lengthy to be included in the present questionnaire battery. As such, replication of the present results using measures reviewed by Leyro et al. to assess the intolerance of ambiguity dimension might be warranted.

Furthermore, in order to have a sufficient number of indicators to validate Zvolensky et al.'s (2010) higher-order model, eight self-report measures were used in the present study. To reduce the length of questionnaire batteries, it would be useful to develop a relatively short self-report measure that assesses the five dimensions of the hierarchical distress (in)tolerance construct. Following the approach used by McHugh and Otto (2012) in their development of a 10-item DT measure, items from measures assessing each of the five DT dimensions could be exposed to an EFA in the pursuit of developing a relatively short, multidimensional, self-report measure of Zvolensky et al.'s distress (in)tolerance construct. Developing such a measure seems to be an important step in allowing researchers to compare the utility of Zvolensky et al.'s model to competing models of DT (e.g., McHugh and Otto 2012).

One important extension of the present findings will be to investigate the relations of behavioral indices of DT (e.g., cold presser task) to the hierarchical model as well as the five lower-order constructs. Additionally, although the use of a community sample in the present study should be considered a relative strength, caution is warranted in generalizing study findings to a clinical population. To ensure generalizability of the present findings, future research should seek replication in clinical samples. Further, in future research, it will be important to examine the incremental explanatory power of the hierarchical model in explaining individual differences in criterion commonly associated with the construct of distress tolerance (e.g., depression, anxiety).

Distress tolerance has been implicated in the maintenance and exacerbation of a broad range of deleterious outcomes. However, to date, determining the transdiagnostic status of DT has been limited due to the lack of consensus regarding the conceptualization and measurement of the construct. Findings from the present study provide an important step toward determining the transdiagnostic relevance of DT by providing support for one of the most comprehensive models of DT to date. The present findings are important in clarifying the nature of DT, but there is still much work to be done. Importantly, validation of Zvolensky et al.'s (2010) hierarchical experiential distress (in)tolerance model provides a platform from which to build a nomological network of regulatory processes underlying psychopathology.

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