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The Anxiety Depression Distress Inventory–27 (ADDI–27): New Evidence of Factor Structure, Item-Level Measurement Invariance, and Validity

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Abstract

Three studies examining the factor structure and psychometric properties of the Anxiety Depression Distress Inventory–27 (ADDI–27) extended the initial instrument development studies for this recently introduced inventory. The ADDI–27 is an empirically derived short form of the Mood and Anxiety Questionnaire–90 (MASQ–90) comprising three scales: Positive Affect, Somatic Anxiety, and General Distress. The main objectives of Study 1 ($N = 700$) were to examine the factor structure of the ADDI–27 and its measurement invariance across gender at the item level. The objective of Study 2 ($N = 538$) was to examine evidence for the convergent and discriminant validity of scores on the ADDI–27. The objective of Study 3 ($N = 240$) was to assess further evidence for the nomological network and convergent and discriminant validity of the ADDI–27 scores. Results of exploratory structural equation modeling yielded strong support for a 3-factor model, with approximate fit indexes meeting or exceeding the conventional cutoffs. With $p = .001$ as the criterion for detecting noninvariance, results of measurement invariance analysis suggested that all of the ADDI–27 items were invariant across gender. Results of multivariate validity analyses across 2 studies provided support for the convergent and discriminant validity of scores on the ADDI–27 scales.

Depression and anxiety are each associated with impaired social functioning and reduced quality of life (Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007; Strine et al., 2008). In addition, anxiety disorder is frequently comorbid with major depressive disorder, with comorbidity prevalence estimates ranging from 50% to 60% (Hirschfeld, 2001; Kessler, Chiu, Demler, & Walters, 2005). When subdiagnostic symptomatology is taken into account, the prevalence of comorbidity might be 5% to 7% higher (Gorman, 1996; Kessler, Berglund, et al., 2005). The high comorbidity rate indicates that presentation with depressive symptoms should be considered a risk factor for the development of anxiety symptoms, and vice versa (Cameron, 2007). Furthermore, individuals with comorbid anxiety and depression might experience increased difficulty performing routine activities of daily living (Berzins, Garcia, Acosta, & Osman, 2016; Osman, Bagge, Freedenthal, Guterrez, & Emmerich, 2011). Given the high prevalence of comorbid anxiety and depression, additional research is

needed to investigate the unique markers of each symptom cluster as well as the elements that are common to both.

Researchers have long attempted to disentangle indicators of depression and anxiety (e.g., Bridewell & Chang, 1997; Subica, Allen, Frueh, Elhai, & Fowler, 2016), but few self-report instruments have been developed that discriminate anxiety- and depression-related symptoms within a single stand-alone inventory. A critical first step in disentangling depressive symptoms from anxiety-related symptoms is proper measurement of the specific qualities of each symptom cluster. One benefit of a single measure capable of separating anxiety-related symptoms from depression-related symptoms is that clinicians could compute within-person scores indicating the extent to which individuals are showing each cluster of symptoms, thereby aiding in the development of personalized treatment protocols. Additionally, researchers using such scores could derive a clearer conceptual understanding of the distinct markers that set depression apart from anxiety, and of the symptoms that represent overlapping variance.

Joint measures of anxiety and depression

Development of the Mood and Anxiety Symptom Questionnaire–90

One of the first self-report measures that attempted to address the discussed limitation of the psychometric literature was the Mood and Anxiety Symptom Questionnaire–90 (MASQ–90; Clark & Watson, 1991). Using items from the revised *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed. [DSM–III–R]; American Psychiatric Association, 1987) as a viable source, Clark and Watson (1991) designed the MASQ–90 to examine aspects of the tripartite model of anxiety and depression. The tripartite model posits that depression and anxiety are related via a shared factor (negative affect) and differentiated by a factor specific to anxiety (somatic hyperarousal) and a factor specific to depression (low positive affect). Subsequent studies of the factor structure of the items comprising the MASQ–90 have consistently supported a three-factor solution (de Beurs, den Hollander-Gijsman, Helmich, & Zitman, 2007; Keogh & Reidy, 2000; Nitschke, Heller, Imig, McDonald, & Miller, 2001). The empirically derived dimensions comprise (a) a nonspecific general distress or negative affect dimension, (b) a physiological or somatic anxiety dimension, and (c) a positive affect dimension consisting entirely of items reflecting higher positive affect (e.g., “Felt really happy”). Notably, items reflecting loss of interest (e.g., “Felt withdrawn”) have consistently failed to resolve into a distinct and coherent factor (Osman et al., 2011).

The length and complexity of the MASQ–90 have limited its usefulness for clinical and research purposes. As such, shorter forms of the instrument have been developed, including the Mood and Anxiety Symptom Questionnaire–62 (MASQ–62; Watson & Clark, 1991) and the Mini-Mood and Anxiety Symptom Questionnaire (Mini-MASQ; Clark & Watson, 1995). In a prior review of the research literature investigating the various forms of the MASQ, Osman et al. (2011) noted a lack of strong published evidence (beyond coefficient α) of the internal consistency reliability of the scale scores and a limited number of empirical studies supporting the factor structure and basic psychometric properties of the shortened forms. Based on these findings, Osman et al. (2011) conducted three studies addressing the aforementioned limitations, resulting in an adaptation of the initial inventory into a 27-item

inventory capable of distinguishing anxiety from depression. Given that the current project seeks to replicate and extend Osman et al.'s (2011) results, we briefly review the prior work by Osman and colleagues next.

Development of the Anxiety Depression Distress Inventory–27

In Study 1, which analyzed responses from 580 undergraduate students, Osman et al. (2011) empirically derived a subset of 27 items from the MASQ–90, creating the Anxiety Depression Distress Inventory–27 (ADDI–27). Exploratory principal-axis factor (PAF) analysis yielded a three-factor solution, corresponding to the Positive Affect (PA; nine items), General Distress (GD, i.e., negative affect; nine items), and Somatic Anxiety (SA; nine items, i.e., physiological hyperarousal) dimensions of the tripartite model. In addition, Osman et al. reported factor intercorrelations that were consistent with those previously reported for the MASQ–90. Furthermore, using composite reliability estimates (coefficient ρ) computed within structural equation modeling (SEM), Osman et al. found that each ADDI–27 scale score had acceptable internal consistency reliability.

In Study 2, Osman et al. (2011) administered the ADDI–27 to 230 adolescent psychiatric inpatients. Participants had psychiatric diagnoses of either an internalizing disorder (i.e., major depression, posttraumatic stress disorder (PTSD), bipolar disorder, dysthymic disorder, obsessive–compulsive disorder) or an externalizing disorder (i.e., conduct disorder, oppositional defiant disorder, adjustment disorder with disturbance of conduct). Results of mean-adjusted maximum likelihood confirmatory factor analysis (CFA) with parceled items supported a three-factor oblique solution, with indexes indicating adequate fit to the sample data, $\chi^2(24) = 64.39$, comparative fit index [CFI] = .98, Tucker–Lewis Index [TLI] = .96, standardized root mean square residual [SRMR] = .04, root mean square error of approximation [RMSEA] = .07. The authors also found strong support for overlapping variance between the ADDI–27 and the MASQ–90 scale scores, and for the convergent and discriminant validity of the scale scores based on comparison with scores on instruments measuring similar constructs. Furthermore, results from a multivariate analysis of variance showed that scores on the three subscales of the ADDI–27 distinguished significantly between internalizing and externalizing groups at $p < .001$.

In Study 3, Osman et al. (2011) administered the ADDI–27 to a new sample consisting of 384 undergraduates. Results from composite reliability analysis yielded coefficient ρ values .80 for all three scales. CFA with parceled items yielded indices indicating adequate-to-close fit. Analysis of differential correlates yielded results supporting convergent and discriminant validity of the scale scores.

Objectives and overview of analyses

We conducted three new studies in independent samples to replicate and extend previous ADDI–27 research. One limitation of prior studies is that they did not evaluate the factor structure of the ADDI–27 scores using a contemporary factor analytic technique. Accordingly, in Study 1, we conducted exploratory structural equation modeling (ESEM) on ADDI–27 scores within a new sample. Also in Study 1, we conducted item-level measurement invariance testing across gender. Ample prior research shows that the highest

prevalence rates for depression and anxiety are among adult women. Specifically, depressive symptoms for men and women begin to diverge during adolescence, and by adulthood women are twice as likely to present with depressive symptoms, a trend that continues into older adulthood (see, e.g., reviews by Kessler, 2003; Luppá et al., 2012). Similarly, current and lifetime prevalence rates for anxiety disorders are higher for women relative to men (Steel et al., 2014). Gender differences in depressive symptoms and anxiety disorders have been observed in clinical and community-based samples alike (McLean & Anderson, 2009; Parker & Brotchie, 2010). Given these differences, it is critical that researchers evaluate measurement invariance on widely used instruments that assess depression and anxiety. Measurement invariance testing can enable researchers to evaluate whether observed gender differences are at least partially explained by test bias. Accordingly, in Study 1 we analyzed measurement invariance at the item level, across gender. We also evaluated internal consistency reliability.

Studies 2 and 3 were undertaken to further evaluate construct validity, as well as convergent and discriminant validity of ADDI-27 scores. In Study 2, we conducted latent variable SEM to examine the convergent and discriminant validity of scores on the ADDI-27 within a set of concurrent measures selected for their conceptual, empirical, and clinical relevance. We also conducted logistic regression analyses to evaluate the performance of the ADDI-27 scales in predicting high levels of anxiety and general distress. In Study 3, we conducted manifest variable SEM within an additional set of measures to assess further evidence for the nomological network and convergent and discriminant validity of ADDI-27 scores.

Study 1

Method

Participants and procedure—Participants for Study 1 ($N = 700$) consisted of university students recruited from college campuses in the midwestern and southeastern United States, and included 480 women (M age = 20.83, $SD = 4.52$ years) and 220 men (M age = 21.36, $SD = 4.68$). Men and women in the sample did not differ significantly in age. The sample was primarily Hispanic or Latino (37.8%) and White (33.9%), with small percentages of other ethnic groups. All study procedures were approved by each university's institutional review board (IRB) committee. All participants completed an IRB-approved consent form prior to completing the study measures.

Measures: In addition to the ADDI-27 items, participants completed a brief background information questionnaire containing demographic items including age, gender, ethnicity, and marital status. Recall that the ADDI-27 is a self-report instrument consisting of 27 items rated on a 5-point Likert-type scale (Osman et al., 2011). Each of the dimensions (i.e., GD, PA, and SA) consists of nine positively worded items. Each scale is scored as the sum of individual item scores, with higher scores on SA indicating increased levels of anxious symptomatology, lower scores on PA indicating higher levels of depressive symptomatology, and higher scores on GD indicating higher levels of nonspecific negative affect. Because the ADDI-27 is made up of one positive (i.e., protective) and two negative (i.e., risk) dimensions, it is not appropriate to calculate a total score for this instrument.

Data analytic plan

Descriptive statistics and internal consistency reliability: We computed means, standard deviations, skewness (Sk), and kurtosis (Ku) for the ADDI–27 scale scores. We also evaluated internal consistency reliability of scores on each scale with coefficient α (Cronbach, 1951) and coefficient ρ (composite reliability), using SEM to derive point estimates (Raykov, 2009; Raykov & Marcoulides, 2015). Although previous ADDI–27 research evaluated composite reliability, we also computed coefficient α to provide an alternate (i.e., convergent) indicator of internal consistency reliability. In addition, we used the bootstrapping technique ($N_{\text{resamples}} = 2,000$) to determine 95% confidence intervals for each point estimate. We interpreted estimates above .70 as evidence of adequate internal consistency.

ESEM—To evaluate whether the factor structure of the ADDI–27 in this sample was consistent with previous findings, we conducted ESEM using the *Mplus* 7.2 program for Windows (Muthén & Muthén, 1998–2014). ESEM is a contemporary technique that adopts a rigorous exploratory factor analytic procedure (e.g., allowing all ADDI–27 items to load on all factors) within an SEM framework. Unlike CFA, ESEM does not require items to be constrained to zero loadings on nontarget factors. As a result, ESEM usually does not yield inflated factor loadings or inflated interfactor correlations, and thus the factors obtained within ESEM tend to be more distinct. In addition, *Mplus* provides fit statistics that can be used to evaluate how well different ESEM factor solutions reproduce the observed correlation matrix.

Results of Shapiro–Wilk W tests indicated that responses for many of the items were not normally distributed. Thus, we selected the mean- and variance-adjusted weighted least squares (WLSMV) estimator as an appropriate method for analyzing nonnormal polytomous item responses. Expecting moderate correlations between factor scores, we selected the direct oblimin rotation. These tests were also undertaken to evaluate the unidimensionality of each subscale of the ADDI–27, in an effort to support the next phase of data analysis: differential item functioning (DIF).

Item-level measurement invariance testing: In light of the research literature demonstrating robust gender differences in reported depression and anxiety symptoms, we investigated whether test bias could be detected in responses to items on the ADDI–27. Item-level measurement invariance testing was conducted within IRTPRO-2, a program commonly used to test for DIF (Cai, du Toit, & Thissen, 2011–2015). Specifically, our analysis involved the comparison of two models. First, we estimated a less restrictive model where the slope (a) parameters, or indexes of item discrimination, varied across men and women. Next, we estimated a more restrictive model where the a parameters were constrained to be equivalent across items and groups (Cai et al., 2011–2015). As with polytomous items, the difficulty indicators (b parameters) within IRTPRO-2 were free to vary across items and gender in both models. Men were the reference group in both the restrictive (a parameters constrained) and less restrictive models. Because the analyses were exploratory, we did not anchor any items.

We conducted separate analyses on each scale. We assessed the relative fit of each proposed model to the sample data using the Akaike information criterion (AIC) and 2 log-likelihood estimates, interpreting lower values of each statistic as evidence of a closer approximation to the data (Cai et al., 2011–2015). In addition, we examined Orlando and Thissen's (2000) $S\text{-}\chi^2$ item-fit statistic to assess the performance of each item. Finally, we examined the graded item response theory (IRT) statistic (χ^2 c/a) for evidence of noninvariance at the item level. We interpreted items with p values $\leq .001$ as noninvariant across gender; scales with more than three noninvariant items were determined to be noninvariant at the scale level.

Results

Descriptive statistics and internal consistency reliability—Descriptive statistics for the ADDI–27 scale scores are shown in Table 1 (Study 1). Men and women differed significantly only in their mean scores on GD, $t(698) = 2.01, p = .05, d = .16$ (95% CI [.01, .32]). There were no statistically significant differences between scores for men and women on the remaining scales. Internal consistency reliability was good for scores on all three scales of the ADDI–27. Coefficient α and coefficient ρ yielded equivalent point estimates of .92, and 95% confidence intervals between .91 and .93 for PA. Similar results emerged for SA (coefficient $\alpha = .83$ [.81, .86]; coefficient $\rho = .84$ [.81, .86]); however, our results also indicated that, relative to coefficient α , coefficient ρ slightly underestimated internal consistency for GD (coefficient $\alpha = .89$ [.88, .91]; coefficient $\rho = .87$ [.86, .89]), although this difference was negligible.

ESEM—We estimated a series of common exploratory factor analysis (EFA) rotations with ESEM using *Mplus*, including one-, two-, and three-factor solutions. For the one-factor solution, the robust fit statistics were $\chi^2(324) = 5,495.67$, CFI = .69, TLI = .67, SRMR = .20, RMSEA = .17. These statistics suggested poor fit to the observed data matrix. The two-factor solution, in which the SA and GD items loaded onto a single factor, yielded robust fit indexes approaching the recommended cutoffs, $\chi^2(298) = 2,377.86$, CFI = .90, TLI = .88, SRMR = .08, RMSEA = .10. However, the three-factor solution yielded a superior approximation to the sample data, as indicated by approximate fit indexes well within the prescribed ranges: $\chi^2(273) = 1,176.45$, CFI = .96, TLI = .94, SRMR = .04, RMSEA = .07. Of note, the χ^2 test was statistically significant for all three solutions estimated. However, this statistic is known to be overly sensitive, particularly in larger samples. Thus, assessment of model fit was based primarily on approximate fit indexes. We also conducted robust χ^2 difference tests (results available on request), which indicated that the three-factor solution provided a significant improvement in fit compared to the one- and two-factor solutions.¹

Regarding the three-factor solution (Table 2), each item loaded $\geq .40$ on its target factor with no cross-loadings $\geq .30$. The largest interfactor correlation was between GD and PA ($r = -.54$ [–.48, –.59]), followed by the correlation between GD and SA ($r = .47$ [.40, .53]). The smallest correlation was between PA and SA ($r = -.24$ [.17, –.32]). These correlations are

¹We also estimated an oblique four-factor solution. However, only two items (17 and 21) featured loadings $> .35$ on the fourth factor ($\lambda = .45$ and $\lambda = .37$, respectively). In addition, these items featured strong cross-loadings ($\lambda = .70$) on PA. Because F4 did not feature the minimum number of items required for viability, the four-factor solution was discarded.

similar to those previously reported for the ADDI-27, and provide evidence of the convergent and discriminant validity of the scale scores.

Item-level measurement invariance testing—Separate difference tests for each scale ($p < .01$) confirmed that the AIC values for the unconstrained models were lower than the AIC values for the constrained models for SA and GD (AIC = 51.69 and 158.88, respectively), whereas the constrained model fit the data better for PA (AIC = 75.16). We found parallel results with the -2 log-likelihood statistic. Averaging across items, results suggested that there were no differences between the discriminant properties of the items for men and women on SA and GD; however, results also suggested that certain items on the PA scale more effectively differentiated between high and low levels of trait positive affect for men relative to women, or vice versa. To further investigate this result, we examined the graded IRT statistic to examine evidence of measurement invariance for each item individually. According to our earlier criterion for detection of DIF ($p < .001$), our results suggested that all of the ADDI-27 items were invariant across gender (see Table 3). Items 1 (“Felt sad”; GD) and 4 (“Felt really happy”; PA) did approach noninvariance at $p = .01$,² but did not meet the prespecified threshold of $p < .001$ for noninvariance or for the number of noninvariant items (3) that would indicate a noninvariant scale.

Study 2

Method

Participants and procedure—The sample for Study 2 consisted of college students ($n = 324$, 60.2%) and community adults ($n = 214$, 39.8%). A conventional snowball sampling procedure was used in both the Midwest and Southwest (e.g., word-of-mouth communication) to recruit the study participants. The community adult group ($M_{age} = 33.76$, $SD = 8.04$) was older than the student group ($M_{age} = 18.89$, $SD = 1.43$), and the difference was statistically significant, $t(536) = 32.53$, $p < .001$, $d = 2.87$ (95% CI [2.62, 3.11]). In addition, the groups differed significantly by ethnicity, $\chi^2(6, 538) = 15.31$, $p = .018$, with higher proportions of Hispanic and White participants in the student group. However, the two groups did not differ significantly by sex. With regard to the ADDI-27 scales, the groups differed significantly only in their scores on SA, $t(536) = 3.31$, $p = .001$. However, the effect size was small, $d = 0.29$ (95% CI [0.12, 0.46]). Similarly, group differences in scores on concurrent measures were small or nonsignificant. Consequently, the samples were combined for the current analysis. The combined sample ($N = 538$) included 268 women ($M_{age} = 25.12$, $SD = 8.90$) and 270 men ($M_{age} = 24.50$, $SD = 8.99$). Men and women did not differ significantly in age. The sample was primarily Hispanic or Latino (39.2%) and White (34.0%). Participants completed IRB-approved consent forms, consistent with the approved study protocol.

²This finding suggests that men and women had a tendency to respond differently to these two items only. This result might have been due to a real (population) difference between genders (e.g., men might be less likely to experience sadness) or it could be a sample-specific result. Without statistically significant results or further evidence of noninvariance for the full set of items, it appears more likely to be due to sampling error.

Measures—In addition to the ADDI–27, participants completed a background information questionnaire and four concurrent measures as described next.

Davidson Trauma Scale–17: The Davidson Trauma Scale (DTS–17) is a self-report questionnaire (Davidson et al., 1997) containing 17 items corresponding to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text revision [*DSM–IV–TR*]; American Psychiatric Association, 2000) symptoms of PTSD. Items on the DTS–17 correspond to PTSD *DSM–IV–TR* Criterion B (intrusion/reexperiencing; DTS–INT), Criterion C (avoidance; DTS–AVD), and Criterion D (hyperarousal; DTS–HYP) symptom clusters. In light of previous research documenting a relationship between symptoms of somatic anxiety and PTSD (e.g., Fan, Zhang, Yang, Mo, & Liu, 2011; Groome & Soureti, 2004), we expected scores on ADDI–SA to predict unique variance in each of the DTS–17 scale scores.

Impact of Event Scale–Revised: The Impact of Event Scale–Revised (IES–R) is a widely used 22-item self-report instrument measuring symptoms of PTSD (Weiss, 2007). It contains statements corresponding to symptom Clusters B (IES–R–INT), C (IES–R–AVD), and D (IES–R–HYP) of the *DSM–IV–TR*. Each of the 22 items is a statement referring to an unspecified Criterion A traumatic event that the participant might have experienced (lifetime occurrence). As with the DTS–17, we expected ADDI–SA scores to be uniquely associated with scores on each of the IES–R scales, based on the documented evidence of a relationship between somatic anxiety and PTSD symptoms.

University of Texas at San Antonio Future Disposition Inventory: The University of Texas at San Antonio Future Disposition Inventory (UTSA–FDI) is a 24-item self-report questionnaire measuring hopelessness (i.e., future disposition) in association with suicidal thoughts (Osman et al., 2010). It consists of items pertaining to three dimensions of the future disposition construct. The protective or positive dimension (positive focus; PF) focuses on protective responses such as optimism, constructive plans for the future, satisfaction with life, and determination in handling problematic situations linked with future life events. The negative dimension (negative focus; NF) addresses risk-related responses such as worry, cognitive rigidity, and life dissatisfaction. The suicide orientation (SO) dimension contains items pertaining to suicidal ideation, suicide rumination, and the desire to die. Each item is rated on a 5-point Likert-type scale ranging from 1 (*not at all true of me*) to 5 (*extremely true of me*), and item ratings were summed to score each scale. Given the evidence of a relationship between positive affect and optimism regarding the future (e.g., Palgi, Shrira, Ben-Ezra, Cohen-Fridel, & Bodner, 2011; Rego, Sousa, Marques, & Cunha, 2012), we expected scores on ADDI–PA to evidence a positive association with UTSA–FDI–PF scores and negative associations with UTSA–FDI–NF and UTSA–FDI–SO scores.

Suicide Behaviors Questionnaire–Revised: The Suicide Behaviors Questionnaire–Revised (SBQ–R) consists of four items, each of which measures a distinct aspect of suicidal behaviors (Osman et al., 2001). Item 1 taps into lifetime suicidal ideation and history of suicide attempts. Item 2 measures the frequency of suicidal ideation over the last 12 months. Item 3 taps into threats of suicidal behavior, and Item 4 measures self-reported likelihood of

future suicide attempt. For this study, the SBQ–R was scored as the sum of all four items to provide an overall measure of suicide-related behaviors.

A number of studies have yielded convergent evidence of a relationship between high anxiety and suicide ideation (e.g., Cougle, Keough, Riccardi, & Sachs-Ericsson, 2009; Goodwin & Roy-Byrne, 2006), whereas the evidence for a potential link between high anxiety and suicide attempts is contradictory (e.g., Norton, Temple, & Pettit, 2008; Sareen, 2011). In addition, few recent studies have examined the potential relationship between positive affect and suicide. One study found a negative association between suicide ideation and the positive emotions facet of Extra-version within the Five-Factor Model of personality (Chioqueta & Stiles, 2005). Although we thought it reasonable to expect a negative association between scores on SBQ–R and ADDI–PA, the relative lack of previous research advised caution. In addition, we note that the SBQ–R contains a number of items referencing external behaviors, including frequency of threats and attempts, whereas the UTSA–FDI–SO is more purely a measure of suicide-related cognitions. Given that previous research firmly supports an association between high anxiety (as well as low positive affect) and suicide ideation, both the SBQ–R and UTSA–FDI–SO were included to test the discriminant validity of scores on the ADDI–27; that is, their ability to discriminate between suicide cognitions (UTSA–FDI–SO) and suicide behavior (SBQ–R).

Data analytic plan

Descriptive statistics and internal consistency reliability: We computed means, standard deviations, skewness, and kurtosis for the ADDI–27 and concurrent measures. In addition, internal consistency reliability coefficients (i.e., α and ρ) were computed using latent variable SEM in *Mplus*.

Validity analysis: Convergent and discriminant validity of ADDI–27 scale scores were assessed using latent variable SEM in *Mplus*. Items comprising the ADDI–27 scales were modeled in accordance with the oblique three-factor solution retained in Study 1. Concurrent measures were modeled as uncorrelated endogenous (dependent) variables. A preliminary CFA showed the hyperarousal factors of the DTS–17 and the IES–R to be highly correlated across instruments ($r = .78$ [.66, .93]). In view of this result, we modeled items from these two scales as a single latent variable, PTSD hyperarousal. Similarly, avoidance and intrusion factors were strongly correlated across DTS–17 and IES–R ($r = .56$ [.45, .57] and $.71$ [.57, .84]). Consequently, we modeled related items across instruments as PTSD avoidance and PTSD intrusion. Items comprising the SBQ–R and the three UTSA–FDI scales were modeled in accordance with the published scoring.

Dependent variables were regressed on the oblique three-factor model of the ADDI–27, generating 21 path coefficients. Taking into account the multivariate nonnormality of the data (normalized estimate of Mardia's coefficient = 111.16, $p < .001$), we selected maximum likelihood estimation with robust standard errors (MLR).

Standardized path coefficients for direct effects in SEM are similar to standardized beta weights (β) in multiple regression and can be interpreted similarly. In particular, they represent the unique variance predicted by an independent variable after controlling for other

associations in the model. Across Studies 2 and 3, we assessed the magnitude of path coefficients using the following guidelines: below .20 = small, .20 to .49 = moderate, .50 or greater = large. Nonlinear constraints were applied within *Mplus* to estimate the magnitudes and standard errors of the differences between pairs of path coefficients, which were then evaluated using a two-tailed *Z* test (Cheung 2009). The conventional cutoff of $Z = 1.96$ statistical ($p = .05$) was selected to assess significance.

Logistic regression: We used logistic regression to evaluate the performance of ADDI-27 scale scores in distinguishing individuals with high levels of anxiety and distress from those with low levels. This analysis was facilitated by the IES-R. Although a clinical cutoff score for the IES-R has not been established, research by Creamer, Bell, and Failla (2003) suggests that a score of 33 or higher on the IES-R represents a probable diagnosis of PTSD. In our sample, a score of 33 or above corresponded closely to the top quartile (25%) of respondents. Thus, we created two groups corresponding to the top and bottom quartiles by IES-R score. The criterion for inclusion in the high IES-R group was a score ≥ 30 , corresponding to values in the top quartile of the sample ($n = 135$), whereas the criterion for inclusion in the low IES-R group was a score ≤ 1 , corresponding to values in the bottom quartile ($n = 150$). The combined sub-sample consisted of $N = 185$ individuals ($M_{age} = 24.8$, $SD = 8.98$; 47.4% men; 52.6% women). We then conducted logistic regression analyses with the ADDI-27 scales as predictors of group membership. To obtain more readily interpretable parameter estimates and effect sizes, independent variables were mean centered and standardized prior to analysis.

Results

Descriptive statistics and internal consistency reliability—Descriptive statistics for the ADDI-27, DTS-17, IES-R, SBQ-R, and UTSA-FDI are summarized in Table 1 (Study 2). Men and women differed significantly in their mean scores on the following four subscales: ADDI-GD ($d = .27$ [.10, .44]), DTS-HYP ($d = .18$ [.01, .35]), UTSA-FDI-PF ($d = .20$ [.03, .37]), and IES-R-INT, $d = .19$ [.02, .36]. In all four cases, the average score for women was significantly higher ($p < .05$). There were no statistically significant differences between the means for men and women on the remaining scale scores.

Scale scores for the ADDI-27, DTS-17, IES-R, and UTSA-FDI demonstrated evidence of internal consistency reliability as estimated by both coefficient α and coefficient ρ (point estimate range = .88–.92 for both indices; total 95% CI [.86, .93]). For all subscales (except for the SBQ-R), lower 95% confidence intervals were $\geq .80$ for both α and ρ coefficients, indicating good internal consistency reliability across estimates. Although somewhat lower, we judged the internal consistency reliability of the SBQ-R in the current sample to be adequate: coefficient $\alpha = .71$, 95% CI [.67, .75], coefficient $\rho = .79$ [.75, .83].

Validity analysis—Model estimation terminated normally. All response items featured strong loadings on their target factors ($\lambda = .48$ –.94, $p < .001$). In addition, estimates for correlations among the exogenous latent variables were as follows: ADDI-SA versus ADDI-GD = .57 [.48, .66], ADDI-GD versus ADDI-PA = $-.53$ [-.61, -.45], and ADDI-PA versus ADDI-SA = $-.17$ [-.28, -.07]. Standardized path coefficients with robust 95%

confidence intervals are shown in Table 4. ADDI–GD featured significant associations with nearly all criterion variables, although the associations with PTSD intrusion, UTSA–FDI positive focus, and UTSA–FDI suicide orientation were weak, and the association with SBQ–R was nonsignificant. ADDI–GD emerged as a strong unique predictor of UTSA–FDI negative focus ($\beta = .52$ [.38, .67]), and a moderate predictor of avoidance ($\beta = .22$ [.13, .58]) and hyperarousal, $\beta = .21$ [.12, .55]. ADDI–GD was more strongly associated with negative focus than with any other criterion variable ($Zs = 2.30, ps = .003$). In addition, ADDI–GD performed significantly better as a predictor of negative focus than ADDI–PA ($Z = 10.47, p < .001$) and ADDI–SA ($Z = 2.39, p = .017$).

ADDI–PA was strongly associated with UTSA–FDI positive focus ($\beta = .61$ [.51, .71]), and featured moderate negative associations with negative focus ($\beta = -.22$ [–.31, –.13]) and suicide orientation, $\beta = -.24$ [–.34, –.15]. Further, ADDI–PA was more strongly associated with positive focus than with any other criterion variable ($Zs = 7.88, ps < .001$). ADDI–PA performed significantly better as a predictor of positive focus than ADDI–GD ($Z = 5.34, p < .001$) and ADDI–SA ($Z = 6.92, p < .001$). Of note, associations between ADDI–PA and all three PTSD symptom clusters were small and nonsignificant. The same was true of the association between ADDI–PA and SBQ–R scores.

ADDI–SA was most strongly associated with PTSD hyperarousal ($\beta = .53$ [.25, .81]) and PTSD intrusions ($\beta = .50$ [.20, .80]), and featured weak to moderate associations with the remaining criterion variables. ADDI–SA was a significantly stronger predictor of PTSD intrusions, PTSD avoidance, and PTSD hyperarousal than either ADDI–GD or ADDI–PA ($Zs = 1.99, ps = .047$). The association between ADDI–SA and SBQ–R was nonsignificant.

Logistic regression—The likelihood ratio, score, and Wald χ^2 tests were statistically significant at $p < .01$ for all three models, indicating acceptable overall model fit. The logistic regression coefficients for scores on all three ADDI–27 scales were also statistically significant: ADDI–PA, $\beta = 0.35, \chi^2(1) = 8.19, p = .004$; ADDI–GD, $\beta = 1.01, \chi^2(1) = 43.75, p < .001$; and ADDI–SA, $\beta = 1.10, \chi^2(1) = 44.40, p < .001$. A decrease of 1 *SD* in the ADDI–PA score increased the odds of being classified in the high IES–R group by 42% ($OR = 1.42$ [1.12, 1.81]). An increase of 1 *SD* in the ADDI–GD score more than doubled the odds of being classified in the high IES–R group ($OR = 2.73$ [2.03, 3.68]), and an increase of 1 *SD* in the ADDI–SA score tripled the odds of being classified in the high IES–R group ($OR = 2.99$ [2.17, 4.13]).

Study 3

Method

Participants and procedure—For Study 3, the combined sample of college undergraduates ($N = 240$) included 139 women (M age = 20.28, $SD = 3.04$) and 101 men (M age = 20.40, $SD = 3.18$). Men and women in the sample did not differ significantly in age. Participants were recruited from a university campus in the southwestern United States. The sample was primarily Hispanic or Latino (43.8%) and White (38.3%). Participants completed IRB-approved consent forms, consistent with the approved study protocol.

Measures—In addition to the ADDI–27, participants completed a brief background information questionnaire containing demographic items including age, gender, ethnicity, and marital status.

Positive and Negative Affect Schedule: The Positive and Negative Affect Schedule (PANAS) is a 20-item multidimensional instrument that includes two subscales: one subscale captures positive affect (PANAS-PA) and one subscale captures negative affect (PANAS-NA; Watson, Clark, & Tellegen, 1988). The PANAS was included to assess the convergent and discriminant validity of scores on the ADDI–27 scales. PANAS-NA scores were expected to evidence a strong association with ADDI–GD, and PANAS-PA scores were expected to evidence a strong association with ADDI–PA.

Symptom Assessment–45: The Symptom Assessment–45 (SA45) is a 45-item self-report questionnaire that was included in Study 3 to assess several types of psychopathology (Davison et al., 1997; Maruish, Bershadsky, & Goldstein, 1998). This instrument is composed of nine five-item scales that were used to tap separate dimensions of psychopathology: anxiety (SA45-ANX), depression (SA45-DEP), hostility (SA45-HOS), interpersonal sensitivity (SA45-INS), obsessive–compulsive symptoms (SA45-OCD), paranoia (SA45-PAR), phobic symptoms (SA45-PHO), psychosis (SA45-PSY), and somatization (SA45-SOM). In this study, we used scores from all nine scales as validation measures to assess the validity of the ADDI–27 scales.³

Data analytic plan

Descriptive statistics and internal consistency reliability: We computed means, standard deviations, skewness, and kurtosis for the ADDI–27 and concurrent measures. In addition, internal consistency reliability coefficients (i.e., α and ρ) were computed using latent variable modeling in *Mplus*. We also computed the intercorrelations among scores on the SA45 scales.

Scale validity: Convergent and discriminant validity of scores on the ADDI–27 scales were assessed using SEM with MLR estimation in *Mplus*. Due to the smaller sample size for Study 3 ($N = 240$) relative to the number of free parameters, SEM was conducted with total scale scores rather than latent variable modeling. Scores from all criterion measures (uncorrelated) were regressed on the correlated ADDI–27 scale scores and the resultant path coefficients were examined for evidence of convergent and discriminant validity.

Results

Descriptive statistics and internal consistency reliability—Scores on the ADDI–27 and concurrent measures demonstrated good internal consistency in this sample. For the ADDI–27 scales, estimates ranged from .87 to .90 (total 95% CI [.82, .93]) for coefficient α and .87 to .89 (total 95% CI [.83, .91]) for coefficient ρ . Coefficient α estimates were .90 [.88, .92] for PANAS-PA and .87 [.84, .89] for PANAS-NA. With regard to the SA45,

³One common way in which the SA45 scales are used is in exploratory factor analysis to identify clusters of internalizing (e.g., SA45-ANX, SA45-DEP) and externalizing dimensions (e.g., SA45-HOS).

coefficient α estimates ranged from .67 [.54, .79] for scores on SA45-ANX to .90 [.88, .92] for scores on SA45-DEP. Correlations among the SA45 scales ranged from .40 (SA45-HOS vs. SA45-SOM) to .76 (SA45-INT vs. SA45-PAR). All correlations were statistically significant at $p < .001$, with a mean correlation coefficient of .58.

Descriptive statistics for the ADDI-27, PANAS, and SA45 are summarized in Table 1 (Study 3). Mean scores on the following three scales were significantly higher for women ($p < .05$): ADDI-GD ($d = .29$ [.04, .55]), SA45-ANX ($d = .33$ [.07, .58]), and SA45-PHO ($d = .27$ [.01, .53]), whereas the mean for women was lower on PANAS-PA, $d = .27$ [.01, .53]. No other statistically significant mean differences were observed.

Scale validity—Model estimation terminated normally. Estimates for correlations among exogenous variables were as follows: ADDI-GD versus ADDI-PA = $-.48$ [-.37, -.59]; ADDI-GD versus ADDI-SA = $.46$ [.33, .58]; and ADDI-PA versus ADDI-SA = $-.15$ [-.01, -.30]. Standardized path coefficients with robust 95% confidence intervals are shown in Table 4. ADDI-GD was strongly associated with scores on the PANAS-NA ($\beta = .63$ [.52, .73]) and the SA45 depression scale ($\beta = .59$ [.50, .69]), and evidenced moderate associations with scores on SA45 anxiety, hostility, interpersonal sensitivity, OCD, and paranoia scales, $\beta = .32$ to $.49$ (total 95% CI [.17, .62]). ADDI-PA evidenced a strong positive association with PANAS-PA ($\beta = .69$ [.70, .77]) and a moderate negative association with SA45 depression scores, $\beta = -.32$ [-.40, -.23]. The remaining associations of ADDI-PA were weak or nonsignificant. Finally, ADDI-SA was strongly associated with SA45 somatization scores ($\beta = .65$ [.53, .77]) and moderately associated with SA45 anxiety, obsessive-compulsive, phobic, and psychoticism scores, $\beta = .25$ to $.33$ (total 95% CI [.10, .48]). ADDI-SA evidenced weak associations with the remaining SA45 scales as well as the PANAS.

General discussion

The aim of this project was to evaluate evidence for the internal consistency reliability, factor structure, item-level measurement invariance, and convergent or discriminant validity of scores on the ADDI-27 scales. Across three independent samples, direct latent variable modeling of coefficient α and coefficient ρ provided strong point estimates of internal consistency reliability ($> .80$). In addition, bootstrapping with 2,000 replicates yielded strong lower bound estimates (95% CI) exceeding .80 for scores on all three scales. Results of ESEM (Study 1) demonstrated that an oblique three-factor model provided an adequate fit to the data, as indicated by acceptable CFI, TLI, and RMSEA estimates; strong loadings on target factors; and low cross-loadings. Taken together, these results provide compelling evidence for the internal consistency reliability and factorial validity of scores on the ADDI-27.

The ADDI-27, like other short forms of the MASQ-90 (see, e.g., MASQ-30; Clark & Watson, 1991), was designed to assess symptoms of anxiety, depression, and general distress. We note that these symptoms continue to be essential components of (a) the current *Diagnostic and Statistical Manual of Mental Disorders* (5th ed. [DSM-5]; American Psychiatric Association, 2013) essential symptoms for identifying several anxiety- and depression-related specifiers or disorders, and (b) efforts to conceptualize the tripartite

model of anxiety and depression. For example, the ADDI-27 SA dimension includes several of the *DSM-5* symptoms (e.g., feeling dizzy or light-headed, trembling or shaking, numbness or tingling sensation) for identifying panic attack as a specifier. In addition, ADDI-27 symptoms such as “worried a lot” and “feeling nervous” are included among the *DSM-5* essential symptoms when considering a diagnosis of generalized anxiety disorder. Furthermore, ADDI-27 symptoms such as feelings of sadness, worthlessness, and reduction in the expression of positive emotions (i.e., low PA), are presented by individuals with PTSD.

Results across three studies showed that depression-related symptoms can be distinguished from anxiety-related symptoms in a short-form stand-alone inventory. For instance, in Study 1, positive affect and physiological arousal were clearly differentiated from each other as well as from general distress. In Studies 2 and 3, ADDI-PA emerged as a strong, unique predictor of hopeful future outlook and a moderate negative predictor of future suicide orientation and negative future outlook. Moreover, ADDI-PA was able to discriminate clearly between positive affect and other constructs assessed in Studies 2 and 3, including negative affect, suicide behaviors, PTSD symptoms, and a range of mental health concerns. On the other hand, ADDI-SA emerged as a strong, unique predictor of PTSD symptoms (Study 2) and somatization (Study 3), while distinguishing these symptom clusters from other constructs.

Scores on ADDI-GD demonstrated convergent and discriminant validity as evidenced by strong unique associations with negative future focus (Study 2), as well as with negative affect and depression (Study 3), and evidenced smaller associations with most other symptom clusters. Given the nonsignificant path coefficients for the SBQ-R and the moderate to strong path coefficients for the UTSA-FDI (Study 2), we note that all three ADDI-27 scales were able to discriminate between suicide ideation as measured by UTSA-FDI-SO and suicide behaviors as measured by SBQ-R. Further, given the strong intercorrelations among the SA45 scale scores (Study 3), we found it notable that associations between scores on the SA45 and the ADDI-27 suggested a differentiated pattern, in which ADDI-GD scores showed stronger associations with depressive and anxiety dimensions, and ADDI-SA scores showed a stronger association with somatization.

Our findings have implications for the research literature investigating comorbidities that involve affective and mood disorders. Study 2 was the first study to evaluate the concurrent validity of scores on the ADDI-27 with instruments assessing PTSD, showing that somatic anxiety, in particular, is empirically related to measures of PTSD and future disposition with regard to suicide. This result provides further empirical support for anxiety as a component of stressor-related disorders and suicide ideation, while emphasizing the role of physiological arousal in identifying these disorders (e.g., Bentley et al., 2016; Ribeiro, Silva, & Joiner, 2014). These results are also consistent with the broader literature identifying low positive affect as a correlate of pessimism and suicidal ideation (e.g., Chioqueta & Stiles, 2005; Naragon-Gainey & Watson, 2011), whereas high positive affect appears to bolster an individual's ability to exhibit hopefulness toward the future while inhibiting anxiety. The combination of high positive affect and future-oriented optimism might also be responsible for inhibiting hopelessness and suicidal ideation, potentially by providing a protective buffer

against adverse life events and negative cognitions (Chioqueta & Stiles, 2007; Lamis & Lester, 2012).

Another contribution of the current project was an IRT-DIF analysis investigating measurement invariance of scores on the ADDI-27 at the item level. Consistent with previous studies exploring the potential gender invariance of the MASQ items (Flens, Smits, Carlier, van Hemert, & de Beurs, 2016; Liu et al., 2015), our results from IRT-DIF indicated nearly perfect measurement invariance for the ADDI-27 items across gender, notwithstanding the detection of two items approaching noninvariance. This result suggests that men and women share similar interpretations of the constructs measured by the ADDI-27 items. In view of this result, the ADDI-27 is appropriate for use in future studies evaluating the possible mediating or moderating factors that might explain the higher prevalence rates of mood and anxiety disorders among women (Kessler, 2003; Luppá et al., 2012). A growing literature continues to investigate these robust findings, which have been attributed to the greater tendency for rumination (Nolen-Hoeksema, 1987, 1991), stronger interpersonal orientations (Rudolph, Caldwell, & Conley, 2005), and higher propensity for internalizing behaviors (Eaton et al., 2012) observed in women. The identification of any mediating and moderating factors that might account for gender differences in depression and anxiety remains an important future direction for this avenue of research. In addition, future investigations with the ADDI-27 scales could be used to advance specific theory-based hypotheses regarding the performance of scores on the instrument when measuring gender differences in anxiety and depression.

The ADDI-27 was developed for use in diverse research and applied settings. The results of our logistic regression analyses (Study 2) provide initial indications that the ADDI-27 can be useful in clinical studies and practice. Low scores on ADDI-PA and high scores on ADDI-GD and ADDI-SA significantly increased the odds of being classified in the high symptom group, as assessed by IES-R scores ≥ 30 . Given that these analyses were undertaken in a nonclinical sample, and also given that the IES-R is not a diagnostic instrument per se, we believe that the reported effect sizes, although modest (see Study 2, Results), provide tentative evidence that the ADDI-27 can perform well in clinical settings, thus warranting additional investigation of the instrument's performance in clinical samples.

Limitations

A major limitation the ADDI-27 shares with other short forms of the MASQ-90 is its failure to capture additional essential symptoms (i.e., beyond those associated with anxiety and depression) that could be useful in fully accounting for recent developments in the tripartite model.⁴ There were other limitations to this project, including reliance on self-report, the cross-sectional nature of the data, and the use of exploratory methods without follow-up confirmatory studies. In addition, our study samples consisted of healthy community adults, potentially limiting the generalizability of our findings to clinical populations. In particular, further research is needed to investigate the psychometric

⁴A full discussion of the tripartite model is beyond the scope of this article. For a thorough treatment, see Watson (2005), Watson, Gamez, and Simms (2005), and Watson, Kotov, and Gamez (2006).

properties of the ADDI–27 for use with highly symptomatic populations. Future research should address these limitations and also extend the results of this study in new directions. For example, a future study with the ADDI–27 might examine measurement invariance across different ethnic and racial groups, age cohorts, or clinical statuses.

Conclusion

Despite the aforementioned limitations, these studies provide evidence for the internal consistency, factor structure, measurement invariance across gender, and convergent and discriminant validity of scores on the ADDI–27. Further, the constructs assessed by the ADDI–27 are relevant to areas of active investigation, including comorbidities that involve affective and mood disorders, and traits that could serve as protective factors against psychopathology and future-oriented pessimism. The clinical utility afforded by combining measures of anxiety, positive affect, and general distress within a single inventory commend the use of the ADDI–27 for use in applied settings, especially when a brief assessment instrument is indicated.

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Table 1

Descriptive statistics for ADDI-27 and concurrent measures by gender and total sample.

Study 1	Women (<i>n</i> = 480)		Men (<i>n</i> = 220)		Total sample (<i>N</i> = 700)		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>Ku</i>
ADDI-GD	19.58 *	7.42	18.39 *	7.10	19.21	7.34	0.88
ADDI-PA	27.42	8.13	27.60	7.99	27.47	8.08	-0.01
ADDI-SA	14.21	14.21	13.96	5.42	14.13	5.59	1.47
							2.07
Study 2	Women (<i>n</i> = 268)		Men (<i>n</i> = 270)		Total sample (<i>N</i> = 538)		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>Ku</i>
ADDI-GD	22.40 *	8.23	20.21	7.78	21.30	8.07	0.81
ADDI-PA	30.62	8.26	31.18	8.14	30.90	8.20	-0.29
ADDI-SA	15.56	7.35	16.47	7.13	16.02	7.25	1.26
DTS-INT	4.60	4.97	3.95	4.71	4.27	4.85	1.13
DTS-AVD	6.24	6.74	5.74	6.08	5.99	6.42	0.95
DTS-HYP	5.70 *	5.88	4.70	5.17	5.20	5.55	0.87
IES-R-INT	7.24 *	8.33	5.78	7.03	6.51	7.73	1.27
IES-R-AVD	8.10	8.02	6.95	6.98	7.52	7.53	0.76
IES-R-HYP	4.25	5.68	3.87	5.16	4.06	5.42	1.58
SBQ-R	4.93	2.67	4.84	2.53	4.88	2.60	1.89
UTSA-FDI-PF	31.97 *	5.97	30.74	6.19	31.36	6.11	-0.69
UTSA-FDI-NF	16.35	7.18	15.84	6.30	16.09	6.75	1.06
UTSA-FDI-SO	8.94	4.81	9.07	4.54	9.01	4.67	3.29
							11.54
Study 3	Women (<i>n</i> = 139)		Men (<i>n</i> = 101)		Total sample (<i>N</i> = 240)		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>Ku</i>
ADDI-GD	22.54 *	7.95	20.31	6.99	21.60	7.62	0.67
ADDI-PA	30.91	7.54	32.48	7.10	31.57	7.39	-0.48
ADDI-SA	16.55	7.32	16.07	6.51	16.34	6.98	1.30
PANAS-PA	34.15 *	8.09	36.39	8.39	35.09	8.27	-0.55
							-0.13

Study 1	Women (<i>n</i> = 480)			Men (<i>n</i> = 220)			Total sample (<i>N</i> = 700)		
	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>Ku</i>
PANAS-NA	22.91	8.42		21.26	7.23		22.22	7.97	0.73
SA45-ANX	9.01 *	4.56		7.73	2.80		8.47	3.96	1.81
SA45-DEP	9.82	4.85		8.94	3.82		9.45	4.46	1.12
SA45-HOS	7.16	3.69		7.26	2.98		7.20	3.40	2.26
SA45-INS	9.15	4.47		8.74	3.74		8.98	4.18	1.32
SA45-OCD	10.78	4.98		10.71	4.53		10.75	4.79	0.82
SA45-PAR	9.20	4.13		9.23	3.90		9.22	4.02	1.07
SA45-PHO	6.69	3.10		5.96	2.08		6.38	2.73	3.18
SA45-PSY	6.37	2.43		6.86	2.55		6.58	2.49	2.50
SA45-SOM	8.40	4.20		8.12	3.26		8.28	3.83	1.59
									2.65

Notes. ADDI = Anxiety Depression Distress Inventory; GD = General Distress; PA = Positive Affect; SA = Somatic Anxiety; DTS = Davidson Trauma Scale; INT = Intrusion/reexperiencing; AVD = Avoidance; HYP = Hyperarousal; IES-R = Impact of Event Scale-Revised; SBQ-R = Suicide Behaviors Questionnaire-Revised; UTSA-FDI = University of Texas at San Antonio-Future Disposition Inventory; PF = Positive Focus; NF = Negative Focus; SO = Suicide Orientation; PANAS = Positive and Negative Affect Scale; PA = Positive Affect; NA = Negative Affect; SA45 = Symptom Assessment 45; ANX = Anxiety; DEP = Depression; HOS = Hostility; INS = Interpersonal Sensitivity; OCD = Obsessive-Compulsive Disorder; PAR = Paranoia; PHO = Phobic Symptoms; PSY = Psychotic Symptoms; SOM = Somatization.

* Means differ at $p < .05$.

Table 2

Exploratory structural equation modeling factor loadings from oblique three-factor solution of scores on the ADDI-27 (Study 1).

Item	Factor		
	F1	F2	F3
Factor 1 (F1: General distress)			
12. Felt like a failure	.85	-.05	.03
2. Felt discouraged	.84	.01	-.06
3. Felt worthless	.81	-.06	.02
7. Blamed myself for a lot of things	.81	.05	-.03
22. Was disappointed in myself	.79	-.06	-.10
6. Felt hopeless	.72	-.12	.09
1. Felt sad	.72	.05	.08
25. Worried a lot about things	.66	-.04	.10
5. Felt nervous	.42	.06	.26
Factor 2 (F2: Positive affect)			
21. Felt like I had a lot of energy	.11	.82	-.04
26. Felt really good about myself	-.12	.81	-.03
13. Was proud of myself	-.09	.80	.04
17. Felt really "up" lively	.05	.80	.02
9. Felt like I accomplished a lot	-.07	.78	.07
10. Felt like I had interesting things to do	.04	.76	-.03
19. Felt confident about myself	-.08	.74	-.06
4. Felt very happy	-.01	.71	-.02
11. Felt like I had a lot to look forward to	.01	.71	.00
Factor 3 (F3: Somatic anxiety)			
24. Was trembling or shaking	-.07	-.07	.91
16. Hands were shaky	-.05	-.07	.80
20. Muscles twitched or trembled	-.01	.05	.71
27. Had trouble swallowing	-.06	-.06	.69
15. Was short of breath	.03	-.02	.69
14. Felt dizzy or lightheaded	.08	.03	.68
23. Heart was racing or pounding	.20	.11	.63
8. Felt numbness or tingling in my body	.18	.14	.59
18. Had a very dry mouth	.10	.00	.51
Interfactor correlations			
F1: General distress	—		
F2: Positive affect	-.54	—	
F3: Somatic anxiety	.47	-.24	—

Note. $N = 538$. Factor loadings .40 are set in bold. See Table 1 for complete scale names.

Table 3
Results of item-level measurement invariance testing of the ADDI-27 items across gender (Study 1).

Item	Women (<i>n</i> = 480)				Men (<i>n</i> = 220)			
	<i>a</i> (<i>SE</i>)	<i>S-χ²</i>	<i>df</i>	<i>p</i>	<i>a</i> (<i>SE</i>)	<i>S-χ²</i>	<i>df</i>	<i>p</i>
GD: General distress								
1	1.93 (.16)	56.54	66	.79	2.00 (.25)	44.26	41	.34
2	2.58 (.21)	58.21	61	.58	2.33 (.28)	46.42	40	.22
3	3.18 (.30)	49.67	45	.29	3.04 (.44)	23.75	27	.65
5	1.11 (.11)	78.39	81	.56	1.05 (.16)	61.40	50	.13
6	2.95 (.28)	60.44	49	.13	2.50 (.34)	39.08	33	.21
7	2.20 (.18)	59.66	66	.70	2.14 (.26)	41.84	42	.48
12	3.51 (.33)	67.76	52	.07	4.05 (.59)	31.90	25	.16
22	2.38 (.20)	70.42	65	.30	1.84 (.23)	61.08	43	.04
25	2.04 (.17)	49.99	63	.88	1.93 (.23)	44.46	46	.53
PA: Positive affect								
4	1.84 (.15)	86.01	73	.14	2.06 (.25)	41.58	47	.69
9	2.25 (.17)	72.23	66	.28	2.71 (.32)	46.71	43	.32
10	2.02 (.16)	64.11	71	.71	1.73 (.22)	72.29	57	.08
11	1.78 (.15)	71.32	74	.57	1.77 (.23)	81.38	54	.01
13	2.70 (.21)	64.25	60	.33	2.98 (.37)	43.43	37	.22
17	2.05 (.16)	78.37	70	.23	1.90 (.24)	74.53	54	.03
19	2.80 (.22)	67.76	60	.23	2.20 (.29)	57.33	46	.12
21	1.93 (.15)	66.25	71	.64	2.10 (.27)	49.87	46	.32
26	3.29 (.27)	58.44	53	.28	4.07 (.57)	41.34	33	.15
SA: Somatic anxiety								
8	1.72 (.19)	53.89	52	.40	1.38 (.24)	53.89	52	.40
14	1.81 (.18)	69.14	54	.08	2.26 (.34)	69.14	54	.08
15	1.71 (.18)	60.45	52	.20	1.78 (.28)	60.45	52	.20
16	2.27 (.24)	74.13	50	.01	2.95 (.48)	74.13	50	.01
18	1.35 (.16)	74.43	58	.07	1.09 (.20)	74.43	58	.07
20	2.03 (.21)	73.94	54	.04	1.64 (.25)	73.94	54	.04

Item	Women (<i>n</i> = 480)					Men (<i>n</i> = 220)					χ^2	<i>cl</i>	<i>p</i>
	<i>a</i>	<i>SE</i>	<i>S-χ²</i>	<i>df</i>	<i>p</i>	<i>a</i>	<i>SE</i>	<i>S-χ²</i>	<i>df</i>	<i>p</i>			
23	1.75	(.18)	58.53	58	.46	1.74	(.26)	58.53	58	.46	4.1		.54
24	3.31	(.39)	67.04	34	.00	5.40	(1.33)	67.04	34	.00	3.9		.57
27	1.76	(.25)	38.35	32	.20	2.09	(.41)	38.35	32	.20	3.0		.70

Note. *N* = 700. See Table 1 for complete scale names.

Table 4

Standardized path coefficients and robust 95% confidence intervals from structural equation modeling (SEM) of scores on ADDI-27 with concurrent measures.

DVs	IVs		
	ADDI-GD β	ADDI-PA β	ADDI-SA β
Study 2 (<i>N</i> = 538)			
PTSD intrusions	.19 [.18, .54]	-.08 [-.26, .11]	.50 [.20, .80]
PTSD avoidance	.22 [.13, .58]	-.08 [-.27, .11]	.44 [.14, .74]
PTSD hyperarousal	.21 [.12, .55]	-.11 [-.28, .07]	.53 [.25, .81]
UTSA-FDI positive focus	.19 [.04, .34]	.61 [.51, .71]	-.17 [-.30, -.05]
UTSA-FDI negative focus	.52 [.38, .67]	-.22 [-.31, -.13]	.22 [.10, .35]
UTSA-FDI suicide orientation	.18 [.01, .36]	-.24 [-.34, -.15]	.29 [.13, .45]
SBQ-R	.04 [-.18, .11]	.01 [-.10, .12]	.05 [-.07, .17]
Study 3 (<i>N</i> = 240)			
PANAS-PA	-.13 [-.27, .01]	.69 [.60, .77]	.03 [-.09, .15]
PANAS-NA	.63 [.52, .73]	-.11 [-.20, -.02]	.14 [.03, .26]
SA45-ANX	.43 [.30, .55]	-.11 [-.23, .00]	.33 [.22, .45]
SA45-DEP	.59 [.50, .69]	-.32 [-.40, -.23]	.08 [-.01, .17]
SA45-HOS	.40 [.26, .54]	-.15 [-.28, -.02]	.16 [.02, .30]
SA45-INS	.49 [.38, .62]	-.17 [-.28, -.06]	.10 [-.01, .21]
SA45-OCD	.32 [.17, .47]	-.09 [-.22, .03]	.33 [.18, .48]
SA45-PAR	.44 [.31, .57]	-.09 [-.21, .04]	.19 [.06, .32]
SA45-PHO	.23 [.07, .40]	-.18 [-.32, -.04]	.25 [.10, .40]
SA45-PSY	.21 [.07, .34]	-.15 [-.28, -.02]	.27 [.13, .41]
SA45-SOM	.02 [-.11, .17]	-.14 [-.24, -.04]	.65 [.53, .77]

Note. Estimator = robust maximum likelihood (MLR). Latent variable SEM was implemented in Study 1. In Study 2, SEM was conducted using manifest total scores. Large effect sizes (.50) are shown in bold. Moderate effect sizes (.20-.49) are shown in italics. ADDI = Anxiety Depression Distress Inventory; GD = General Distress; PA = Positive Affect; SA = Somatic Anxiety; PTSD = posttraumatic stress disorder; UTSA-FDI = University of Texas at San Antonio–Future Disposition Inventory; SBQ-R = Suicide Behaviors Questionnaire–Revised; PANAS = Positive and Negative Affect Scale; PA = Positive Affect; NA = Negative Affect; SA45 Symptom Assessment 45; ANX = Anxiety; DEP = Depression; HOS = Hostility; INS = Interpersonal Sensitivity; OCD = Obsessive–Compulsive Disorder; PAR = Paranoia; PHO = Phobic Symptoms; PSY = Psychotic Symptoms; SOM = Somatization.