

An Evaluation of the Relation Between Distress Tolerance and Posttraumatic Stress within a Trauma-Exposed Sample

Anka A. Vujanovic · Marcel O. Bonn-Miller ·
Carrie M. Potter · Erin C. Marshall ·
Michael J. Zvolensky

Published online: 12 November 2010
© Springer Science+Business Media, LLC (outside the USA) 2010

Abstract The present investigation examined the incremental associations between distress tolerance, or the perceived capacity to tolerate emotional distress, and global posttraumatic stress symptom severity as well as symptom cluster severity, beyond the variance accounted for by number of trauma exposure types and negative affectivity. The sample consisted of 140 adults (72 women; $M_{age}=25.9$, $SD=11.1$) who endorsed exposure to traumatic life events, as defined by posttraumatic stress disorder diagnostic criterion A (American Psychiatric Association 2000). Participants did not meet diagnostic criteria for current axis I psychopathology. Distress tolerance demonstrated significant incremental associations with global posttraumatic stress symptom severity ($p<.01$) as well as re-experiencing ($p<.05$), avoidance ($p=.05$), and hyperarousal ($p<.001$) symptom cluster severity. Given the cross-sectional study design, causation cannot be inferred. Theoretical implications and future

directions for better understanding associations between distress tolerance and posttraumatic stress are discussed.

Keywords Distress tolerance · Posttraumatic stress · PTSD · Emotion regulation · Trauma

Distress tolerance has received growing theoretical attention in the field of traumatic stress (Vujanovic et al. 2011). Distress tolerance is typically defined as the capacity to withstand exposure to aversive emotional or physical states (e.g., negative emotions, uncomfortable physical sensations; Brown et al. 2005; Simons and Gaher 2005). Theoretically, the distress tolerance construct has been conceptually linked to various cognitive-affective processes and factors pertinent to studies of traumatic stress (e.g., emotion regulation, experiential avoidance; see Leyro et al. 2010, for a review), although no work to date has empirically evaluated such postulations among trauma-exposed populations (Vujanovic et al. 2011).

Distress tolerance has been studied in terms of a variety of types of clinical syndromes, including mood disorders, eating disorders, personality disorders, and substance use disorders (see Zvolensky et al. 2011, for a review). In terms of anxiety and its disorders, studies have found that lower levels of tolerance for emotional distress and physical stress, and a lesser ability to withstand acute episodes of emotional stress, are significantly related to an increased risk of anxiety symptoms and panic attacks (Boelen and Reijntjes 2009; Bonn-Miller et al. 2009; Daughters et al. 2009; Marshall et al. 2008), fears about the negative consequences of anxiety symptoms (Timpano et al. 2009), and escape behavior in response to somatic arousal (Asmundson and Stein 1994; Telch et al. 2003). These data have begun to illuminate notable linkages between distress tolerance and anxiety-relevant psychopathology.

A. A. Vujanovic (✉) · C. M. Potter
National Center for PTSD—Behavioral Science Division,
VA Boston Healthcare System,
150 South Huntington Avenue (116B-2),
Boston, MA 02130, USA
e-mail: anka.vujanovic@va.gov

A. A. Vujanovic
Boston University School of Medicine,
Boston, MA, USA

M. O. Bonn-Miller
National Center for PTSD—Dissemination and Training Division
& Center for Health Care Evaluation,
VA Palo Alto Healthcare System,
Palo Alto, CA, USA

E. C. Marshall · M. J. Zvolensky
Department of Psychology, University of Vermont,
Burlington, VT, USA

Interestingly, there has been a striking paucity of research focused on associations between distress tolerance and posttraumatic stress symptoms or posttraumatic stress disorder (PTSD). Indeed, no published empirical studies to date have examined this association (Vujanovic et al. 2011). Extrapolating from integrative models of anxiety (Barlow 2002), the *detection* and *interpretation* of emotionally distressing symptoms, such as symptoms of posttraumatic stress, are believed to be critical in the generation of symptom intensity and related impairment (Keane and Barlow 2002). Distress tolerance is directly relevant to an individual's perception of his/her ability to withstand negative emotional states, and by extension, to a person's experience of distressing posttraumatic symptoms (Vujanovic et al. 2011). Individuals with higher tolerance of emotional distress may be less likely to perceive or attend to posttraumatic stress symptoms (e.g., hyperarousal symptoms), relative to those lower in distress tolerance; *or* such individuals may perceive their tolerance as greater for coping with trauma-related psychological symptoms. Conversely, individuals with lower levels of the capacity to tolerate emotional distress may be more apt to perceive posttraumatic stress symptoms (e.g., re-experiencing symptoms) as threatening, experience more intense arousal, and engage in strategic efforts to avoid stimuli that elicit posttraumatic reactivity. This type of perspective would suggest that, contextualized with other cognitive-affective risk and maintenance factors (e.g., anxiety sensitivity; Marshall et al. 2010; Vujanovic et al. 2008), distress tolerance may be uniquely associated with the expression of posttraumatic stress symptoms.

There is no empirical knowledge about the role of distress tolerance in relation to the expression of posttraumatic stress (Vujanovic et al. 2011). To begin to fill this gap in the literature, the present study sought to provide an initial investigation focused on the concurrent association between distress tolerance and posttraumatic stress symptoms among a sample of community-recruited, trauma-exposed adults without current axis I psychopathology. A 'healthy' trauma-exposed sample was selected for this investigation to rule out an alternative explanation that any observed effects were secondary to pre-existing psychopathology (Forsyth and Zvolensky 2002). Specifically, it was hypothesized that distress tolerance would be incrementally associated with posttraumatic stress symptom severity and the severity of each of the three posttraumatic stress symptom clusters (i.e., re-experiencing; avoidance; hyperarousal), above and beyond the variance accounted for by trauma severity (i.e., number of trauma exposure types) and negative affectivity. These covariates were included so as to allow for the examination of the incremental predictive validity of distress tolerance with regard to posttraumatic stress, even after accounting for

shared variance with theoretically-relevant variables, previously documented to have significant relations with the criterion variable(s) of interest (e.g., Tull et al. 2007; Vogt et al. 2007). Here, it was expected that distress tolerance would be inversely related to posttraumatic stress, such that lower levels of distress tolerance would be associated with higher levels of posttraumatic stress.

Method

Participants

A total of 140 participants (72 women; $M_{\text{age}}=25.9$ years, $SD=11.1$), ranging in age from 18 to 65 years, who endorsed exposure to a Criterion A life traumatic event,¹ were recruited via flyer and newspaper advertisements for participation in studies on "emotion" (please see Procedure section for details). On average, participants reported experiencing 2.6 different types of traumatic life events, as per responses on the Posttraumatic Diagnostic Scale (PDS; Foa 1995). On the PDS, participants endorsed mean posttraumatic stress symptom severity levels ($M=9.14$, $SD=10.27$) slightly lower than population norms for trauma-exposed individuals screened out exclusively for PTSD ($M=12.54$, $SD=10.54$; Foa 1995; Foa et al. 1997) but not other axis I disorders. The types of traumatic events reported included: serious accident, fire, or explosion (54.3%), non-sexual assault by a stranger (28.6%), sexual contact when younger than 18 years with someone five or more years older (27.9%), non-sexual assault by a family member or someone known (26.4%), natural disaster (23.6%), sexual assault by a family member or someone known (17.1%), imprisonment (17.1%), life-threatening illness (17.1%), sexual assault by a stranger (6.4%), military combat or a war zone (4.3%), torture (3.6%), and "other" trauma type (e.g., sudden unexpected death of a friend or family member; 37.1%).

The ethnic/racial background of participants was generally consistent with that of the state of Vermont population (State of Vermont Department of Health, 2007) but significantly more homogeneous, as compared to the overall United States population (U. S. Census Bureau 2000): 94.2% of participants identified as White/Caucasian; 2.2% identified as Black/African-American; 1.5% identified as Hispanic/Latino; 0.7% identified as Asian; 0.7%

¹ A traumatic event was defined according to *DSM-IV-TR* PTSD Criterion A. According to Criterion A, a traumatic event is defined as one in which an individual "experienced, witnessed, or was confronted with an event...that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others" and the individual's response "involved intense fear, helplessness, or horror," as defined by the *DSM-IV-TR* Posttraumatic Stress Disorder diagnosis criteria (APA, 2000, p. 467).

identified as Native American; and 0.7% of participants endorsed the ‘other’ race/ethnicity category. Exclusionary criteria for the present study included: (a) current axis I psychopathology; (b) limited mental competency or the inability to provide informed, written consent; (c) current suicidal or homicidal ideation; (d) current or past history of psychotic-spectrum symptoms; and (e) pregnancy. Inclusionary criteria were comprised of: (a) being an adult between the ages of 18–65; and (b) endorsing exposure to a PTSD Criterion A life traumatic event.

Measures

Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders—4th Edition (DSM-IV) Axis I Diagnoses/Non-Patient Version (SCID-I/NP) The SCID-I/NP (First et al. 1995) was used to index current (past month) Axis I diagnoses and assess exclusionary criteria (please see above). The non-patient version was used since participants were a community sample, and not a treatment-seeking clinical sample. The *DSM-IV* version of the SCID-I/NP has been shown to have good reliability (Zanarini et al. 2000) and good to excellent validity (Basco et al. 2000). In the present study, all SCID-I/NP administrations were audiotaped and conducted by trained doctoral students in clinical psychology. A random sampling of 20% of the SCID-I/NP administrations was reviewed by the PIs to ensure inter-rater agreement. No cases of disagreement were noted.

Positive Affect Negative Affect Scale (PANAS) The PANAS (Watson et al. 1988) is a 20-item measure on which respondents indicate, on a 5-point Likert-type scale (1 = *very slightly or not at all* to 5 = *extremely*), the extent to which they generally experience emotions (e.g., “Hostile”). The PANAS is a well-established affective measure (Watson et al. 1988). Factor analysis indicates that it assesses two global dimensions of affect: negative and positive. A large body of literature supports the psychometric properties of the PANAS (see Watson 2000). For the purposes of this study, only the negative affectivity subscale (PANAS-NA) was used to assess the trait-like tendency to experience negative affect states. In the present sample, the PANAS-NA demonstrated high internal consistency ($\alpha=.88$).

Posttraumatic Diagnostic Scale (PDS) The PDS (Foa 1995) is a 49-item self-report instrument designed to assess the presence of posttraumatic stress symptoms, based on *DSM-IV* criteria (American Psychiatric Association [APA], 1994, 2000). Respondents report if they have experienced any of 13 traumatic events, including an “other” category, and then indicate which event was most disturbing. Respondents also rate the frequency (0 = *not at all or only one time* to 3 = *five or more times a week/almost always*) of

17 PTSD symptoms experienced in the past month in relation to the most-disturbing event endorsed (total score range of 0 to 51). The PDS is a measure of trauma-related symptoms with generally excellent psychometric properties (Foa et al. 1997). The PDS has demonstrated high internal consistency ($\alpha=.92$) and high test-retest reliability ($\kappa=.74$). In this study, the PDS was utilized to (a) index traumatic event exposure consistent with PTSD Criterion A, (b) establish the total number of trauma exposure types (derived by summing the number of traumatic event types endorsed), and (c) assess posttraumatic stress symptom severity, and the severity of each posttraumatic stress symptom cluster (i.e., re-experiencing symptoms, avoidance symptoms, and hyperarousal symptoms). In the present sample, the PDS (total symptom severity score) demonstrated high internal consistency ($\alpha=.94$).

Distress Tolerance Scale (DTS) The DTS is a self-report measure on which respondents indicate, on a 5-point Likert-type scale (1 = *strongly agree* to 5 = *strongly disagree*), the extent to which they believe they can experience and withstand distressing emotional states (Simons and Gaher 2005). The DTS encompasses four types of emotional distress items including: perceived ability to tolerate emotional distress (e.g., “*I can’t handle feeling distressed or upset*”), subjective appraisal of distress (e.g., “*My feelings of distress or being upset are not acceptable*”), attention absorption by negative emotions (e.g., “*When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels*”), and regulation efforts to alleviate distress (e.g., “*I’ll do anything to avoid feeling distressed or upset*,” Simons and Gaher 2005). The original 14-item version of the DTS (cf., the more recent 15-item version) was administered as a function of the time period during which these data were collected. Notably, the item not included in the 14-item version (i.e., “*When I feel distressed or upset, I must do something about it immediately*”) is intended only for computation of subscale scores—not utilized for purposes of the current investigation (Simons and Gaher 2005). The DTS has good psychometric properties (Simons and Gaher 2005), including good test-retest reliability (intra-class $r=.61$), as well as good convergent validity ($r=.26-.54$) and discriminant validity ($r=-.52-.59$) with established mood measures. In the present sample, the DTS demonstrated high internal consistency ($\alpha=.89$).

Procedure

Individuals who responded to advertisements about a study on “emotion” were scheduled for an initial (baseline) appointment to determine eligibility and collect study data.

The larger data collection consisted of two study appointments. Data utilized in the present investigation were collected at the baseline assessment session. Upon arrival to the baseline appointment, interested participants first provided verbal and written informed consent. The SCID-I/NP was then administered to determine eligibility based on the criteria identified above. Eligible participants completed a battery of self-report measures and received \$25 compensation. Data collection for the current study was approved by the Institutional Review Board at the University of Vermont.

Data Analytic Approach

First, correlations among variables were examined. Second, a series of four hierarchical regression analyses were performed. Criterion variables included: (1) PDS—Total score, (2) PDS—Re-Experiencing Symptoms subscale score, (3) PDS—Avoidance Symptoms subscale score, and (4) PDS—Hyperarousal Symptoms subscale score. At step one of each of the models, the PDS—Number of Trauma Types variable and PANAS—NA score were entered as covariates. At step two of each of the models, the DTS—total score was entered. This analytic approach provides a test of incremental validity and ensures that any observed effects at step two of the models are separable from the variance accounted for by the other theoretically-relevant factors at step one of the equations (Cohen and Cohen 1983). For each regression analysis, an examination of the percent variance (R^2 Change) contributed by each step of the regression model was conducted, and standardized regression coefficients (β) were reported for each variable in the regression equation.

Results

Table 1 presents zero-order correlations among continuous variables. The DTS—total score was found to be significantly negatively correlated with each of the criterion variables. Specifically, distress tolerance was found to be inversely related to the PDS—Total score, PDS—Re-Experiencing Symptoms subscale score, PDS—Avoidance Symptoms subscale score, and PDS—Hyperarousal Symptoms subscale score (all p 's < .01).

In terms of the PDS—Total score, step one of the model accounted for a significant 18.8% of variance ($p < .001$), with both PDS—Number of Trauma Types ($\beta = .26$; $p < .01$) and negative affectivity ($\beta = .31$; $p < .01$) as significant predictors. Step two of the model accounted for an additional 5.3% of unique variance, with distress tolerance demonstrating negative incremental relations with the PDS—Total score ($\beta = -.27$; $p < .01$).

In terms of the PDS—Re-Experiencing Symptoms subscale, step one of the model accounted for a significant 12.1% of variance ($p < .001$), with both PDS—Number of Trauma Types ($\beta = .23$; $p < .01$) and negative affectivity ($\beta = .24$; $p < .01$) as significant predictors. Step two of the model accounted for an additional 3.0% of unique variance, with distress tolerance demonstrating negative incremental relations with the PDS—Re-Experiencing Symptoms subscale score ($\beta = -.21$; $p < .05$).

In terms of the PDS—Avoidance Symptoms subscale, step one of the model accounted for a significant 17.7% of variance ($p < .001$), with both PDS—Number of Trauma Types ($\beta = .26$; $p < .01$) and negative affectivity ($\beta = .29$; $p < .01$) as significant predictors. Step two of the model accounted for a significant 1.9% of unique variance, with distress tolerance incrementally negatively related with the PDS—Avoidance Symptoms subscale ($\beta = -.18$; $p = .05$).

In terms of the PDS—Hyperarousal Symptoms subscale, step one of the model accounted for a significant 19.6% of variance ($p < .001$), with both PDS—Number of Trauma Types ($\beta = .23$; $p < .01$) and negative affectivity ($\beta = .34$; $p < .001$) as significant predictors. Step two of the model accounted for an additional 9.6% of unique variance, and distress tolerance was incrementally negatively associated with the PDS—Hyperarousal Symptoms subscale ($\beta = -.36$; $p < .001$).

Discussion

Distress tolerance has received growing theoretical attention in the field of traumatic stress (Vujanovic et al. 2011). However, empirical data pertaining to distress tolerance and the expression of posttraumatic stress symptoms among trauma-exposed persons is lacking. To expand this empirical literature, the present investigation sought to examine the incremental associations between distress tolerance and posttraumatic stress symptom severity, above and beyond the theoretically-relevant effects of number of trauma exposure types and negative affectivity.

There was broad-based evidence for a distress tolerance—posttraumatic stress association. First, as expected, distress tolerance was incrementally associated with global posttraumatic stress symptom severity, contributing approximately 5.3% of unique variance to the model. Thus, individuals with lower abilities to withstand negative emotional states were more likely to report higher levels of posttraumatic stress symptoms, and vice versa. Second, with regard to posttraumatic stress symptom clusters, individuals' capacity to tolerate emotional distress was incrementally associated with re-experiencing, avoidance, and hyperarousal symptoms, contributing 3.0%, 1.9%, and 9.6% of unique variance to the models, respectively. Specifically, individuals reporting lower levels of distress tolerance, as indexed by the DTS, reported higher levels of re-experiencing, avoidance, and hyperarousal

Table 1 Descriptive data and zero-order correlations among theoretically-relevant variables

Variable	1	2	3	4	5	6	7	M (SD)
1. PANAS—Negative Affectivity	–	.24**	–.45**	.42**	.32**	.41**	.44**	19.66 (6.61)
2. PDS—Number of Trauma Types	–	–	–.11	.32**	.28**	.32**	.30**	2.64 (1.92)
3. DTS—Total	–	–	–	–.38**	–.30**	–.29**	–.46**	3.48 (0.74)
4. PDS—Total Score	–	–	–	–	.87**	.94**	.91**	9.14 (10.27)
5. PDS—Re-Experiencing	–	–	–	–	–	.74**	.72**	0.48 (0.56)
6. PDS—Avoidance	–	–	–	–	–	–	.77**	0.54 (0.66)
7. PDS—Hyperarousal	–	–	–	–	–	–	–	0.60 (0.74)

The PDS-Total Score is a sum score of all 17 PTSD symptoms measured by the PDS.

Subscales of the PDS are represented as means of the items that comprise each subscale.

* $p < .05$; ** $p < .01$.

symptoms. Interestingly, the greatest effect size was noted for hyperarousal symptoms [$\beta = -.36$ vs. $\beta = -.21$ (re-experiencing) and $\beta = -.18$ (avoidance)], suggesting that the perception of one's ability to tolerate negative emotional states may be especially relevant for trauma-related hyperarousal symptoms. Although the magnitude of the association between distress tolerance and hyperarousal symptoms may indicate relational specificity to this posttraumatic stress symptom cluster, it also is possible that this association is the result of the slightly higher elevation of hyperarousal symptoms (please see Table 1) among this trauma-exposed sample without axis I psychopathology. Notably, the effect sizes for relations between posttraumatic stress symptom clusters and number of trauma types (β 's = .23–.26) as well as negative affectivity (β 's = .24–.34) were mostly as large as those between distress tolerance and posttraumatic stress symptoms. The comparability in effect sizes among this set of variables may be an artifact of the sampling methodology, underscoring the need for future work to extend this line of inquiry to clinical trauma-exposed samples *with* current psychopathology, including PTSD. Together, results suggest that distress tolerance may be an important factor for better understanding cognitive-affective risk for posttraumatic stress symptoms and related psychopathology, pending empirical replications of this work among clinical samples.

The present findings invite cautious theorizing as to the mechanisms underlying a distress tolerance-traumatic stress association. Theoretically, there are several possibilities regarding the directionality of the distress tolerance—posttraumatic stress association (Vujanovic et al. 2011). First, it is plausible that distress tolerance levels may change (increase *or* decrease) as a function of exposure to traumatic stressors. Second, posttraumatic stress symptom severity may promote less tolerance of distress over time. Third, lower or higher levels of distress tolerance prior to trauma exposure may predispose an individual to a course toward risk or resilience, respectively, following trauma. Fourth, distress tolerance and posttraumatic stress symptom

levels may relate bi-directionally or transactionally, as noted in prospective work related to similar emotional vulnerability processes (e.g., anxiety sensitivity; Marshall et al. 2010). One possibility is that individuals with lower levels of distress tolerance harbor perceptions that they are ill-equipped to cope with emotional distress, and that such perceptions hamper their abilities to regulate posttraumatic stress symptoms following trauma, fueling greater posttraumatic stress symptoms over time (Ehlers and Clark 2000). Finally, it is possible that mediating factors or mechanisms (e.g., coping style) may be accounting for the association between distress tolerance and posttraumatic stress. Further prospective and empirical work is necessary to better delineate associations between distress tolerance and posttraumatic stress.

There are a number of limitations of the current investigation. First, the study was cross-sectional in design, and therefore, causation between variables cannot be inferred. Future work would benefit from exploring the explanatory relevance of distress tolerance prospectively, following trauma exposure, with regard to the manifestation of posttraumatic stress symptoms over time. Second, the potential for self-selection bias should be noted, as participants were recruited via community advertisements and provided with monetary compensation for participation. Third, self-report indices of distress tolerance and trauma-related variables were utilized as the principle assessment strategies. It will be important for future research to replicate and extend current findings by utilizing multi-method assessment strategies, such as interview-based *and* experimental methodologies, to index the constructs of interest. Fourth, distress tolerance was defined according to the definition set forth by Simons and Gaher (2005). The DTS represents one of several self-report and behavioral measures of distress tolerance and may be specific to an individual's *perceived* (vs. actual/behavioral) capacity to tolerate emotional distress (Zvolensky et al. 2011). Thus, it is important for future studies to extend this

work by examining associations among various self-report (e.g., Discomfort Intolerance Scale; Schmidt et al. 2006) and behavioral (e.g., cold pressor; breath-holding; mirror-tracing task) indices of distress tolerance and between such indices and posttraumatic stress symptom severity. Fifth, the present study did not include the diagnostic assessment of past axis I disorders or any axis II disorders. As distress tolerance levels may be related to earlier remission of PTSD symptoms following trauma (e.g., Vujanovic et al. 2011) as well as axis II psychopathology (e.g., Gratz and Tull 2011), it is important for future work to examine such potential associations more comprehensively among trauma-exposed populations. Finally, the present sample consisted of a racially/ethnically homogeneous group of participants without current axis I psychopathology. Thus, it is possible that the present findings are specific to trauma-exposed populations without current axis I psychopathology. Extensions of this line of scientific inquiry with more ethnically diverse individuals who present with posttraumatic stress disorder and other forms of psychopathology are important next research step.

Overall, the present investigation offers a novel empirical demonstration of an association between distress tolerance and posttraumatic stress symptoms within a trauma exposed sample. This preliminary data is intended to stimulate future work examining distress tolerance, and other cognitive-affective mechanisms, related to posttraumatic stress symptomatology. Future work is necessary to replicate and extend the present findings using varied methodologies conducted among diverse clinical samples.

Acknowledgements This work was supported, in part, by a National Institute on Mental Health National Research Service Award (1 F31 MH080453-01A1) awarded to Erin C. Marshall; a VA Clinical Science Research and Development (CSR&D) Career Development Award—2, awarded to Dr. Bonn-Miller; and several grants (1 R01 DA027533-01; 1 R01 MH076629-01) awarded to Dr. Zvolensky. The views expressed here are those of the authors and do not necessarily represent those of the Department of Veterans Affairs.

References

- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: Author.
- Asmundson, G. J. G., & Stein, M. B. (1994). Triggering the false suffocation alarm in panic disorder patients by using a voluntary breath-holding procedure. *The American Journal of Psychiatry*, *151*, 264–266.
- Barlow, D. H. (2002). *Anxiety and its disorders* (2nd ed.). New York: Guilford.
- Basco, M. R., Bostic, J. Q., Davies, D., Rush, A. J., Witte, B., Hendrickse, W., et al. (2000). Methods to improve diagnostic accuracy in a community mental health setting. *American Journal of Psychiatry*, *157*, 1599–1605. doi:10.1176/appi.ajp.157.10.1599.
- Boelen, P. A., & Reijntjes, A. (2009). Intolerance of uncertainty and social anxiety. *Journal of Anxiety Disorders*, *23*, 130–135. doi:10.1016/j.janxdis.2008.04.007.
- Bonn-Miller, M. O., Zvolensky, M. J., & Bernstein, A. (2009). Discomfort intolerance: evaluation of incremental validity for panic-relevant symptoms using 10% carbon dioxide-enriched air provocation. *Journal of Anxiety Disorders*, *23*, 197–203. doi:10.1016/j.janxdis.2008.06.007.
- Brown, R. A., Lejuez, C. W., Kahler, C. W., Strong, D. R., & Zvolensky, M. J. (2005). Distress tolerance and early smoking lapse. *Clinical Psychology Review*, *25*, 713–733. doi:10.1016/j.cpr.2005.05.003.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences*. Hillsdale: Lawrence Erlbaum Associates.
- Daughters, S. B., Reynolds, E. K., McPherson, L., Kahler, C. W., Danielson, C. K., Zvolensky, M., et al. (2009). Distress tolerance and early adolescent externalizing and internalizing symptoms: the moderating role of gender and ethnicity. *Behaviour Research and Therapy*, *47*, 198–205. doi:10.1016/j.brat.2008.12.001.
- Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, *38*, 319–345. doi:10.1016/S0005-7967(99)00123-0.
- First, M., Spitzer, R., Gibbon, M., & Williams, J. (1995). *Structured clinical interview for DSM-IV (nonpatient edition)*. New York: Biometrics Research Department, New York State Psychiatric Institute.
- Foa, E. B. (1995). *Posttraumatic stress diagnostic scale manual*. Minneapolis: National Computer Systems.
- Foa, E. B., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of posttraumatic stress disorder: the posttraumatic diagnostic scale. *Psychological Assessment*, *9*, 445–451. doi:10.1037/1040-3590.9.4.445.
- Forsyth, J. P., & Zvolensky, M. J. (2002). Experimental psychopathology, clinical science, and practice: an irrelevant or indispensable alliance? *Applied and Preventive Psychology: Current Scientific Perspectives*, *10*, 243–264. doi:10.1016/S0962-1849(01)80002-0.
- Gratz, K. L., & Tull, M. T. (2011). Distress tolerance in the pathogenesis and treatment of borderline personality disorder. In M. J. Zvolensky, A. Bernstein, & A. A. Vujanovic (Eds.), *Distress tolerance*. New York: Guilford.
- Keane, T. M., & Barlow, D. H. (2002). Posttraumatic stress disorder. In D. H. Barlow (Ed.), *Anxiety and its disorders* (pp. 418–453). New York: Guilford.
- Leyro, T. M., Zvolensky, M. J., & Bernstein, A. (2010). Distress tolerance and psychopathological symptoms and disorders: a review of the empirical literature among adults. *Psychological Bulletin*, *136*, 576–600. doi:10.1037/a0019712.
- Marshall, E. C., Zvolensky, M. J., Vujanovic, A. A., Gregor, K., Gibson, L. E., & Leyro, T. M. (2008). Panic reactivity to voluntary hyperventilation challenge predicts distress tolerance to bodily sensations among daily cigarette smokers. *Experimental and Clinical Psychopharmacology*, *16*, 313–321. doi:10.1037/a0012752.
- Marshall, G., Miles, J., & Stewart, S. (2010). Anxiety sensitivity and PTSD symptom severity are reciprocally related: evidence from a longitudinal study of physical trauma survivors. *Journal of Abnormal Psychology*, *119*, 143–150. doi:10.1037/a0018009.
- Schmidt, N. B., Richey, J. A., & Fitzpatrick, K. K. (2006). Discomfort intolerance: development of a construct and measure relevant to panic disorder. *Journal of Anxiety Disorders*, *20*, 263–280. doi:10.1016/j.janxdis.2005.02.002.
- Simons, J. S., & Gaher, R. M. (2005). The distress tolerance scale: development and validation of a self-report measure. *Motivation and Emotion*, *29*, 83–102. doi:10.1007/s11031-005-7955-3.

- State of Vermont Department of Health. (2007). *Population of Vermont counties by race and ethnicity*. Retrieved from <http://health.vermont.gov/research/2007pop/documents/TABLE707.PDF>
- Telch, M. J., Jacquin, K., Smits, J. A. J., & Powers, M. B. (2003). Emotional responding to hyperventilation as a predictor of agoraphobia status among individuals suffering from panic disorder. *Journal of Behavior Therapy and Experimental Psychiatry*, 34, 161–170. doi:10.1016/S0005-7916(03)00037-5.
- Timpano, K. R., Buckner, J. D., Richey, J. A., Murphy, D. L., & Schmidt, N. B. (2009). Exploration of anxiety sensitivity and distress tolerance as vulnerability factors for hoarding behaviors. *Depression and Anxiety*, 26, 343–353. doi:10.1002/da.20469.
- Tull, M. T., Jakupcak, M., McFadden, M. E., & Roemer, L. (2007). The role of negative affect intensity and the fear of emotions in posttraumatic stress symptom severity among victims of childhood interpersonal violence. *Journal of Nervous and Mental Disease*, 195, 580–587. doi:10.1097/NMD.0b013e318093ed5f.
- U. S. Census Bureau. (2000). *Profiles of general demographic characteristics. 2000 census of population and housing. United States*. Retrieved from http://www2.census.gov/census_2000/datasets/demographic_profile/0_United_States/2kh00.pdf
- Vogt, D. S., King, D. W., & King, L. A. (2007). Risk pathways for PTSD: Making sense of the literature. In M. J. Friedman, T. M. Keane, & P. A. Resick (Eds.), *Handbook of PTSD: Science and practice* (pp. 99–115). New York: Guilford.
- Vujanovic, A. A., Zvolensky, M. J., & Bernstein, A. (2008). Incremental associations between facets of anxiety sensitivity and posttraumatic stress and panic symptoms among trauma-exposed adults. *Cognitive Behaviour Therapy*, 37, 76–89. doi:10.1080/16506070801969039.
- Vujanovic, A. A., Bernstein, A., & Litz, B. T. (2011). Traumatic stress. In M. J. Zvolensky, A. Bernstein, & A. A. Vujanovic (Eds.), *Distress tolerance*. New York: Guilford.
- Watson, D. (2000). *Mood and temperament*. New York: Guilford.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063–1070. doi:10.1037/0022-3514.54.6.1063.
- Zanarini, M. C., Skodol, A. E., Bender, D., Dolan, R., Sanislow, C., Schaefer, E., et al. (2000). The collaborative longitudinal personality disorders study: Reliability of axis I and II diagnoses. *Journal of Personality Disorders*, 14, 291–299.
- Zvolensky, M. J., Leyro, T., Bernstein, A., & Vujanovic, A. A. (2011). Distress tolerance: Historical perspectives, theory, and measurement. In M. J. Zvolensky, A. Bernstein, & A. A. Vujanovic (Eds.), *Distress tolerance*. New York: Guilford.