ORIGINAL ARTICLE

Posttraumatic Stress and Suicidality Among Firefighters: The Moderating Role of Distress Tolerance

Brooke A. Bartlett[1] · Charles Jardin[1,2] · Colleen Martin[3] · Jana K. Tran[4] · Sam Buser[4] · Michael D. Anestis[5] · Anka A. Vujanovic[1]

Abstract
Firefighters report high rates of suicidality and posttraumatic stress disorder (PTSD). This investigation explored the moderating role of distress tolerance (DT) in the association between PTSD symptomatology and suicidality in firefighters. Covariates included trauma load, depressive symptom severity, gender, race, age, and education. The sample was comprised of 765 (94.0% male; $M_{age} = 38.8$, SD = 8.6) trauma-exposed firefighters who completed a questionnaire battery. Structural equation modeling was employed. PTSD symptom severity was significantly, positively associated with global suicide risk, suicidal ideation/attempt, frequency of suicidal ideation, lifetime threat of suicide, and perceived likelihood of future suicide attempts. Lower levels of DT were significantly associated with higher frequency of past-year suicidal ideation. Significant interactive effects were noted; firefighters with higher levels of PTSD symptom severity and low levels of DT had the highest levels of global suicide risk and perceived likelihood of future suicide attempt. Clinical and research implications are discussed.

Keywords Trauma · PTSD · Suicide · Distress tolerance · Firefighters

Introduction

Suicidality, defined as suicidal ideation, behavior, and/or attempts, is a significant public health concern among firefighters. Firefighters report higher rates of suicidal ideation, plans, and attempts (46.8, 19.2, and 15.5%, respectively) as compared to both general (5.6–14.3, 3.9, and 1.9–8.7%, respectively) and military (3.8–13.9, 5.3, and 0.4–2.4%, respectively) populations (Nock et al. 2008, 2014; Stanley et al. 2015). Despite the elevated risk for suicidality documented among firefighters, there is a dearth of information available regarding the psychological factors associated with this risk. Hence, further research is needed to better

understand the psychological processes associated with suicidality in firefighters in order to inform evidence-based intervention and prevention efforts for this vulnerable, understudied population.

Trauma exposure (e.g., natural disasters, car accidents, terrorist attacks) and posttraumatic stress disorder (PTSD) symptomatology are highly prevalent among firefighters (Berger et al. 2011; Corneil et al. 1999; Haslam and Mallon 2003; McCammon 1996; Meyer et al. 2012), and both are related to increased risk for suicidality (Arsenault-Lapierre et al. 2004; Bentley et al. 2016; Brenner et al. 2011; Cavanagh et al. 2003; Jankovic et al. 2013; Krysinska and Lester 2010; Krysinska and Martin 2009; Lopez-Castroman et al. 2015; Tarrier and Gregg 2004). Indeed, rates of trauma exposure among firefighters are estimated to be approximately 91.5%, with nearly one-third reporting three or more traumatic event exposures (Meyer et al. 2012). Due to repeated and chronic exposures to trauma, firefighters are at high risk for the development of PTSD, with prevalence estimates for current PTSD as high as 22.2% (Corneil et al. 1999). PTSD symptomatology has been identified as a major risk factor for suicidality (e.g., suicidal thoughts and behaviors; Bentley et al. 2016; Jankovic et al. 2013; Krysinska and Lester 2010; Lopez-Castroman et al. 2015), with a

✉ Anka A. Vujanovic
aavujano@central.uh.edu

[1] Department of Psychology, Trauma and Stress Studies Center, University of Houston, 126 Heyne Building, Houston, TX 77204-5502, USA

[2] Durham VA Medical Center, Durham, NC, USA

[3] Cincinnati VA Medical Center, Cincinnati, OH, USA

[4] Houston Fire Department, Houston, TX, USA

[5] University of Southern Mississippi, Hattiesburg, MS, USA

significant proportion of those with a diagnosis of PTSD also exhibiting suicidality (i.e., suicidal ideation, plans, and attempts; Panagioti et al. 2012; Tarrier and Gregg 2004). Research examining the association between PTSD and suicidality among firefighters is scarce, but two studies to date have demonstrated that PTSD symptomatology is significantly positively associated with lifetime suicidal ideation and suicide attempts among firefighters (Boffa et al. 2017; Martin et al. 2017). Given the high rates of trauma exposure and PTSD symptomatology among firefighters, it is important to understand psychological processes—targetable via cognitive behavioral intervention—that may underlie the association between PTSD symptoms and suicidality among firefighters.

Distress tolerance (DT), defined as the perceived (i.e., self-report) or actual/behaviorally-indexed (e.g., computer tasks, cold pressor) ability to tolerate negative or aversive emotional or physical states (Leyro et al. 2010), is one such promising factor relevant to the PTSD-suicidality association. An emerging literature of cross-sectional studies has demonstrated that perceived and behaviorally-indexed DT are negatively associated with PTSD symptomatology across various populations, including trauma-exposed community adults, military veterans, individuals with substance use disorders, and psychiatric inpatients (Banducci et al. 2017; Vujanovic et al. 2017, 2016). Theoretically, low DT in the aftermath of trauma may lead to increased experiential avoidance due to insufficient perceived or actual resources to withstand trauma-related emotional distress; conversely, heightened DT may help individuals to cope more effectively following trauma as a result of greater tolerance of distress (Vujanovic et al. 2015). Furthermore, DT may fluctuate as a function of exposure to trauma; and/or DT and PTSD symptomatology may relate bi-directionally such that DT increases or decreases alongside corresponding changes in PTSD symptomatology or vice versa (Vujanovic et al. 2015). In addition, DT has been associated with distinct aspects of suicidality. Low levels of perceived (i.e., self-reported) emotional DT, defined as one's perception of his/her ability to withstand negative emotions, have been associated with non-suicidal self-injury (Anestis et al. 2013), a potent risk factor for suicidal behaviors, as well as heightened suicidal ideation or desire (Anestis et al. 2011). High levels of behavioral DT, defined as actual, behaviorally-indexed ability to withstand psychological frustration or physical discomfort (e.g., pain), have been positively associated with the increased capability for suicide (Anestis and Joiner 2012), theorized to develop through repeated exposure to painful and/or provocative events (Anestis et al. 2011). These findings highlight the complexity of relations between cognitive-affective risk mechanisms, such as DT, and suicidality.

Few studies have examined the interplay of PTSD symptomatology, DT, and suicidality. In a sample of inpatients in a substance use disorder residential treatment program, behaviorally-indexed DT significantly moderated the association between PTSD symptom severity and number of past medically attended suicide attempts (Anestis et al. 2012), such that higher DT amplified the association between PTSD and past suicide attempts. In acute-care psychiatric inpatients, perceived DT mediated the association between PTSD symptom severity and suicidal ideation severity as well as suicidality as reason for psychiatric admission (Vujanovic et al. 2017). That is, low DT partially accounted for the association between heightened PTSD symptom severity and greater suicidal ideation severity as well as psychiatric hospitalization due to suicidality. The extant empirical and theoretical literature suggests that higher levels of an individual's behaviorally-indexed ability to tolerate physical or psychological distress may exacerbate the association between PTSD symptomatology and heightened capability for suicide (Anestis et al. 2011; Bender et al. 2012). However, lower *perceived* emotional DT may be associated with increased suicidal desire (Anestis, Bagge, et al., 2011) but a theoretically lower capability of actually engaging in potentially lethal behaviors in the absence of exposure to potentially provocative events. No studies to date have evaluated the interplay of PTSD symptomatology and DT with regard to suicidality in firefighters.

Taken together, several notable gaps have been found in the literature. First, there is limited research examining suicidality among firefighters, a critical mental health outcome. This is unfortunate since research suggests that firefighters experience higher rates of various negative mental health outcomes due to their job-related duties (Martin et al. 2017; Meyer et al. 2012). Second, no studies to date have examined DT in relation to either PTSD or suicidality in firefighters. Better understanding clinical correlates of suicide risk among firefighters has great potential to inform the development of novel, specialized, evidence-based prevention and intervention efforts. Third, no studies to date have examined DT as a moderator of the PTSD-suicidality association among firefighters. Given that emerging research demonstrates that higher behaviorally-indexed DT may play a meaningful role in the association between PTSD and past suicidal behavior among substance users (Anestis and Joiner 2012) and the association between PTSD and suicidal ideation in psychiatric inpatients (Vujanovic et al. 2017), it is important to explore these associations among firefighters. In firefighters, a lower perceived capacity to tolerate negative emotional states may amplify the association between PTSD symptomatology and suicidality, such that this association may be strongest at low levels of DT. Theoretically, firefighters with PTSD symptomatology who experience such symptomatology as intolerable and unmanageable may be at increased risk of manifesting suicidal ideation or desire

in an attempt to 'escape' or 'end' the distress (Vujanovic et al. 2017).

Therefore, the current study aims to examine associations between PTSD symptom severity, DT, and suicidality in firefighters. Specifically, we first hypothesized that higher PTSD symptom severity would be positively associated with global suicide risk, operationalized as suicidal ideation/attempt, intent, and/or threat of future suicide attempt, as demonstrated in previous work (Boffa et al. 2017; Stanley et al. 2015, 2016). Second, we hypothesized that lower levels of self-reported, perceived DT would be associated negatively with global suicide risk. Finally, we hypothesized a priori that self-reported, perceived DT would moderate, or attenuate, the association between PTSD symptom severity and global suicide risk. That is, we expected the strongest association between heightened PTSD symptomatology and greater suicide risk would be observed among firefighters who report low levels of DT. Firefighters reporting a combination of heightened PTSD symptom severity and low DT were expected to manifest the highest levels of suicide risk. All effects were expected above and beyond theoretically-relevant covariates, including trauma load (i.e., total number of traumatic event types experienced), depressive symptom severity, and sociodemographic factors (i.e., gender, race, education, age). Covariates were selected based on their robust associations with suicidality among various populations, including firefighters (Davidson et al. 1996; Liu et al. 2006; Martin et al. 2017) as well as their inclusion in relevant past work (e.g., Anestis et al. 2013; Anestis and Joiner 2012; Martin et al. 2017; Vujanovic et al. 2017). Exploratory *post hoc* analyses were conducted to examine four aspects of suicidality (i.e., ideation/attempt, frequency of ideation, threat of suicide attempt, and intention of future suicide attempt) as outcomes in the model proposed above.

Method

Participants

This study is a secondary analysis of data from a larger project examining stress and health-related behaviors among firefighters. The overall sample included 765 firefighters (94.0% male; $M_{age} = 38.4$, SD = 8.6). Participants were professional firefighters, who perform both Emergency Medical Services (EMS) and fire suppression services, at a fire department in a large metropolitan area in the southern U.S. To be included in the study, participants must: be 18 years of age or older, be current firefighters, have endorsed at least one PTSD Criterion A traumatic life event (American Psychiatric Association 2013), and have consented to completion of all online questionnaires. Exclusionary criteria were comprised of inability or unwillingness to provide informed

consent for the completion of the online questionnaires. Please see Procedures section for more information.

Measures

Demographic Questionnaire

Participants were asked to self-report demographic information. Demographic variables (e.g., gender, race, education, age) were used as covariates in the present study.

Life Events Checklist Version-5 (Lec-5; Weathers et al. 2013)

The LEC-5 is a self-report questionnaire that is used to screen for potentially traumatic events experienced at any time throughout the lifespan. Respondents are presented with 16 potentially traumatic events (e.g., combat, sexual assault, transportation accident) as well as an additional item assessing for 'other' potentially traumatic events not listed. In the current study, respondents were asked to indicate (via check mark) whether each listed event "happened to me", "witnessed it", "learned about it", "part of my job", or "not sure". If participants endorsed "happened to me", "witnessed it", or "part of my job" for a given item, this was coded as positive exposure to the particular traumatic event type. Total exposures were summed to produce a variable indicating the total number of traumatic life event types experienced. In the current sample, internal consistency for the total number of traumatic life event types experienced variable was excellent ($\alpha = 0.90$). A latent variable of trauma load was specified from the LEC-5 using item parcels to reduce the number of parameters estimated. Parcels were created by randomly selecting items into one of four parcels (parcel 1: items 6, 9, 12, 15, range: 0–4; parcel 2: items 1, 2, 7, 16, range: 0–4; parcel 3: items 3, 10, 13, 14, range: 0–4; parcel 4: items 4, 5, 8, 11, 17, range 0–5). The LEC-5 variable was used as a covariate in the present study.

PTSD Checklist-Civilian Version-5 (Pcl-5; Blevins et al. 2015)

The PCL-5 is a 20-item self-report questionnaire that measures PTSD symptom severity. Each of the 20 items reflects a symptom of PTSD according to the *DSM-5* (APA 2013). Respondents are asked to rate each item on a 5-point scale (0 = *Not at all* to 4 = *Extremely*) in regard to the frequency in which they have been bothered by the symptom in the past month (e.g., "In the past month, how much have you been bothered by repeated, disturbing, and unwanted memories of the stressful experience?"). Total symptom severity scores range from 0 to 80, with higher scores indicating

higher symptom severity. The PCL-5 has demonstrated good psychometric properties (Blevins et al. 2015; Briere 2001; Morey 2007; Weathers et al. 1993). Internal consistency of the total PTSD symptom severity (PCL-5 total score) in the current sample was excellent ($\alpha = 0.90$). A latent variable, derived from the PCL-5, was specified by utilizing the five-factor model of PTSD (Armour et al. 2016). As such, parcels were created for intrusions (items 1–5; $\alpha = 0.94$), avoidance (items 6, 7; $\alpha = 0.93$), negative alterations in cognition and mood (items 8–14; $\alpha = 0.93$), dysphoric arousal (items 17, 18; $\alpha = 0.87$), and anxious arousal (items 15, 16, 19, 20; $\alpha = 0.77$); these five symptom clusters were used as indicators of the latent PTSD symptom severity variable.

Distress Tolerance Scale (DTS; Simons and Gaher 2005)

The DTS is a 15-item self-report measure that evaluates the extent to which respondents believe they can experience and withstand distressing emotional states, rated on a 5-point scale (1 = *strongly agree* to 5 = *strongly disagree*). The DTS contains four subscales: Tolerance ("I can't handle feeling distressed or upset"), Appraisal ("Being distressed or upset is always a major ordeal for me"), Absorption ("When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels"), and Regulation ("I'll do anything to stop feeling distressed or upset"). Total scores range from 15 to 75, with higher values indicating greater levels of DT. The DTS demonstrates good psychometric properties, including good internal consistency, test–retest reliability, convergent validity, and discriminant validity with established measures of mood (Simons and Gaher 2005). For the current study, the DTS total score was used to represent the overall level of DT, as consistent with past literature (Simons and Gaher 2005; Vujanovic et al. 2013). In the current sample, internal consistency for the total DTS score was excellent ($\alpha = 93$). For the purposes of this study, the four DTS subscales (i.e., Tolerance [$\alpha = 88$], Appraisal [$\alpha = 78$], Absorption [$\alpha = 88$], Regulation [$\alpha = 80$]) were used as indicators of the latent DT variable.

Suicide Behaviors Questionnaire-Revised (Sbq-R; Osman et al. 2001)

The SBQ-R, identified as a gold standard assessment (Batterham et al. 2015), is a 4-item self-report measure of suicide risk. Each of the four items on the SBQ-R assesses a different aspect of suicidality: Item 1 taps into *lifetime* suicide ideation and/or suicide attempts (i.e., "Have you ever thought about or attempted to kill yourself?"; 1 = *never* to 4 = *I have attempted to kill myself, and really hoped to die*); Item 2 assesses the *frequency* of suicidal ideation over the past twelve months (i.e., "How often have you thought about

killing yourself in the past year?"; 1 = *never* to 5 = *very often [5 or more times]*); Item 3 taps into the *threat* of suicide attempt (i.e., "Have you ever told someone that you were going to commit suicide, or that you might do it?"; 1 = *no* to 3 = *Yes, more than once, but did not want to do it / Yes, more than once, and really wanted to do it*); and Item 4 evaluates the self-reported *likelihood* of suicidal behavior in the future (i.e., "How likely is it that you will attempt suicide someday?"; 0 = *never* to 6 = *very likely*). Total scores range from 3 to 18, with higher scores indicating greater levels of suicide risk. Suggested cutoff scores to identify at-risk individuals and specific risk behaviors for the adult general population are ≥ 7 and ≥ 8 for psychiatric inpatient populations. The total SBQ-R demonstrates good psychometric properties for adult inpatient populations, including sensitivity (93%), specificity (95%), positive predictive value (0.87), and discrimination (0.89; Osman et al. 2001) (Batterham et al. 2015). Internal consistency of the SBQ-R in the current sample was acceptable ($\alpha = 0.76$). In the current study, a latent suicidality variable served as the outcome variable to measure global suicide risk and was estimated from all four items of the SBQ-R. Three of the four SBQ-R items had five or fewer response options and were analyzed as categorical indicators.

Center for Epidemiological Studies Depression Scale (Ces-D; Radloff 1977)

The CES-D is a 20-item self-report measure used to assess depressive symptom severity. Items are scored on a four-point scale ranging from 0 ("rarely or none of the time/less than 1 day") to 3 ("most or all of the time/5 to 7 days") in regard to the frequency in which individuals have been bothered by the symptom in the past week. Total symptom severity scores range from 0 to 60, with higher scores indicating higher depressive symptom severity. The CES-D has demonstrated high internal consistency, moderate test–rest reliability, and good convergent and discriminant validity. In the current sample, internal consistency of the CES-D was good ($\alpha = 0.88$). Since the CES-D lacks subscales, the CES-D was modeled using four item parcels which were created by randomly selecting items into each parcel (parcel 1: items 1, 2, 3, 13, 12; parcel 2: items 4, 5, 10, 17, 19; parcel 3: items 6, 14, 15, 16, 18; parcel 4: items 7, 8, 9, 11, 20).

Procedures

All firefighters were recruited for participation in the parent study through the fire department. A fire department-wide email was sent to all firefighters, notifying them of the opportunity to complete an online research survey for one continuing education (CE) credit and a chance to win

one of several raffle prizes (e.g., movie tickets, restaurant gift certificates). Notification emails indicated that the purpose of the survey was to better understand how firefighters cope with stress and how much firefighters engage in health-related behaviors. Firefighters were given access to the informed consent form and survey through an online fire department CE portal. Once firefighters accessed the portal, they were provided with a description of the survey and the choice to review the informed consent form, which delineated all aspects of the study. Those who did not wish to participate or consent to the study were given the option to indicate (by clicking 'no') that they did not wish to participate. The total amount of time required for participation in this study was estimated at 45–60 min. Firefighters could discontinue participation at any time without penalty. Firefighters who completed the online survey received one CE credit for participation.

Data Analytic Strategy

Descriptive analyses and bivariate correlations were conducted using IBM SPSS 24.0 (IBM, 2015). All remaining analyses were conducted using Mplus 7.31. Multiple imputation ($n = 20$ datasets) was used to account for missing data. Confirmatory factor analysis was used to estimate a measurement model with weighted least squared means and variances estimation (WLSMV). To reduce model complexity, multidimensional scales were fit using their respective subscales (e.g., PCL-5 and DTS), while unidimensional scales for covariates (i.e., CES-D and LEC-5) were fit using item parcels (Little et al. 2013). For each of the unidimensional scales, parcels were compiled using random assignment of items to one of four parcels. Parceling afforded reducing the measurement error in the model through the formation of latent variables relative to analyses using only observed scale totals (Little et al. 2013). All four sociodemographic covariates were utilized as observed variables, and therefore were not included in the measurement model. These covariates were modeled as follows: age (continuously), gender (1 = male, 0 = female/transgender), race (1 = white, 0 = nonwhite), and education (1 = college degree, 0 = no college degree). Three of the four SBQ-R items had five or fewer response options and were analyzed as categorical indicators. A measurement model was first specified to examine how well each of the subfactors loaded onto the latent variables of interest (i.e., trauma exposure, depression symptom severity, PTSD symptom severity, and distress tolerance). Next, a path analysis was specified to test the study's hypothesized direct and interaction effects. Model fit for both the measurement model and the path model were assessed using the root mean square error of approximation (RMSEA), with values of less than 0.06 indicating excellent fit and values

above 0.10 suggesting poor fit; and the Comparative Fit Index and Tucker-Lewis Index with values between 0.95 and 1.00 indicating excellent fit and values between 0.90 and 0.94 indicating acceptable fit (Hu and Bentler 1999).

The study hypotheses were tested by progressively specifying two path analysis models. Because Mplus is not able to conduct moderation analyses using WLSMV estimation, the path analytic models were estimated using maximum likelihood estimation. To reduce the complexity of integration, Monte Carlo integration was employed. In the first model examined, a latent suicidality variable served as the outcome variable and was estimated from all four items of the SBQ-R. In the first step, the first and second study hypotheses were tested by including all covariates in the model (e.g., trauma load, depressive symptom severity, gender, race, education, and age) along with the main effects of DT and PTSD symptom severity. In the second step, the third hypothesis was examined by entering the product of DT with PTSD symptom severity, using the XWITH command in Mplus. The second model followed the same procedures, but examined each of the SBQ-R items as separate outcomes simultaneously in a multivariate path analysis.

Results

For the descriptive statistics and bivariate relations of all observed indicators, see Tables 1 and 2. Unstandardized parameter estimates from the path analysis are provided in Table 3, while standardized estimates are presented in the text below. Notably, analyses were conducted with and without covariates in the models, and the pattern of results remained the same (Table 4).

Measurement Model

The measurement model demonstrated acceptable model fit: $\chi^2(179) = 483.250$, $p < .001$; RMSEA = 0.047; CFI = 0.942; TLI = 0.932. With the exception of the χ^2 statistic, all fit indices were in the acceptable range. With larger sample sizes and/or non-normally distributed data, the χ^2 model fit test becomes increasingly sensitive to differences between the predicted and observed covariances, increasing the likelihood of a significant χ^2 test. Standardized factor loadings ranged from 0.621 to 0.987 (see Fig. 1).

Global Suicidality

In step 1 of the main effects model, greater PTSD symptom severity was related to greater global suicidality, while no main effect was observed for DT. Among the covariates, greater depression, greater trauma load, and being female were each related to greater global suicidality. The

Table 1 Participant characteristics (n = 765)

Variable	M/n (SD/%)
Gender[a]	
Male	719 (94.0)
Female	41 (5.4)
Transgender	5 (0.7)
Race/ethnicity[a]	
White	578 (75.6)
Hispanic/Latino	205 (26.8)
Black/African American	94 (12.3)
'Other'	64 (8.4)
Asian	14 (1.8)
Native Hawaiian/Pacific Islander	1 (0.1)
American Indian/Alaskan Native	14 (1.8)
Age[a]	38.4 (8.6)
Education[a]	
8th Grade	4 (0.5)
GED (or equivalent)	6 (0.8)
High school	57 (7.5)
Some college	356 (46.5)
Bachelor's degree	342 (44.7)
Years of service in department[a]	13.4 (8.9)
Marital status[a]	
Married	533 (69.7)
Divorced	49 (6.4)
Living with partner	36 (4.7)
Single	145 (19.0)
Widowed	2 (0.3)
PTSD diagnostic criteria[b]	193 (26.6)
Suicidal ideation *or* attempt[c]	187 (24.4)
Trauma exposure (happened to me, witnessed it, and/or part of my job)[d]	
Natural disaster	9 (1.2)
Fire or explosion	11 (1.4)
Transportation accident	22 (2.9)
Serious accident	23 (3.0)
Exposure to toxic substance	19 (2.5)
Physical assault	33 (4.3)
Assault with a weapon	26 (3.4)
Sexual assault	23 (3.0)
Other unwanted or uncomfortable sexual experience	44 (5.8)
Combat or exposure to a war-zone	41 (5.4)
Captivity	56 (7.3)
Life-threatening illness or injury	89 (11.6)
Severe human suffering	103 (13.5)
Sudden violence death	104 (13.6)
Sudden accidental death	77 (10.1)
Serious injury, harm, or death you caused to someone else	40 (5.2)
Any other stressful event or experience	45 (5.9)

[a]Demographics questionnaire, [b]PTSD Checklist for DSM-5 (PCL-5; diagnostic cut-off of 33), [c]Suicide Behaviors Questionnaire-Revised (SBQ-R), [d]Life Events Checklist for DSM-5 (LEC-5)

Table 2 Bivariate associations and descriptive statistics for all observed variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender	–	0.06	− 0.06	− 0.00	− 0.02	− 0.01	− 0.03	− 0.00	− 0.09**	− 0.07*	− 0.10**	− 0.11**	− 0.03
2. Race		–	0.07*	0.09**	− 0.04	0.12**	− 0.02	0.02	0.02	− 0.00	0.03	− 0.06	0.05
3. Education			–	− 0.08*	− 0.02	− 0.03	− 0.02	0.04	− 0.00	0.00	− 0.01	− 0.02	0.01
4. Age				–	− 0.01	0.05	− 0.00	0.05	0.01	− 0.00	− 0.00	− 0.02	0.04
5. CES-D					–	0.05	0.65**	− 0.38**	0.40**	0.31**	0.39**	0.17**	0.32**
6. LEC-5						–	0.11**	− 0.04	0.11**	0.11**	0.06	0.09*	0.09**
7. PCL-5							–	− 0.29**	0.44**	0.36**	0.39**	0.23**	0.36**
8. DTS								–	− 0.22**	− 0.16**	− 0.24**	− 0.15**	− 0.14**
9. Suicidality									–	0.84**	0.82**	0.59**	0.82**
10. SBQR1										–	0.60**	0.49**	0.55**
11. SBQR2											–	0.36**	0.50**
12. SBQR3												–	0.38**
13. SBQR4													–
Mean (n)	721	440	342	38.86	10.38	11.36	29.55	61.48	3.87	1.31	1.21	1.06	0.30
SD (%)	94	57	45	8.60	8.03	3.94	14.33	12.82	1.80	0.60	0.64	0.26	0.74

Gender, coded 0 = female / transgender, 1 = male, with descriptive statistics for number/percent male; Race, coded 0 = non-White, 1 = non-Hispanic White, with descriptive statistics for number/percent non-Hispanic White; Education, coded 0 = less than college degree, 1 = college graduate, with descriptive statistics for number/percent college graduates; Age, in years; *CESD* Center for Epidemiological Studies Depression Scale total scale score, *LEC-5* life events checklist for the DSM-5, *PCL-5* posttraumatic stress disorder checklist for DSM-5 total scale score; *DTS* distress tolerance scale total score, *Suicidality* suicidal behavior questionnaire-revised (SBQ-R) total scale score, *SBQR1* SBQ-R item 1; *SBQR2* SBQ-R item 2, *SBQR3* SBQ-R item 3, *SBQR4* SBQ-R item 4

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

Table 3 Unstandardized Path Analysis Results: Main Effect and Moderation Effect Models

	Step 1: main effects model				Step 2: interaction effect model			
	B	SE	Lower CI	Upper CI	B	SE	Lower CI	Upper CI
PTSD severity	0.37**	0.07	0.22	0.52	0.31**	0.08	0.15	0.46
Distress tolerance	− 0.09	0.05	− 0.20	0.01	− 0.07	0.05	− 0.19	0.03
Interaction	–	–	–	–	− 0.11*	0.04	− 0.20	− 0.02
Depression	0.18*	0.08	0.02	0.34	0.18*	0.08	0.03	0.34
Trauma load	0.14**	0.05	0.03	0.25	0.14**	0.05	0.04	0.25
Age	0.00	0.00	− 0.00	0.01	0.00	0.00	− 0.00	0.01
Gender	− 0.39*	0.19	− 0.77	− 0.00	− 0.38	0.20	− 0.78	0.00
Race	0.10	0.10	− 0.09	0.30	0.08	0.10	− 0.11	0.28
Education	0.06	0.10	− 0.12	0.26	0.09	0.10	− 0.10	0.30

Suicidality latent suicidal behavior questionnaire-revised (Osman et al. 2001); *PTSD Severity* latent PTSD Checklist for the DSM-5 (Blevins et al. 2015); *Distress Tolerance* latent distress tolerance scale (Simons and Gaher 2005); *Interaction* product of PTSD severity with distress tolerance, *Depression* latent Center for Epidemiological Studies Depression Scale (Radloff 1977), *Trauma Load* latent life events checklist for the DSM-5 (Weathers et al. 2013); Age in years; Gender, coded 0 = female/transgender, 1 = male; Race, coded 0 = non-White, 1 = non-Hispanic White; Education, coded 0 = less than college degree, 1 = college graduate

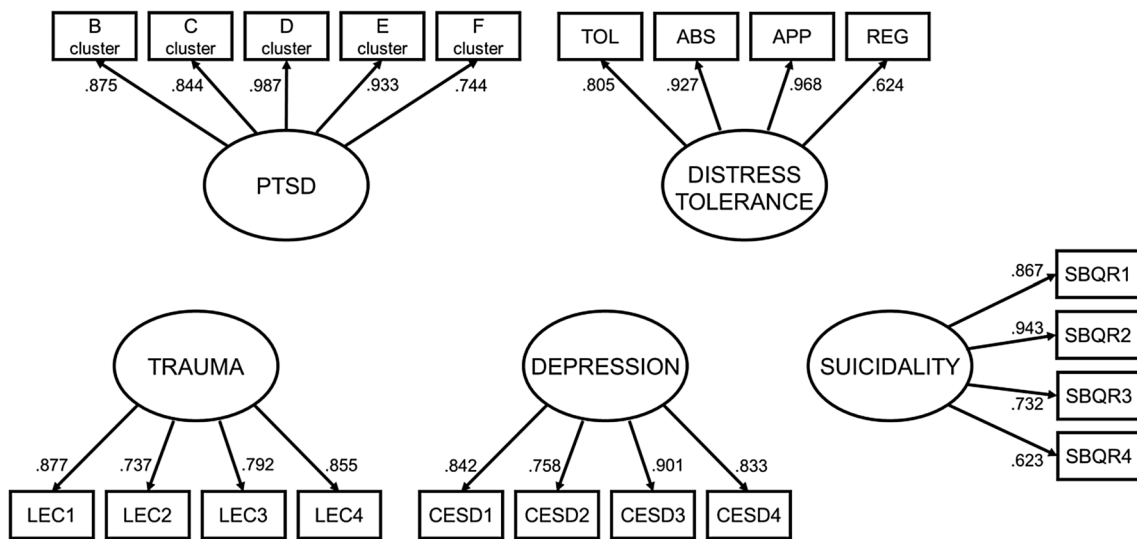Confidence intervals are presented for 95% level of confidence

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

interaction term between PTSD symptom severity and DT in step 2 of the moderation model was also related to global suicidality. Upon further probing the interaction, the relation of PTSD symptom severity with global suicidality was strongest at low levels of DT and weakened as DT increased (see Fig. 2). Both depression and trauma load remained related to global suicidality. See Table 3 for resulting parameter estimates.

Table 4 Structural model unstandardized parameter estimates predicting observed SBQ-R items

Lifetime suicidal ideation/attempts	Step 1: main effects model				Step 2: interaction effect model			
	B	SE	Lower CI	Upper CI	B	SE	Lower CI	Upper CI
PTSD severity	0.60**	0.22	0.16	1.04	0.70*	0.28	0.14	1.25
Distress Tolerance	− 0.10	0.11	− 0.33	0.11	− 0.12	0.18	− 0.48	0.24
Interaction	–	–	–	–	− 0.25	0.21	− 0.67	0.16
Depression	0.30	0.18	− 0.06	0.67	0.34	0.27	− 0.19	0.87
Trauma load	0.30**	0.10	0.10	0.51	0.32**	0.11	0.10	0.54
Age	0.00	0.01	− 0.01	0.02	0.00	0.01	− 0.01	0.02
Gender	− 0.30	0.35	− 1.01	0.39	− 0.29	0.35	− 1.00	0.40
Race	0.08	0.18	− 0.27	0.45	0.08	0.18	− 0.28	0.44
Education	0.13	0.18	− 0.21	0.49	0.14	0.18	− 0.21	0.50

Past-year suicidal ideation	Step 1: main effects model				Step 2: interaction effect model			
	B	SE	Lower CI	Upper CI	B	SE	Lower CI	Upper CI
PTSD Severity	0.53*	0.22	0.10	0.96	0.62	0.31	0.01	1.24
Distress Tolerance	− 0.33*	0.15	− 0.62	− 0.03	− 0.41*	0.21	− 0.82	− 0.00
Interaction	–	–	–	–	− 0.09*	0.21	− 0.52	0.33
Depression	0.56*	0.26	0.03	1.08	0.69*	0.34	0.02	1.36
Trauma Load	0.11	0.13	− 0.15	0.39	0.13	0.15	− 0.16	0.43
Age	0.00	0.01	− 0.02	0.03	0.00	0.01	− 0.02	0.03
Gender	− 0.94*	0.40	− 1.73	− 0.14	− 0.92*	0.40	− 1.72	− 0.12
Race	0.45	0.26	− 0.05	0.96	0.45	0.26	− 0.05	0.97
Education	0.09	0.24	− 0.39	0.58	0.10	0.25	− 0.39	0.59

Lifetime suicide threat	Step 1: main effects model				Step 2: interaction effect model			
	B	SE	Lower CI	Upper CI	B	SE	Lower CI	Upper CI
PTSD severity	0.59*	0.29	0.02	1.16	0.70	0.43	− 0.14	1.56
Distress tolerance	− 0.35	0.21	− 0.76	0.06	− 0.47	0.30	− 1.07	0.12
Interaction	–	–	–	–	− 0.15	0.27	− 0.69	0.38
Depression	0.00	0.30	− 0.58	0.60	− 0.09	0.44	− 0.97	0.78
Trauma load	0.52*	0.23	0.06	0.97	0.59*	0.26	0.08	1.10
Age	− 0.00	0.02	− 0.05	0.03	− 0.00	0.02	− 0.05	0.03
Gender	− 1.31*	0.48	− 2.26	− 0.35	− 1.29**	0.49	− 2.26	− 0.32
Race	− 0.52	0.35	− 1.21	0.17	− 0.53	0.35	− 1.23	0.16
Education	− 0.16	0.36	− 0.86	0.54	− 0.14	0.36	− 0.86	0.57

Perceived future suicidal behavior	Step 1: main effects model				Step 2: interaction effect model			
	B	SE	Lower CI	Upper CI	B	SE	Lower CI	Upper CI
PTSD severity	0.22**	0.08	0.06	0.38	0.20*	0.10	0.00	0.40
Distress tolerance	− 0.00	0.03	− 0.07	0.06	− 0.04	0.07	− 0.19	0.11
Interaction	–	–	–	–	− 0.29*	0.12	− 0.53	− 0.04
Depression	0.12*	0.05	0.02	0.22	0.11	0.07	− 0.03	0.25
Trauma Load	0.04	0.02	− 0.00	0.10	0.05	0.02	0.00	0.10
Age	0.00	0.00	− 0.00	0.01	0.00	0.00	-0.00	0.01
Gender	− 0.07	0.104	− 0.278	0.128	− 0.049	0.102	− 0.249	0.151
Race	0.08	0.05	− 0.01	0.18	0.07	0.04	− 0.02	0.17
Education	0.03	0.05	− 0.05	0.13	0.04	0.04	− 0.04	0.14

Suicidality latent Suicidal Behavior Questionnaire-Revised (Osman et al. 2001), *PTSD Severity* latent PTSD Checklist for the DSM-5 (Blevins et al. 2015), *Distress Tolerance* latent Distress Tolerance Scale (Simons and Gaher 2005), *Interaction* product of PTSD Severity with Distress Tolerance; *Depression* latent Center for Epidemiological Studies Depression Scale (Radloff 1977), *Trauma Load* latent Life Events Checklist for the DSM-5 (Weathers et al. 2013); Age in years; Gender, coded 0 = female/transgender, 1 = male; Race, coded 0 = non-White, 1 = non-Hispanic White; Education, coded 0 = less than college degree, 1 = college graduate

Confidence intervals are presented for 95% level of confidence

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

Fig. 1 Measurement model with standardized factor loadings. *CESD1* Center for Epidemiological Studies Depression Scale (CESD) items 1, 2, 3, 13, 12, *CESD2* CESD items 4, 5, 10, 17, 19, *CESD3* CESD items 6, 14, 15, 16, 18, *CESD4* CESD items 7, 8, 9, 11, 20, *LEC1* Life Events Checklist for the DSM-5 (LEC) items 6, 9, 12, 15, *LEC2* LEC items 1, 2, 7, 16, *LEC3* LEC items 3, 10, 13, 14, *LEC4* LEC items 4, 5, 8, 11, 17, *B cluster* Posttraumatic Stress Disorder Checklist for DSM-5 (PCL5) intrusions, *C cluster* PCL5 avoidance; *D clus-* *ter* PCL5 negative alterations in cognitions and mood; *E cluster* PCL 5 dysphoric arousal; *F cluster* PCL5 anxious arousal; *TOL* Distress Tolerance Scale (DTS) tolerance subscale; *ABS* DTS absorption subscale; *APP* DTS appraisal subscale; *REG* DTS regulation subscale; *SBQR1* Suicidal Behavior Questionnaire-Revised (SBQ-R) item 1; *SBQR2* SBQ-R item 2; *SBQR3* SBQ-R item 3, *SBQR4* SBQ-R item 4. Unstandardized factor loadings and parameter estimates available upon request
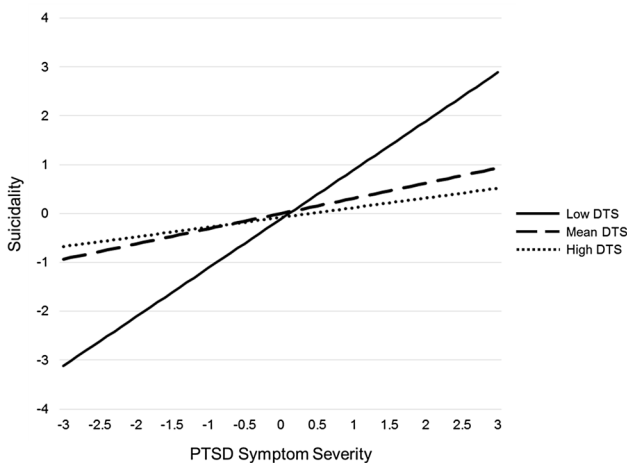
Fig. 2 Interaction of PTSD symptom severity with distress tolerance in predicting suicidality. Increments along each axis represent standard deviations for the standardized latent factors

Item-Level Suicidality

As a follow-up to the structural models predicting general suicidality, additional structural models were specified to examine each of the four suicidality items as separate outcome variables. First, with regard to greater lifetime suicidal ideation and/or attempts (SBQ-R item 1), PTSD symptom severity and greater trauma load, but not DT, were related.

The interaction of PTSD symptom severity with DT was unrelated to lifetime suicidal ideation/attempts. Second, in terms of more frequent past-year suicidal ideation, DT was negatively related, while PTSD symptom severity, being female, and depression symptoms were positively related. The interaction effect was unrelated to the frequency of past-year suicidal ideation. Third, with regard to lifetime threat of suicide, PTSD symptom severity, being female, and trauma load were positively associated in the main effects model. DT was unrelated to lifetime threat of suicide. The interaction effect was unrelated to lifetime threat of suicide. Finally, for perceived likelihood of future suicidal behavior, main effects were observed for PTSD symptom severity and depression symptoms, both of which were positively related to the outcome. DT was unrelated to the perceived likelihood of future suicidal behavior. The interaction of PTSD symptom severity with DT was associated with perceived likelihood of future suicidal behavior, in that greater levels of PTSD symptom severity and lower levels of DT led to the greater perceived likelihood of future suicidal behavior.

Discussion

The current study examined the main and interactive effects of PTSD symptom severity and DT with regard to global suicide risk among firefighters. Hypotheses were largely

supported by the data. First, greater PTSD symptom severity was significantly related to higher levels of global suicide risk. These results are consistent with recent research that found PTSD symptom severity to be significantly associated with lifetime suicidal ideation and lifetime suicide attempts among firefighters (Boffa et al. 2017; Martin et al. 2017). Post hoc analyses revealed that greater PTSD symptom severity was significantly related to suicidal ideation and/or attempt, frequency of past-year suicidal ideation, greater lifetime threat of suicide, and a greater perceived likelihood of future suicidal behavior. Findings from these exploratory analyses are consistent with prior research among community and trauma-exposed populations, including military veterans, undergraduate students, and residential substance abusers, which indicates that PTSD is associated with an increased incidence of prior attempted suicide and prior and current suicidal ideation (Krysinska and Lester 2010). Given the high rates of trauma exposure and increased risk for PTSD symptomatology among firefighters, this work underscores the importance of further examination of the PTSD-suicidality association among this particularly vulnerable population.

Second, a significant main effect was not found with regard to perceived DT and global suicide risk, although low perceived DT was significantly related to greater past-year suicide ideation only. This is consistent with extant literature demonstrating an association between *perceived* DT and suicidal desire (i.e., suicidal ideation; Anestis et al. 2011). There may be several explanations for this finding. First, the current study consisted of only one self-report measure of DT, while behavioral measures of DT were not included. The related construct of *behavioral* DT, defined as one's objective ability to tolerate uncomfortable psychological or physical states (e.g., pain), has demonstrated positive associations with suicidal behavior (e.g., Anestis et al. 2011a, b). Indeed, low levels of perceived DT have been associated with heightened suicidal desire (Anestis et al. 2011a, b) or suicidal ideation. Conversely, high levels of behaviorally-indexed DT have been associated with increased capability for suicide (Anestis et al. 2012a), defined as elevated tolerance of physical pain and diminished fear of death. One's capability for suicide is theorized to develop through repeated exposure to painful and/or provocative events (Anestis et al. 2011a), and thus, a combination of suicidal desire and capability for suicide is theorized to confer heightened risk for suicide (e.g., Van Orden et al. 2008). Given that the extant literature has found inconsistent levels of convergence among self-report and behavioral indices of DT (Leyro et al. 2010; Marshall-Berenz et al. 2010; McHugh et al. 2011), it is important that future work examine the variously defined dimensions of the DT construct in relation to suicide risk among firefighters. Second, the current study utilized only one measure of suicidality, which was limited to four items. Although psychometrically validated and demonstrated to be a gold standard assessment instrument for suicide risk (Batterham et al. 2015), the SBQ-R is not a comprehensive measure and may not distinguish well between suicidal desire/ideation (Anestis et al. 2011a, b) and the capability for suicide (i.e., suicide behaviors or attempts; Anestis et al. 2012). Thus, perceived DT may be more relevant to the desire for suicide than the transition from ideation to action. Third, given that firefighters are a unique population and experience chronic stress by virtue of their careers, they may manifest higher levels of DT than the general community samples (please see discussion below). In other words, individuals with greater DT may be more apt to self-select into the firefighting profession or may develop greater DT by virtue of the profession. Relatedly, heightened stigma relevant to mental health concerns in the fire service (Henderson et al. 2016) may contribute to lower rates of reporting difficulty with tolerating negative emotional states. Lastly, the current sample consisted of only a subset of firefighters at the surveyed fire department, and it may be that those firefighters who chose to participate were not fully representative of the fire department as a whole. Of note, however, post hoc analyses indicated that, at the level of main effects, lower levels of perceived DT were significantly related to frequency of past-year suicidal ideation but not any other facet of suicidality indexed via the SBQ-R. Since this is the first study to date to examine DT as a cognitive-affective factor with relevance to both PTSD symptomatology and suicide risk among firefighters, more research is needed to better understand these associations between various indices of DT (self-report and behavioral) and (a) suicidal ideation and (b) suicidal behavior, respectively, in order to inform effective interventions efforts.

Third, there was a significant interaction between PTSD symptom severity and DT in relation to global suicide risk. As hypothesized, the association between PTSD symptom severity and suicidality was strongest at the lowest levels of perceived DT. Thus, PTSD symptom severity is related to heightened global suicide risk, and this association is markedly stronger when firefighters' levels of perceived DT are low. Moreover, there appeared to be relatively little difference in global suicide risk for firefighters with heightened PTSD symptom severity but mean and high levels of DT (see Fig. 2). These findings are consistent with two existing studies that demonstrated a significant moderating effect of DT in the association between PTSD symptomatology and suicidality among trauma-exposed samples (Anestis et al. 2012; Vujanovic et al. 2017). Results highlight the significant public health concern of suicidal ideation and behavior among firefighters by showcasing relevant associations with PTSD symptomatology and underlying cognitive mechanisms. It is crucial that future work be conducted for the purposes of informing evidence-based prevention and

intervention efforts for this particularly unique population. Indeed, the strain placed on firefighters via occupational stressors and chronic exposure to traumatic events may put them at an increased risk for the development of PTSD symptomatology, which may then confer risk for suicidality. What is more, firefighters who perceive themselves less able to tolerate distressing emotions may be more likely to engage in suicide-related thoughts. Thus, our findings have clinically-relevant implications, in that treatment-seeking firefighters who present with higher levels of PTSD symptomatology may benefit from receiving treatment that incorporates DT-enhancement skills. This line of inquiry has the potential to increase awareness of firefighters' risk of developing adverse mental health outcomes, such as PTSD and suicidal ideation or behavior, by increasing fire service-wide implementation of relevant intervention and prevention programs. To date, this is the first study to examine the moderating role of DT in the association between PTSD symptom severity and suicidality among firefighters. It is imperative that future work examine PTSD symptomatology and relevant cognitive mechanisms so as to potentially decrease risk for suicide among firefighters via effective intervention and prevention programs.

Although not the primary aims of the study, there were additional findings worthy of mention. First, depressive symptom severity, trauma load, and female gender, covariates in analyses, were related to greater levels of global suicide risk. Depressive symptoms have been related to suicidal ideation (Chopko et al. 2014; Martin et al. 2017; Violanti et al. 2008, 2009), while trauma load and being female have been associated with both suicidal ideation, behavior, and attempts (Davidson et al. 1996; Rouse et al. 2015; Violanti et al. 2006), among both first responders and the general population. All three covariates continued to be significantly related to suicide risk, when examining all variables in the model. In post hoc analyses, trauma load was significantly related to lifetime suicidal ideation and/or attempts as well as greater lifetime threat of suicide. This is consistent with past work linking trauma load with suicidality (Arsenault-Lapierre et al. 2004; Bentley et al. 2016; Cavanagh et al. 2003). Depressive symptom severity and female gender were significantly related to the frequency of past-year suicidal ideation, while only depressive symptom severity was significantly related to the perceived likelihood of future suicide, as consistent with past work among firefighters (Martin et al. 2017). These findings extend current research documenting trauma load, depression, and gender to be significant risk factors for suicidality among firefighters (Martin et al. 2017). Other sociodemographic correlates (i.e., race, education, age) were not significantly related to suicidality in the present sample, inconsistent with past work, and further exploration of sociodemographic correlates of suicidality in firefighter populations is warranted.

Second, approximately 26.5% of firefighters met clinical cut-off levels for probable PTSD and 24.4% endorsed suicidal ideation or attempt. Of note, the prevalence of firefighters who met diagnostic cut-off criteria for PTSD in this sample was higher in comparison to other samples of firefighters as well as the general population (Berninger et al. 2010; Corneil et al. 1999; Haslam and Mallon 2003; Kessler et al. 2005). However, the prevalence of those endorsing suicidal ideation or attempt was lower in comparison to other samples of firefighters as well as the general population (Kessler et al. 1999; Stanley et al. 2015, 2016). In regard to DT, our sample reported higher levels of DT as measured by the DTS ($M = 61.5$; $SD = 12.8$) in comparison to general community ($M = 48.72$; $SD = 10.36$; Vujanovic et al. 2011), psychiatric inpatient ($M = 42.75$; $SD = 15.10$; Vujanovic et al. 2017), and military veteran ($M = 34.88$; $SD = 11.37$; Banducci et al. 2017; Vinci et al. 2016) samples. These observations are presently only descriptive; the magnitude of the effects of these differences across populations warrants further exploration. If such differences replicate within nationally representative samples, this might indicate that firefighters either truly manifest heightened DT compared to other populations or may under-report emotional difficulties due to stigma, as discussed above. If firefighters indeed manifest especially heightened DT, programs may be developed to provide broad-based psychoeducation regarding indicators of normative and excessive stress in the fire serves, adaptive and maladaptive coping, and resources for support. Taken together, these issues represent an important line for future research so as to better understand the emotional tolerance abilities of firefighters.

In addition to the limitations already noted, there are additional caveats to consider in interpreting the present findings. First, this study relied exclusively on self-report, and consequently, effects of method variance and reporting bias cannot be ruled out. Hence, it is important for future studies to integrate interview-based and experimental measures addressing cognitive mechanisms, PTSD, and suicidality to advance our understanding of these processes as well as reduce under-reporting trends that result from fear of reporting sensitive topics (e.g., Hom et al. 2016; Millner et al. 2015). Future studies employing multimodal measures (self-report and behavioral indices) of DT are imperative to better understand relations between perceived and behaviorally-indexed DT with regard to suicidal ideation versus suicidal behavior. Secondly, these data were based on a sample of mostly white/Caucasian male firefighters. The need to better understand the unique experiences and needs of female firefighters and those with different racial and ethnic backgrounds is of utmost importance. Third, this study utilized a cross-sectional design, therefore no inferences about causality among variables can be inferred. Prospective, longitudinal studies are needed for the purposes of tracking

firefighters' stress and health over time in order to better understand relationships among pertinent variables, such as whether individuals with heightened DT might self-select into the fire service despite its inherent risk or whether duration of employment in the fire service may relate to lower or higher DT. These considerations highlight the need for more research utilizing rigorous methodologies and study designs to be conducted among firefighters, a population that is in desperate need of greater understanding. Moreover, our sample of firefighters work in a large, urban fire department. Thus, these findings may not generalize to firefighters working in smaller or more rural fire departments, given differences in rates and types of trauma exposures. This underscores the need for replication with nationally-representative samples of firefighters. Finally, the firefighters surveyed work in one of the few fire departments in the U.S. that proactively implemented a suicide prevention program for their employees (Finney et al. 2015). Thus, the firefighters surveyed may have greater awareness of suicidality and greater access to mental health services, which may result in lower levels of suicidality. Another related issue is that the firefighters in the present sample were all active duty and thus may have underreported psychiatric symptoms due to fears of negative job ramifications (Anestis and Green 2015).

Despite these limitations, the current study had several noteworthy strengths, including its focus on a large sample of firefighters, a relatively understudied population with regard to mental health and related correlates, especially PTSD and suicide. Results underscore the importance of considering symptoms of PTSD and underlying cognitive mechanisms, such as DT, in better understanding suicidality among firefighters. Future research should build upon this preliminary work by investigating associations between DT and suicidal ideation versus suicidal behavior, respectively. Research examining the PTSD-suicidality relationship among firefighters, a population in immense need of greater attention and understanding given their services to our communities, may be an important catalyst for the implementation and dissemination of more effective suicide prevention and intervention programs throughout U.S. fire departments.

Compliance with Ethical Standards

Conflict of Interest Brooke A. Bartlett, Charles Jardin, Colleen Martin, Jana K. Tran, Sam Buser, Michael D. Anestis, & Anka A. Vujanovic declare that they have no conflicts of interest.

Informed Consent Participants who indicated that they were interested in participating (by clicking 'yes') were directed to the informed consent form. Once firefighters electronically signed off on the consent form, they were directed to the first page to begin completion of all online survey questionnaires. All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Research Involving Human and Animal Rights No animal studies were carried out by the authors for this article.

References

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders. (5th edn.). Arlington, VA: American Psychiatric Publishing.

Anestis, M. D., Bagge, C. L., Tull, M. T., & Joiner, T. E. (2011). Clarifying the role of emotion dysregulation in the interpersonal-psychological theory of suicidal behavior in an undergraduate sample. Journal of Psychiatric Research, 45(5), 603–611. https://doi.org/10.1016/j.jpsychires.2010.10.013.

Anestis, M. D., Bender, T. W., Selby, E. A., Ribeiro, J. D., & Joiner, T. E. (2011). Sex and Emotion in the Acquired Capability for Suicide. Archives of Suicide Research, 15(2), 172–182. https://doi.org/10.1080/13811118.2011.566058.

Anestis, M. D., & Green, B. A. (2015). The impact of varying levels of confidentiality on disclosure of suicidal thoughts in a sample of United States National Guard personnel. Journal of Clinical Psychology, 71(10), 1023–1030. https://doi.org/10.1002/jclp.22198.

Anestis, M. D., & Joiner, T. E. (2012). Behaviorally-indexed distress tolerance and suicidality. Journal of Psychiatric Research, 46(6), 703–707. https://doi.org/10.1016/j.jpsychires.2012.02.015.

Anestis, M. D., Pennings, S. M., Lavender, J. M., Tull, M. T., & Gratz, K. L. (2013). Low distress tolerance as an indirect risk factor for suicidal behavior: Considering the explanatory role of non-suicidal self-injury. Comprehensive Psychiatry, 54(7), 996–1002. https://doi.org/10.1016/j.comppsych.2013.04.005.

Anestis, M. D., Tull, M. T., Bagge, C. L., & Gratz, K. L. (2012). The moderating role of distress tolerance in the relationship between posttraumatic stress disorder symptom clusters and suicidal behavior among trauma exposed substance users in residential treatment. Archives of Suicide Research, 16(3), 198–211. https://doi.org/10.1080/13811118.2012.695269.

Armour, C., Ross, J., & Elhai, J. (2016). A systematic literature review of PTSD's latent structure in the Diagnostic and Statistical Manual of Mental Disorders: DSM-IV to DSM-5 Clinical Psychology Review https://doi.org/10.1016/j.cpr.2015.12.003.

Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: a meta-analysis. BMC Psychiatry, https://doi.org/10.1186/1471-244X-4-37.

Banducci, A. N., Connolly, K. M., Vujanovic, A. A., Alvarez, J., & Bonn-Miller, M. O. (2017). The impact of changes in distress tolerance on ptsd symptom severity post-treatment among veterans in residential trauma treatment. Journal of Anxiety Disorders. https://doi.org/10.1016/j.janxdis.2017.01.004.

Batterham, P. J., Ftanou, M., Pirkis, J., Brewer, J. L., Mackinnon, A. J., Beautrais, A., … Christensen, H. (2015). A systematic review and evaluation of measures for suicidal ideation and behaviors in population-based research. Psychological Assessment, 27(2), 501–512. https://doi.org/10.1037/pas0000053.

Bender, T. W., Anestis, M. D., Anestis, J. C., Gordon, K. H., & Joiner, T. E. (2012). Affective and Behavioral Paths Toward the Acquired Capacity for Suicide. Journal of Social and Clinical Psychology, 31(1), 81–100. https://doi.org/10.1521/jscp.2012.31.1.81.

Bentley, K. H., Franklin, J. C., Ribeiro, J. D., Kleiman, E. M., Fox, K. R., & Nock, M. K. (2016). Anxiety and its disorders as risk factors for suicidal thoughts and behaviors: A meta-analytic review. Clinical Psychology Review, 43, 30–46. https://doi.org/10.1016/j.cpr.2015.11.008.

Berger, W., Coutinho, E. S. F., Figueira, I., Marques-Portella, C., Luz, M. P., Neylan, T. C., … Mendlowicz, M. V. (2011). Rescuers

misclassification. *PLoS ONE, 10*(10), e0141606. https://doi.org/10.1371/journal.pone.0141606.

Morey, L. (2007). *Personality Assessment Inventory professional manual* (2nd edn.). Odessa, FL: Psychological Assessment Resources.

Nock, M. K., Borges, G., Bromet, E. J., Alonso, J., Angermeyer, M., Beautrais, A., … Williams, D. (2008). Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *The British Journal of Psychiatry, 192*(2), 98–105. https://doi.org/10.1192/bjp.bp.107.040113.

Nock, M. K., Stein, M. B., Heeringa, S. G., Ursano, R. J., Colpe, L. J., Fullerton, C. S., … Kessler, R. C. (2014). Prevalence and correlates of suicidal behavior among soldiers: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *JAMA Psychiatry, 71*(5), 514–522. https://doi.org/10.1001/jamapsychiatry.2014.30.

Osman, A., Bagge, C., Guitierrez, P., Konick, L., Kooper, B., & Barrios, F. (2001). The suicidal behaviors questionnaire-revised (SBQ-R): Validation with clinical and nonclinical samples. *Assessment, 5*, 443–454.

Panagioti, M., Gooding, P. A., & Tarrier, N. (2012). A meta-analysis of the association between posttraumatic stress disorder and suicidality: the role of comorbid depression. *Comprehensive Psychiatry, 53*(7), 915–930. https://doi.org/10.1016/j.comppsych.2012.02.009.

Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385–401. https://doi.org/10.1177/014662167700100306.

Rouse, L. M., Frey, R. A., López, M., Wohlers, H., Xiong, I., Llewellyn, K., … Wester, S. R. (2015). Law enforcement suicide: Discerning etiology through psychological autopsy. *Police Quarterly, 18*(1), 79–108. https://doi.org/10.1177/1098611114563083.

Simons, J. S., & Gaher, R. M. (2005). The distress tolerance scale: Development and validation of a self-report measure. *Motivation and Emotion, 29*(2), 83–102. https://doi.org/10.1007/s11031-005-7955-3.

Stanley, I. H., Hom, M. A., Hagan, C. R., & Joiner, T. E. (2015). Career prevalence and correlates of suicidal thoughts and behaviors among firefighters. *Journal of Affective Disorders, 187*, 163–171. https://doi.org/10.1016/j.jad.2015.08.007.

Stanley, I. H., Hom, M. A., & Joiner, T. E. (2016). A systematic review of suicidal thoughts and behaviors among police officers, firefighters, EMTs, and paramedics. *Clinical Psychology Review, 44*, 25–44. https://doi.org/10.1016/j.cpr.2015.12.002.

Tarrier, N., & Gregg, L. (2004). Suicide risk in civilian PTSD patients. *Social Psychiatry and Psychiatric Epidemiology, 39*(8), 655–661. https://doi.org/10.1007/s00127-004-0799-4.

Van Orden, K. A., Witte, T. K., Gordon, K. H., Bender, T. W., & Joiner, T. E. (2008). Suicidal desire and the capability for suicide: Tests of the interpersonal-psychological theory of suicidal behavior among adults. *Journal of Consulting and Clinical Psychology, 76*(1), 72–83. https://doi.org/10.1037/0022-006X.76.1.72.

Vinci, C., Mota, N., Berenz, E., & Connolly, K. (2016). Examination of the relationship between PTSD and distress tolerance in a sample of male veterans with comorbid substance use disorders. *Military Psychology, 28*(2), 104–114. https://doi.org/10.1037/mil0000100.

Violanti, J. M., Castellano, C., Rourke, J. O., & Paton, D. (2006). Proximity to the 9/11 terrorist attack and suicide ideation in police officers. *Traumatology, 12*(3), 248–254. https://doi.org/10.1177/1534765606296533.

Violanti, J. M., Charles, L. E., Hartley, T. A., Mnatsakanova, A., Andrew, M. E., Fekedulegn, D., … Burchfiel, C. M. (2008). Shift-work and suicide ideation among police officers. *American Journal of Industrial Medicine, 51*(10), 758–768. https://doi.org/10.1002/ajim.20629.

Violanti, J. M., Fekedulegn, D., Charles, L. E., Andrew, M. E., Hartley, T. A., Mnatsakanova, A., & Burchfiel, C. M. (2009). Suicide in police work: Exploring potential contributing influences. *American Journal of Criminal Justice, 34*(1–2), 41–53. https://doi.org/10.1007/s12103-008-9049-8.

Vujanovic, A. A., Bakhshaie, J., Martin, C., Reddy, M. K., & Anestis, M. D. (2017). Posttraumatic stress and distress tolerance: Associations with suicidality in acute-care psychiatric inpatients. Journal of Nervous and Mental Disease 205, 531–541.

Vujanovic, A. A., Bonn-Miller, M. O., Potter, C. M., Marshall, E. C., & Zvolensky, M. J. (2011). An evaluation of the relation between distress tolerance and posttraumatic stress within a trauma-exposed sample. *Journal of Psychopathology and Behavioral Assessment, 33*(1), 129–135. https://doi.org/10.1007/s10862-010-9209-2.

Vujanovic, A. A., Dutcher, C. D., & Berenz, E. C. (2017). Multimodal examination of distress tolerance and posttraumatic stress disorder symptoms in acute-care psychiatric inpatients. *Journal of Anxiety Disorders, 48*, 45–53. https://doi.org/10.1016/j.janxdis.2016.08.005.

Vujanovic, A. A., Hart, A. S., Potter, C. M., Berenz, E. C., Niles, B., & Bernstein, A. (2013). Main and interactive effects of distress tolerance and negative affect intensity in relation to PTSD symptoms among trauma-exposed adults. *Journal of Psychopathology and Behavioral Assessment, 35*(2), 235–243. https://doi.org/10.1007/s10862-012-9325-2.

Vujanovic, A. A., Litz, B. T., & Farris, S. G. (2015). Distress Tolerance as Risk and Maintenance Factor for PTSD: Empirical and Clinical Implications. In C. R. Martin, V. R. Preedy & V. B. Patel (Eds.), Comprehensive Guide to Post-Traumatic Stress Disorder (pp. 1–13). New York: Springer International Publishing.

Vujanovic, A. A., Rathnayaka, N., Amador, C. D., & Schmitz, J. M. (2016). Distress tolerance: associations with posttraumatic stress disorder symptoms among trauma-exposed, cocaine-dependent adults. *Behavior Modification, 40*(1–2), 120–143. https://doi.org/10.1177/0145445515621490.

Weathers, F. W., Blake, D. D., Schnurr, P. P., Kaloupek, D. G., Marx, B. P., & Keane, T. M. (2013). The life events checklist for DSM-5 (LEC-5). Retrieved from http://www.ptsd.va.gov.

Weathers, F. W., Litz, B. T., & Herman, D. S. (1993). The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility. Presented at the Meeting of the International Society for Traumatic Stress Studies.