

AN EXAMINATION OF THE INTERPERSONAL-PSYCHOLOGICAL THEORY OF  
SUICIDE AMONG URBAN FIREFIGHTERS: ASSOCIATIONS WITH  
POSTTRAUMATIC STRESS AND DISTRESS TOLERANCE

by  
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## ABSTRACT

Firefighters report an alarmingly high rate of suicidal ideation, behavior, and attempts. Due to the inherently stressful occupational demands of the job, firefighters also report high rates of trauma exposure and posttraumatic stress disorder (PTSD) symptomatology, which may pose increased risk for the development of suicidality (i.e., ideation, behavior, and risk). 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 problems or physical states, is a potentially important cognitive mechanism to consider in relation to suicidality and PTSD among firefighters. The overarching goal of the current study was to examine the associations between PTSD, DT, and suicidality in context of the Interpersonal-Psychological Theory of Suicide (IPTS) framework among a sample of firefighters. Participants were comprised of 248 trauma-exposed firefighters ( $M_{age} = 40.23$  [9.58]; 91.9% male) who completed a web-based questionnaire battery. Preliminary analyses included descriptive statistics and bivariate correlations for all pertinent study variables, and remaining analyses utilized SPSS PROCESS MACRO to conduct moderated mediation analyses. Results revealed that thwarted belongingness (TB) significantly mediated the association between PTSD symptom severity and suicide ideation severity. There was also a significant and positive interactive effect between PTSD symptom severity and perceived emotional DT in relation to TB at moderate and high levels of perceived emotional DT. The mediating effect of TB in relation to PTSD symptom severity and suicide ideation severity was conditional on moderate and high levels of perceived emotional DT. Moreover, there was a significant and positive interactive effect between capability for suicide and TB in relation to global suicide risk at high levels of TB. This is the first study to examine

associations between PTSD, DT, and suicidality within the context of the IPTS among firefighters. Findings highlight unique associations among suicide risk variables and hold important clinical implications for firefighters, such that perceptions of TB might be an especially potent risk factor for the development of subsequent suicidal ideation and behaviors for this particular population. Results may be used to inform suicide prevention and peer support programs among departments nation-wide.

Keywords: posttraumatic stress disorder; PTSD; distress tolerance; interpersonal theory of suicide, suicide; firefighters

## TABLE OF CONTENTS

<b><u>INTRODUCTION</u></b> .....	<b>1</b>
<u>SUICIDALITY: GENERAL POPULATION</u> .....	1
<u>SUICIDALITY: FIREFIGHTERS</u> .....	1
<u>INTERPERSONAL-PSYCHOLOGICAL THEORY OF SUICIDE – GENERAL INTRODUCTION</u> .....	2
<u>PERCEIVED BURDENSOMENESS</u> .....	3
<u>THWARTED BELONGINGNESS</u> .....	3
<u>CAPABILITY FOR SUICIDE</u> .....	5
<u>INTERPERSONAL-PSYCHOLOGICAL THEORY OF SUICIDE: EMPIRICAL SUPPORT</u> .....	8
<u>WHY MIGHT THE IPTS BE PARTICULARLY RELEVANT TO FIREFIGHTERS?</u> .....	9
<u>INTERPERSONAL-PSYCHOLOGICAL THEORY OF SUICIDE AMONG FIREFIGHTERS: EMPIRICAL SUPPORT</u> .....	10
<u>TRAUMA EXPOSURE AND PTSD AMONG FIREFIGHTERS</u> .....	13
<u>PTSD AND SUICIDALITY: A BRIEF OVERVIEW</u> .....	14
<u>PTSD AND SUICIDALITY AMONG FIREFIGHTERS</u> .....	15
<u>PTSD IN CONTEXT OF THE INTERPERSONAL-PSYCHOLOGICAL THEORY OF SUICIDE</u> .....	15
<u>DISTRESS TOLERANCE: CHALLENGES IN MEASURING THE CONSTRUCT</u> .....	17
<u>DISTRESS TOLERANCE AND PTSD</u> .....	18
<u>DISTRESS TOLERANCE AND SUICIDALITY</u> .....	19
<u>EXAMINATION OF DISTRESS TOLERANCE AMONG FIREFIGHTERS</u> .....	21
<u>ASSOCIATIONS BETWEEN PTSD, DISTRESS TOLERANCE, AND SUICIDALITY</u> .....	21
<u>PTSD, DISTRESS TOLERANCE, AND THE INTERPERSONAL-PSYCHOLOGICAL THEORY OF SUICIDE AMONG FIREFIGHTERS: THEORETICAL IMPLICATIONS</u> .....	22
<u>GAPS IN THE LITERATURE</u> .....	23
<u>STUDY AIMS AND HYPOTHESES</u> .....	24
<u>AIM 1: WHICH FIREFIGHTERS THINK ABOUT (I.E., DESIRE) SUICIDE AND WHY?</u> .....	24
<u>AIM 2: WHICH FIREFIGHTERS ARE CAPABLE OF DYING BY SUICIDE AND HOW?</u> .....	26
<u>AIM 3: WHICH FIREFIGHTERS ARE AT GREATEST RISK OF ATTEMPTING AND/OR DYING BY SUICIDE AND WHY?</u> .....	27
<b><u>METHOD</u></b> .....	<b>29</b>
<u>PARTICIPANTS</u> .....	29
<u>MEASURES</u> .....	29
<u>PROCEDURES</u> .....	35
<u>DATA ANALYTIC PLAN</u> .....	36
<u>POWER ANALYSIS</u> .....	40
<b><u>RESULTS</u></b> .....	<b>41</b>
<u>DESCRIPTIVE STATISTICS</u> .....	41
<u>BIVARIATE CORRELATIONS</u> .....	42
<u>AIM 1</u> .....	43
<u>AIM 2</u> .....	44
<u>AIM 3</u> .....	45

<u>EXPLORATORY ANALYSES</u> .....	45
<b><u>DISCUSSION</u></b> .....	<b>47</b>
<u>AIM 1: WHICH FIREFIGHTERS THINK ABOUT (I.E., DESIRE) SUICIDE AND WHY?</u> .....	48
<u>AIM 2: WHICH FIREFIGHTERS ARE CAPABLE OF DYING BY SUICIDE AND HOW?</u> .....	55
<u>AIM 3: WHICH FIREFIGHTERS ARE AT GREATEST RISK OF ATTEMPTING AND/OR DYING BY SUICIDE AND WHY?</u> .....	58
<u>EXPLORATORY ANALYSES</u> .....	62
<u>ADDITIONAL FINDINGS</u> .....	65
<u>LIMITATIONS AND FUTURE DIRECTIONS</u> .....	68
<u>CONCLUSIONS</u> .....	71
<b><u>REFERENCES</u></b> .....	<b>73</b>

## LIST OF TABLES

<a href="#"><u>TABLE 1. PARTICIPANT CHARACTERISTICS</u></a> .....	102
<a href="#"><u>TABLE 2. BIVARIATE ASSOCIATIONS AND DESCRIPTIVE STATISTICS</u></a> .....	104
<a href="#"><u>TABLE 3. MODERATED MEDIATION MODEL: AIMS 1A AND 1B</u></a> .....	105
<a href="#"><u>TABLE 4. MODERATED MEDIATION MODEL: AIM 2</u></a> .....	107
<a href="#"><u>TABLE 5. MODERATED MEDIATION MODEL: AIMS 3A AND 3B</u></a> .....	109
<a href="#"><u>TABLE 6. BIVARIATE ASSOCIATIONS AND DESCRIPTIVE STATISTICS FOR STUDY VARIABLES AMONG FIREFIGHTERS WHO ENDORSED RACIAL/ETHNIC MINORITY STATUS</u></a> .....	111
<a href="#"><u>TABLE 7. BIVARIATE ASSOCIATIONS AND DESCRIPTIVE STATISTICS FOR STUDY VARIABLES AMONG FIREFIGHTERS WHO ENDORSED WHITE (I.E., NON-HISPANIC) STATUS</u></a> .....	112
<a href="#"><u>TABLE 8. EXPLORATORY ANALYSES: COMPARING MAIN VARIABLES AMONG WHITE (NON-HISPANIC) AND RACIAL/ETHNIC MINORITY STATUS</u></a> .....	113

## LIST OF FIGURES

<a href="#"><u>FIGURE 1. THEORETICAL MODEL FOR AIM 1A</u></a> .....	114
<a href="#"><u>FIGURE 2. THEORETICAL MODEL FOR AIM 1B</u></a> .....	115
<a href="#"><u>FIGURE 3. THEORETICAL MODEL FOR AIM 2</u></a> .....	116
<a href="#"><u>FIGURE 4. THEORETICAL MODEL FOR AIM 3A</u></a> .....	117
<a href="#"><u>FIGURE 5. THEORETICAL MODEL FOR AIM 3B</u></a> .....	118



## **Introduction**

### **Suicidality: General Population**

Suicide is a serious public health concern in the United States (U.S.), occurring at a rate of approximately 14 per 100,000 individuals in 2017, an increase of approximately 31% since 2001 (Center for Behavioral Health Statistics and Quality, 2018; Centers for Disease Control and Prevention [CDC], 2017). Moreover, suicide is the tenth leading cause of death nationwide, with an estimated 1.2 million suicide attempts annually, which translates to one attempt every 27 seconds (Center for Behavioral Health Statistics and Quality, 2018). Given that rates of suicide are highest among individuals with previous suicide attempts, suicidality (i.e., ideation, behavior, and risk) is considered to be chronic in nature (Yuodelis-Flores & Ries, 2015). Indeed, research has shown that a history of suicide attempts is a strong predictor of future suicidal behavior, including death by suicide (Brown, Beck, Steer, & Grisham, 2000; Joiner, 2005).

### **Suicidality: Firefighters**

Among firefighters, specifically, suicidality is a significant public health concern. Indeed, 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). Furthermore, in comparison to non-emergency medical services (EMS) firefighters, those who serve dual roles by also responding to EMS calls are six times more likely to have made a career suicide attempt in comparison to firefighters who do not provide EMS services (Stanley et al., 2015). Despite the elevated risk for suicidal ideation and behavior documented among firefighters, there is a relative dearth of

information available regarding the psychological factors associated with this risk. Further research is needed to better understand the psychological processes associated with suicidal ideation and behavior in firefighters in order to inform evidence-based intervention and prevention efforts for this vulnerable, understudied population.

### **Interpersonal-Psychological Theory of Suicide – General Introduction**

The Interpersonal-Psychological Theory of Suicide (IPTS), introduced by Joiner (2005) and later expanded by Van Orden and colleagues (2010), is one potential avenue for better understanding suicidality among firefighters. The theory attempts to explain why the overwhelming majority of individuals who think about suicide do not attempt suicide. Indeed, although in 2017 an estimated 10.6 million adults (approximately 4.3% of the adult U.S. population) in the U.S. reported having serious thoughts of dying by suicide, an estimated 2.8 million (1.1%) made a suicide-related plan and an estimated 1.3 million adults (0.6%) attempted suicide (Center for Behavioral Health Statistics and Quality, 2018; Centers for Disease Control and Prevention [CDC], 2017). Of note, however, this resulted in a staggering 47,173 deaths by suicide in the year 2017 alone, which equates to more than twice as many suicides as there were homicides (19,510; Centers for Disease Control and Prevention [CDC], 2017).

Thus, the IPTS posits three distinct and interactive risk factors that must be present in order for someone to both desire suicide and be capable of attempting suicide, including: perceived burdensomeness (PB), thwarted belongingness (TB), and capability for suicide (Joiner, 2005; Van Orden et al., 2010; Van Orden, Witte, Gordon, Bender, & Joiner, 2008). The interaction of these three distinct pathways attempts to explain how and why an individual may transition from passive suicidal ideation to active suicidal ideation, and

when/how nonfatal and fatal suicidal behaviors emerge. In other words, the theory suggests that an individual will not die by suicide unless he or she possesses both the desire and capability (i.e., ability) to do so. Please see below for an expanded discussion on the three pathways proposed by the IPTS.

### **Perceived Burdensomeness (PB)**

The IPTS proposes that PB (i.e., the view that one's existence burdens family, friends, and/or society) is one of two necessary components for the desire to die by suicide (Joiner et al., 2009; Joiner, 2005; Van Orden et al., 2010). Individuals who perceive themselves to be a burden incorrectly calculate that their death is worth more than their life to others, which is a tragic and potentially fatal misperception (Joiner et al., 2009). As such, the theory posits that this misperception translates to feelings of self-hatred and expendability (i.e., perceiving oneself as completely inconsequential and/or unwanted), two key dimensions of PB (Van Orden et al., 2010). Indeed, a recent systematic literature review examining associations between PB and suicidality found significant associations between PB and suicidal ideation and suicide attempts among a variety of populations (e.g., active duty military personnel; undergraduates; veterans; terminally ill cancer patients; adult outpatients; jail inmates; Hill & Pettit, 2014). This review also found evidence for the moderating and mediating effects of PB in relation to risk/protective factors, such as depressive symptoms and negative urgency (i.e., acting rashly when upset to reduce negative affect), and suicidal behavior (Hill & Pettit, 2014).

### **Thwarted Belongingness (TB)**

The second component necessary for the desire to die, according to the IPTS, is TB (i.e., a low sense of belongingness due to the experience that one is alienated from others, not

an integral part of a family, circle of friends, or other valued group; Joiner, 2005; Joiner et al., 2009). Indeed, humans have an innate need to belong (Baumeister & Leary, 1995). It is theorized that when this fundamental need goes unmet, it leads to a variety of negative health- and psychological-related outcomes (Baumeister & Leary, 1995; Cacioppo & Cacioppo, 2014; Hawkley & Cacioppo, 2010; Holt-Lunstad et al., 2015), as well as increased rates of suicidal ideation, behavior, and attempts across the lifespan (Conner et al., 2007; Fässberg et al., 2012; Trout, 1980; Turecki & Brent, 2016). Moreover, feelings of TB have been shown to lead to decreases in the ability to self-regulate behavior (i.e., conforming to external [socially] defined standards for the purposes of securing acceptance by others; Baumeister, DeWall, Ciarocco, & Twenge, 2005) as well as increases in physical pain tolerance (DeWall & Baumeister, 2006). Van Orden et al. (2010) proposed that loneliness and the absence of reciprocal care are dimensions of TB, and that these dimensions may be comprised of components including self-reported social withdrawal, family conflict, loneliness, and few friends. Empirical literature examining associations between TB and suicidal ideation and behaviors is mixed. For example, TB has been found to be associated with greater suicidal ideation (Anestis, Bagge, Tull, & Joiner, 2011; Chu, Hom, et al., 2017; Van Orden et al., 2008; You, Van Orden, & Conner, 2011) and behaviors (Gunn III et al., 2012; You et al., 2011). Further, TB has been found to mediate or account for the association between established risk factors for suicide (e.g., sleep disturbance, level of attachment security, depression) and suicidal ideation (Chu et al., 2017; Van Orden et al., 2008; Venta, Mellick, Schatte, & Sharp, 2014). Some research, however, has not found support for the role of TB in the IPTS (e.g., Cero, Zuromski, Witte, Ribeiro, & Joiner, 2015; Forrest et al., 2016; Hill & Pettit, 2012; Lamis & Malone, 2011; O'Keefe et al., 2014). For example,

among a sample American Indians, O’Keefe et al. (2014) found no significant association between TB and suicidal ideation. Authors purport that this may be due, in part, to cultural inaccuracy of the IPTS measure (e.g., the questions do not translate to belongingness among tribal, community-based cultures; O’Keefe et al., 2014). Moreover, among adult women in residential or partial hospitalization eating disorder treatment, Forrest et al. (2016) found no significant association between TB and suicidal ideation (Forrest et al., 2016). This again may be due, in part, to the sample such that individuals with eating disorders face unique social-interpersonal consequences. For example, anorexia nervosa develops longitudinally by fasting over a period of years, as opposed to acute fasting, and subsequently feelings of isolation and TB may develop over years (Forrest et al., 2016). Other studies point to potential statistical confounds as the reason for the lack of significant associations between TB and suicidal ideation among some samples (e.g., robust standard errors, modern missing data handling, formal tests for non-linear confounds; Cero et al., 2015). Mixed findings such as these highlight the need for further research examining the role of TB in relation to suicidal ideation and behavior.

### **Capability for Suicide**

**Increased pain tolerance.** The IPTS proposes that the desire to die by suicide is not sufficient for engaging in lethal suicidal behavior intended to end one’s life (e.g., slitting wrists; overdose) because dying by suicide is difficult (Van Orden et al., 2010). Instead, an individual with suicidal desire must also possess the capability to move forward with enacting suicidal behavior. Of note, in prior conceptualizations of the IPTS, this construct was referred to as the *acquired capability* for suicide. However, recent evidence suggests a potential genetic component in the capability for suicide (Smith et al., 2012). Thus, leading

IPTS research substantiates retaining the “acquired” component of capability for suicide for conceptualization purposes (Chu, Buchman-Schmitt, et al., 2017). However, it has been recommended that moving forward, the construct be represented through the use of the broader term *capability for suicide*, which seeks to capture both the “acquired” element as well as any potential genetic factors (Chu, Buchman-Schmitt, et al., 2017).

Coupled with potential genetic predispositions, the facet regarding the “acquired” component of capability for suicide is composed of increased pain tolerance through exposure to painful and provocative events ([PPE] e.g., fear-inducing experiences). According to Van Orden et al. (2010), dying by suicide is not only frightening, but it is also physically painful. Thus, with increased exposure to PPE, one becomes habituated to pain which ultimately leads to a higher pain tolerance (Joiner et al., 2009; Van Orden et al., 2010). Given that pain tolerance is conceptualized as a dimensional phenomenon (e.g., highly method-specific), the IPTS posits that the following three factors are key in determining an individual’s tolerance for pain involved in a specific suicide method: 1) expectations about pain-to-be-experienced, 2) physiological habituation to physical pain sensations, and 3) cognitive appraisals of the tolerability of expected/experienced pain (Van Orden et al., 2010). This phenomenon has been strongly supported in the literature. For example, Franklin et al. (2011) found that pain tolerance mediated the association between PPE and capability for suicide, and that participants who reported non-suicidal self-injury displayed increased capability and tolerance to pain. Nock and Prinstein (2005) also found that individuals who engaged in self-mutilation behavior (e.g., cutting, burning) reported an absence of physical pain during self-injury episodes. Moreover, individuals admitted to the emergency room due to suicide attempt exhibited higher levels of physiological pain tolerance than those admitted

for accidental injury (Orbach et al., 1996). Indeed, the literature has suggested that individuals with a history of more suicide attempts exhibit higher levels of pain tolerance and greater history of PPE in comparison to depressed suicide ideators and controls (i.e., individuals who did not report a psychiatric diagnosis, suicide ideation, attempts, or self-harm; Orbach, Mikulincer, King, Cohen, & Stein, 1997; Smith, Cukrowicz, Poindexter, Hobson, & Cohen, 2010).

**Fearlessness about death.** The capability for suicide is proposed as a multidimensional construct that involves not only increased tolerance of physical pain but also a decreased fear of death (Van Orden et al., 2010). Suicide is a fearsome endeavor as it requires overcoming strong, evolutionary-based self-preservation instincts (Joiner et al., 2009; Ribeiro et al., 2014). Thus, the IPTS builds upon evolutionary models of fear and anxiety and proposes that humans are born with an innate, biological fear of suicide because suicidal behavior involves exposure to stimuli and cues that have been associated with threats to survival for centuries (Van Orden et al., 2010). According to the IPTS, individuals must lose some of the fear associated with death in order to die by suicide (Van Orden et al., 2010). Similar to developing an increased tolerance of physical pain, a decreased fear of death is also theorized to occur in the face of habituation through repeated exposures to PPE. Indeed, the component of fearlessness about death (FAD; [not including pain tolerance]; Ribeiro et al., 2014) in relation to suicidal behavior has also been supported throughout the literature. For example, depressed suicide attempters reported the highest levels of FAD and the lowest levels of aversion when presented with suicide-related images in comparison to depressed suicide ideators and controls (Smith et al., 2010). Dhingra et al. (2015) reproduced similar findings exemplifying that suicide attempters had significantly higher levels of FAD

in comparison to suicide ideators with no history of suicide attempts. Indeed, fearlessness about suicide (e.g., death) has discriminated suicide attempters and non-suicide attempters throughout the literature through decades of research (Gutierrez et al., 1996; Malone et al., 2000; Minear & Brush, 1980; Orbach et al., 1984). Moreover, individuals with a history of suicidal and nonsuicidal self-injurious behavior endorse less fear of suicide in comparison to individuals without a history of suicidal behavior, even when compared on levels of serious suicidal ideation (e.g., those who reported stronger desire to die and/or formulation of a plan for attempting suicide; Linehan, Goodstein, Nielsen, & Chiles, 1983).

Thus, according to the IPTS, the capability for suicide may, in part, be a result of habituation and activation of opponent processes in response to repeated exposure to physically painful and/or fear-inducing experiences, leading to increased physical pain tolerance and reduced fear of death (Van Orden et al., 2010). Put more plainly, through repeated practice and exposure, an individual can habituate to the physically painful and fearful aspects of self-harm and death, paving the way toward making it possible for the individual to engage in increasingly painful, physically damaging, and lethal forms of self-harm (Van Orden et al., 2010). Therefore, those with the capability for suicide will evidence *both* FAD as well as an elevated pain tolerance (Ribeiro et al., 2014). It is important to note that the theory posits potentially differential relationships between increased pain tolerance and decreased fear of death, such that FAD may be implicated in the transition from active desire for suicide to suicidal intent, and increased pain tolerance may be implicated in determining the medical lethality of an attempt (Ribeiro et al., 2014; Van Orden et al., 2010).

### **Interpersonal-Psychological Theory of Suicide: Empirical Support**



A recent meta-analysis conducted by Chu and colleagues (2017) utilizing 130 articles and 143 samples (N = 59,698) found overall empirical support for the IPTS in predicting suicide among a variety of populations (e.g., psychiatric inpatients and outpatients, prison inmates, undergraduates, sexual minorities, military service members, community adults). Specifically, Chu et al. (2017) found that independently, TB and PB were significantly, moderately associated with suicidal ideation and suicide risk, and weakly related to suicide attempt history, consistent with the IPTS. They also found the interaction of PB and TB to be significantly associated with suicidal ideation. Capability for suicide demonstrated a significant, weak relation to suicidal ideation and suicide attempts, and no significant relation to suicide risk. The authors make note that the weak and non-significant findings are also in line with the IPTS, such that capability for suicide alone is *not* theorized to predict a main effect on suicide risk; rather, capability for suicide is only relevant to suicide risk in the presence of desire for suicide. Lastly, consistent with the IPTS, these authors found that the three-way interaction of PB, TB, and capability for suicide was significantly related to suicide attempts and suicide risk. Although the majority of studies utilized in the meta-analysis were conducted among samples in the U.S. and Canada, the IPTS has also received some support cross-culturally. For example, 17 of the samples included in the meta-analysis were recruited from outside the U.S. and Canada, and 7 of the studies asked participants to complete a non-English language version of an IPTS measure (Chu, Buchman-Schmitt, et al., 2017).

### **Why Might the IPTS be Particularly Relevant to Firefighters?**

A career in firefighting carries unique occupational demands that make the IPTS particularly applicable to the firefighter population. Among these occupational demands are

risks involving directly experiencing and witnessing acute and repeated (i.e., chronic) dangers to health and safety that are inherent to the nature of the job. Along with the risk of potentially experiencing or witnessing injury or loss of life, these repeated experiences on the job (i.e., chronic exposure to PPE) may desensitize individuals towards the fear of death, and increase tolerance of physical pain, creating conditions under which suicidality may develop (i.e., capability; Stanley, Hom, & Joiner, 2016; Van Orden et al., 2010). Another potential consideration is that firefighters may possess higher-than-average capability for suicide upon entering the profession. Therefore, these individuals may self-select into the fire service and have increased capability for suicide by virtue of that fact that they are choosing a career that involves chronic exposure to trauma/stress (e.g., direct or indirect [witnessing] of violence, injury, death) and consistent risk to their health. Although the capability to risk one's own life, even when doing so will cause physical pain and/or discomfort to oneself, for the sake of protecting others is an admirable job requirement among firefighters, that same level of capability may turn from admirable to tragic, particularly when combined with greater levels of PB and TB (Chu, Buchman-Schmitt, et al., 2017). It is possible that higher levels of capability (e.g., decreased fear of death, increased tolerance for pain) may serve as a protective factor for some firefighters, but it may also serve as a significant danger for others. Moreover, many full-time firefighters serve more than one role and are dually certified in EMS, providing additive risk (Stanley et al., 2016), potentially due to the additional responsibilities of providing medical care to individuals who may be severely injured or on the brink of death.

### **Interpersonal-Psychological Theory of Suicide among Firefighters: Empirical Support**

Literature examining the IPTS among firefighters is extremely limited, and only one study to date has examined all three constructs of the IPTS (i.e., PB, TB, and FAD) in relation to career suicidal ideation and suicide attempt history among a sample of current U.S. firefighters (N = 863; Chu, Buchman-Schmitt, Hom, Stanley, & Joiner, 2016). The authors did not find a significant two-way interaction between PB and TB in relation to career suicidal ideation severity, but they documented a significant three-way interaction between PB, TB, and FAD in relation to career suicidal attempts, controlling for sex. Specifically, they found that the interaction between heightened TB and PB was associated with increased likelihood of a history of suicide attempts at both high and low levels of FAD. Of note, however, these findings were no longer significant after controlling for years in the fire service or age (Chu, Buchman-Schmitt, Hom, Stanley, & Joiner, 2016). Although greater number of years in the fire service was conceptualized as a risk factor for capability for suicide due to potentially increased exposure to PPE on the job, it is possible that the firefighters with a greater number of years, and subsequently older age, represented a particularly “healthy” sample of firefighters. Indeed, nearly 50% of this sample reported between 11-30 years in the fire service, which may indicate that this sample of firefighters was generally high functioning and able to maintain a career in the fire service. Given the cross-sectional nature of this study, it is possible that firefighters with a lower number of years in the service, or those who dropped out of the fire service, are not particularly represented in this sample. Thus, further research is necessary to contextualize the role of years in the fire service and age among firefighters.

A few additional studies have examined IPTS constructs among firefighters. For example, Gallyer and colleagues (2018) conducted a cross-sectional study and found that,

among 944 U.S. firefighters, PB and TB were positively associated, and their association was positively related to higher rates of suicidal ideation. Moreover, PB, but not TB, mediated the association between problematic alcohol use and career suicidal ideation. The same authors found that among a sample of 241 women firefighters, TB and PB were also positively associated, and their association was related to higher levels of suicidal ideation (Gallyer et al., 2018). PB had an indirect and direct effect on career suicidal ideation through TB, but not through problematic alcohol use; similarly, TB had an indirect and direct effect on career suicidal ideation through PB, but not through problematic alcohol use (Gallyer et al., 2018). A recent study examining a moderated mediation model found that among a sample of 216 career U.S. firefighters, trauma-related coping self-efficacy (e.g., one's perceived capacity to cope after being exposed to trauma) significantly mediated the associations between critical incidents (e.g., incident exposure among firefighters and emergency service personnel experienced on the job) and TB, PB, and FAD (Streeb et al., 2018). Moreover, high levels of perceived social support from a significant other moderated these mediated associations, such that when social support from one's significant other was high, trauma-related coping self-efficacy decreased as critical incidents increased, which subsequently further increased TB or PB.

Lastly, specific subsectors of the fire service may be more at risk for suicidal ideation and behavior. A recent study found that, in comparison to non-wildland firefighters, wildland firefighters reported significantly higher levels of TB (Stanley, Hom, et al., 2018). The authors hypothesized that although previous research has suggested that firefighters experience lower levels of TB due to the camaraderie inherent within fire departments, wildland firefighters, specifically, may experience higher levels of TB due to the “on

demand” nature of their jobs (Stanley, Hom, et al., 2018). In other words, given that wildland firefighters are often called to action from a registry of available firefighters on a need-basis, it is possible that they do not form comparable levels of trust and support within their “*ad hoc* crews” in comparison to firefighters within individual fire departments (Stanley, Hom, et al., 2018). Also hypothesized is that even if strong bonds are formed initially between members of wildland fire crews, they may be deeply offset by factors such as the fleeting nature of wildland fire crews, and how distant wildland firefighters may feel from family and friends when called to action (Stanley, Hom, et al., 2018). Moreover, when examining TB and PB as parallel mediators in the association between wildland firefighter status and suicide risk, Stanley and colleagues (2018) found a significant indirect effect of wildland firefighter status and suicide risk through TB but not PB (Stanley, Hom, et al., 2018). Taken together, the relatively scant literature examining the IPTS among firefighters as well as the mixed results of available literature underscore the importance of advancing research examining this theory among firefighters.

### **Trauma Exposure and PTSD among Firefighters**

Firefighting is commonly acknowledged as a highly stressful and dangerous career. Along with intensive occupational stressors, such as over-night shifts that extend beyond 24 hours on the job (Saijo et al., 2008), firefighters’ duties involve life-threatening situations (Fullerton, McCarroll, Ursano, & Wright, 1992; Wagner, Heinrichs, & Ehlert, 1998). For example, firefighters often are exposed to incidents such as natural disasters, car accidents, terrorist attacks, explosions, fires, and hazardous materials (McCammon, 1996). Thus, they are often first-hand witnesses to mass-destruction, injury, mutilated bodies, grief, and death (Wagner et al., 1998). As a result, firefighters represent a uniquely vulnerable population

repeatedly exposed to traumatic life events, as defined by the *Diagnostic and Statistical Manual of Mental Disorders- Fifth Edition (DSM-5)* posttraumatic stress disorder (PTSD) Criterion A (American Psychiatric Association [APA], 2013). Indeed, rates of trauma exposure are estimated to be approximately 91.5% among firefighters, with almost one-third reporting three or more total traumatic event exposures (Meyer et al., 2012).

As a result of repeated exposures to trauma, firefighters are at high risk for the development of PTSD (Berger et al., 2011; Fullerton et al., 1992; Haslam & Mallon, 2003). It is estimated that the prevalence of PTSD among firefighters may be as high as 32.4% (Tomaka et al., 2017). Several studies also have documented that firefighters report high rates of subclinical PTSD symptoms (Corrigan et al., 2009; Fullerton et al., 1992; Haslam & Mallon, 2003), which are associated with similar levels of impairment as a PTSD diagnosis among the general population (Pietrzak et al., 2011; Zlotnick et al., 2002).

### **PTSD and Suicidality: A Brief Overview**

Both trauma exposure and PTSD 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 & Lester, 2010; Krysinska & Martin, 2009; Lopez-Castroman et al., 2015; Tarrier & Gregg, 2004). 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 & Lester, 2010; Lopez-Castroman et al., 2015), with a significant proportion of those with a diagnosis of PTSD also exhibiting suicidality (i.e., suicidal ideation, plans, and attempts; Panagioti, Gooding, & Tarrier, 2012; Tarrier & Gregg, 2004). Moreover, findings suggest that PTSD differentiates individuals who think about suicide from individuals who make suicide attempts, rendering PTSD as one of the only

psychiatric diagnoses that predict the transition from suicidal ideation to suicide attempts (Bryan et al., 2017; May & Klonsky, 2016; Nock et al., 2009).

### **PTSD and Suicidality among Firefighters**

Despite elevated risk for PTSD and suicidality among firefighters (e.g., Berger et al., 2011; Nock et al., 2008, 2014; Stanley et al., 2015; Tomaka et al., 2017), there is a relative dearth of literature examining this association among this vulnerable population. Existing literature suggests a positive association between PTSD symptom severity and suicidality, including suicidal ideation, behavior, attempts, and risk, among firefighter populations (Bartlett et al., 2018; Bing-Canar et al., 2019; Boffa et al., 2017, 2018; Stanley et al., 2019). 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.

### **PTSD in Context of the Interpersonal-Psychological Theory of Suicide**

A growing though relatively novel literature has examined the impact of PTSD on suicidality utilizing IPTS-related constructs and theoretical frameworks. For example, research has found that specific symptoms/clusters of PTSD, based upon *DSM-IV* and *DSM-5* criteria, are associated with capability for suicide. Specifically, utilizing the five-factor model of PTSD symptoms based on *DSM-IV* criteria among trauma-exposed undergraduates (i.e., re-experiencing, avoidance, numbing, dysphoric arousal, and anxious arousal), the anxious arousal cluster was negatively associated with FAD, whereas the numbing cluster was positively associated with pain tolerance (Zuromski et al., 2014). Utilizing the six-factor anhedonia model of PTSD based on *DSM-5* criteria (i.e., reexperiencing, avoidance, negative

alterations in cognition and mood, anhedonia, dysphoric arousal, and anxious arousal), Spitzer and colleagues (2018) found that among trauma-exposed undergraduates, the anhedonia cluster was positively associated with fearlessness of pain involved in dying. Moreover, Davis et al. (2014) found that based on *DSM-IV* criteria, emotional numbing symptoms were positively associated with suicidal ideation among female trauma-exposed undergraduates. Specifically, PTSD-related detachment/estrangement symptoms derived from the emotional numbing symptom cluster were especially associated with suicidal ideation after controlling for depression, type of trauma, and all other PTSD symptoms (Davis et al., 2014). Similarly, utilizing serial mediation models, posttraumatic mental contamination (i.e., internal and/or diffuse feeling of dirtiness, infection, or impurity experienced in the wake of a traumatic event in the absence of contact with an external source) was indirectly associated with suicide risk via PTSD avoidance and arousal/reactivity symptoms among trauma-exposed adults from the community (Brake et al., 2019). Moreover, posttraumatic mental contamination was serially (i.e., subsequently) associated with suicide risk via TB and PB; PTSD avoidance and arousal reactivity symptoms caused greater TB and PB symptoms (Brake et al., 2019).

Among nonclinical and clinical samples of active duty military personnel, PTSD symptom severity was strongly associated with depressive symptoms, which in turn were related to suicide risk directly or indirectly through TB and PB (Bryan et al., 2013). TB and PB have also been found to have a significant two-way interaction in association with suicidal ideation among psychiatric inpatient veterans at high levels of PB, specifically, while controlling for gender, PTSD symptoms, and depressive symptoms (Monteith et al., 2013).



Thus, the literature has documented significant associations between *DSM-IV* and *DSM-5* PTSD symptomatology and suicidality in the context of the IPTS utilizing several different theoretical frameworks. In view of a particularly scant body of literature, it is imperative that further research examining PTSD symptomatology in relation to suicide risk via an IPTS framework be conducted to explore the important role that PTSD symptomatology plays in relation to suicidality for the purposes of intervention and prevention programs. Furthermore, given that the available literature on this subject utilizes samples of trauma-exposed undergraduate and community adults, it is vital that research be conducted among firefighters to examine the potentially unique role of PTSD symptoms in relation to suicide risk among this exceptionally distinctive population. Lastly, given their established associations, it is important to understand psychological processes-targetable via cognitive behavioral intervention-that may underlie the association between PTSD symptoms and suicidality among firefighters through the lens of the IPTS.

### **Distress Tolerance: Challenges in Measuring the Construct**

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 problems or physical states (Leyro et al., 2010), is a promising cognitive mechanism relevant to the PTSD-suicidality association in the context of the IPTS. The construct of DT is often characterized by assessment modality (i.e., self-report versus behavioral assessment) and type of distress (i.e., physical versus psychological/emotional). However, the DT literature faces a significant challenge in the operationalization and measurement of the construct. Given the multitude of self-report and behavioral indices of DT (Leyro et al., 2010), studies often include certain measures while excluding others,

impeding our ability to generalize and synthesize findings across indices (Vujanovic & Zegel, in press). While some research indicates that regardless of type of distress, self-report and behavioral DT measures tend to be moderately correlated (Bernstein et al., 2009; Marshall et al., 2010; McHugh et al., 2011; McHugh & Otto, 2012), others suggest that, typically, self-report and behavioral measures of DT are not significantly correlated (Anestis & Joiner, 2012; Marshall et al., 2010; McHugh et al., 2011). Furthermore, the empirical and theoretical literature indicate that DT may be context sensitive (Leyro et al., 2010) as well as malleable to change via intervention (e.g., Linehan, 1993). These findings suggest that self-report and behavioral measures of DT assess a multifaceted range of the DT construct, highlighting the importance of efforts to better define the nature of these constructs as well as their relations to PTSD symptomatology and suicidality given clinical implications as an intervention target.

### **Distress Tolerance and PTSD**

An emerging literature of mostly cross-sectional studies has demonstrated that lower levels of perceived and behaviorally-indexed DT are associated with greater PTSD symptomatology across a range of populations, including trauma-exposed community adults, military veterans, individuals with substance use disorders, and psychiatric inpatients (Banducci, Connolly, Vujanovic, Alvarez, & Bonn-Miller, 2017; Vujanovic, Bakhshaie, Martin, Reddy, & Anestis, 2017; Vujanovic, Dutcher, & Berenz, 2017; Vujanovic, Litz, & Farris, 2015). Given the aforementioned multifaceted and malleable nature of the DT construct, several theoretical pathways have been posited to explain the potential associations between DT and PTSD (Vujanovic & Bernstein, 2011; Vujanovic et al., 2015). Theoretically, individuals with low DT in the aftermath of trauma may experience increased avoidance due

to a lack of perceived or actual resources to withstand trauma-related emotional distress; contrariwise, individuals with heightened perceived/behavioral DT may be better able 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 relate bi-directionally to PTSD symptomatology such that DT increases or decreases along with corresponding variations in PTSD symptomatology or vice versa (Vujanovic et al., 2015). Lastly, distress over-tolerance, which is distinguishable from theoretically adaptive heightened DT by its extremity, may lead to an elevated propensity to persist in the face of adversity despite (a) high levels of distress, (b) evidence that the desired goal may not be achieved, or (c) indication that the effort of persistence may result in negative effects (Vujanovic & Zegel, in press).

### **Distress Tolerance and Suicidality**

DT has been associated with distinct aspects of suicidality as well as constructs from the IPTS framework. Specifically, emergent literature suggests that perceived (i.e., self-report) and behaviorally-indexed DT are associated differentially in regard to suicidal ideation or desire and suicidal behavior (Anestis & Joiner, 2012). For example, low levels of perceived DT have been associated with non-suicidal self-injury (Anestis, Pennings, Lavender, Tull, & Gratz, 2013), a potent risk factor for suicidal behaviors, as well as heightened suicidal ideation or desire (Anestis, Bagge, Tull, & Joiner, 2011; Anestis, Bender, Selby, Ribeiro, & Joiner, 2011). Moreover, low levels of perceived DT are shown to be associated with increased levels of TB and PB, even after controlling for sex, sensation seeking (i.e., the degree to which individuals seek out activities that involve elements of risk and thrill), positive urgency (i.e., the degree to which individuals tend to act rashly in

response to positive affective states), (lack of) premeditation (i.e., the degree to which individuals tend to act without planning), (lack of) perseverance (i.e., the degree to which individuals tend to quit when they experience difficulty or boredom), and depressive and anxiety symptoms (Anestis, Bagge, et al., 2011). However, behaviorally-indexed DT was not found to be significantly associated with TB or PB, but was significantly, positively associated with capability for suicide (Anestis & Joiner, 2012). Moreover, individuals who manifested higher behavioral DT, as measured by an alternative form of the Wisconsin Card Sort Test (i.e., unlike the original, it predetermines which sorts are correct and incorrect), also reported a greater capacity to enact lethal harm, as indexed by the total Acquired Capability for Suicide Scale (Ribeiro et al., 2014) score. Moreover, behavioral DT interacted with PPE in predicting capability for suicide such that higher levels of behavioral DT and PPE were associated with a greater capability for suicide (Anestis & Joiner, 2012). Lastly, DT has been shown to mediate the association between hope and capability for suicide among college students (Anestis, Pennings, Lavender, Tull, & Gratz, 2013). Such findings highlight the multifaceted nature of the DT construct and its importance within the IPTS framework.

Theoretically, high levels of behavioral DT are not maladaptive or problematic in an independent context; however, a greater ability to persist while experiencing distress in conjunction with suicidal desire, developed through other means (e.g., PTSD, which may potentially lead to increased levels of TB and PB), may potentially instill the ability to face serious or lethal suicidal behavior and the fear and discomfort associated with it (Anestis & Joiner, 2012). Thus, DT is a complex cognitive-affective risk mechanism in relation to

suicidality, and it is an important construct when examining suicidal desire and behavior through the lens of the IPTS.

### **Examination of Distress Tolerance among Firefighters**

Research examining the DT-PTSD or DT-suicidality association, specifically, among firefighters is extremely limited. Research has indicated that perceived DT is negatively associated with PTSD symptom severity and suicidality at the bivariate level (Bartlett et al., 2018; Stanley, Boffa, et al., 2018) among firefighters. Moreover, firefighters who reported greater levels of occupational stress and lower levels of perceived DT had significantly higher global suicide risk, greater lifetime suicide threats, and greater current suicidal intent; notably, however, this finding was not significant for firefighters with high levels of DT (Stanley, Boffa, et al., 2018). These findings are particularly significant, as they suggest DT is a clinically-targetable variable with potential to mitigate the likelihood of future suicide attempts among firefighters (Stanley, Boffa, et al., 2018). Given the scarcity of research that exists pertaining to DT in relation to PTSD and/or suicidality among firefighters, it is pertinent that further research be conducted among this population so as to better understand these associations for the purposes of informing intervention and prevention efforts.

### **Associations between PTSD, Distress Tolerance, and Suicidality**

Few studies have examined the interplay of PTSD symptomatology, DT, and suicidality. In a sample of inpatient adults in a substance use disorder residential treatment program, higher levels of behaviorally-indexed DT (as measured by the Paced Auditory Serial Addition Task – Computerized Version) significantly moderated the association between PTSD symptom severity and number of past medically attended suicide attempts (Anestis, Tull, Bagge, & Gratz, 2012). Moreover, lower levels of perceived DT significantly

moderated the association between PTSD symptom severity and global suicide risk and perceived likelihood of future suicide attempt among firefighters (Bartlett et al., 2018). In acute-care psychiatric inpatients, lower levels of perceived DT mediated the association between PTSD symptom severity and suicidal ideation severity as well as suicidality (i.e., ideation and/or behavior) as reason for psychiatric admission (Vujanovic et al., 2017).

In accordance with the IPTS, 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, Bagge, et al., 2011; Anestis, Bender, et al., 2011; Bender, Anestis, Anestis, Gordon, & Joiner, 2012). However, lower *perceived* 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 PPE. Furthermore, research has provided support for the transdiagnostic nature of DT, such that perceived DT has been found to mediate, or account for, associations between PTSD and TB, PB, and capability for suicide (Martin et al., 2018).

### **PTSD, Distress Tolerance, and the Interpersonal-Psychological Theory of Suicide among Firefighters: Theoretical Implications**

Theoretically, firefighters with full- or subthreshold levels of PTSD symptomatology may develop suicidal ideation or desire due to feelings of expendability, burdensomeness, and a lack of perceived connectedness. What is more, firefighters with PTSD symptomatology who find the experience of these symptoms as intolerable and unmanageable and who perceive themselves as a burden to and/or isolated from those around them may be at increased risk to manifest suicidal ideation or desire in an attempt to 'escape'

or ‘end’ the distress (Vujanovic et al., 2017). In other words, lower perceived DT may amplify the association between PTSD symptomatology and suicidal ideation and risk through greater levels of PB and/or TB, such that this indirect association may be strongest at low levels of perceived DT. In addition, many firefighters likely self-select into the dangerous career of firefighting due to an already existing higher capability for suicide (e.g., decreased fear of death). These pre-existing levels of capability for suicide may be strengthened due to a higher number of exposures to PPE experienced on the job (e.g., chronically witnessing harm and death to others; chronically putting oneself in harm’s way), which may increase a firefighter’s ability to persist despite physical/emotional pain or discomfort. These exacerbated levels of capability for suicide may lead to even greater FAD and capability for enacting lethal self-harm in the presence of a desire to do so. Subsequently, this capability may account for a stronger indirect association between PTSD symptom severity and suicide risk, particularly among firefighters who perceive themselves as especially burdensome to those around them or especially disconnected. Firefighters who experience PTSD symptomatology and possess the once “admirable” job requirement of capability (i.e., FAD; increased tolerance to physical/emotional discomfort) in the fire service may be in significant danger for suicide when combined with the belief that others would be “better off without them” or that they are socially disconnected.

### **Gaps in the Literature**

Taken together, several gaps have been noted in the extant literature. First, there is limited research examining suicidality among firefighters, a critical mental health outcome. This is unfortunate given literature suggesting that firefighters experience higher rates of various negative mental health outcomes due to their job-related duties (Martin, Tran, &

Buser, 2017; Martin et al., 2017; Stanley, Boffa, et al., 2018; Stanley et al., 2016). Second, only one study to date has examined all three risk factors proposed by the IPTS (i.e., PB, TB, and capability for suicide; Joiner, 2005; Van Orden et al., 2008) in relation to suicidal ideation and behavior among firefighters (Chu, Stanley, et al., 2016), and only a few studies have examined constructs of the IPTS in relation to suicidal ideation, risk, and capability for suicide among firefighters (e.g., Gallyer et al., 2018; Stanley, Hom, et al., 2018; Streeb et al., 2018). Third, only two studies have evaluated DT and suicidality among firefighters (e.g., Bartlett et al., 2018; Stanley, Boffa, et al., 2018). Fourth, only one study to date has examined associations between PTSD, DT, and suicidality among firefighters (Bartlett et al., 2018). Given that emerging research demonstrates DT as an important cognitive affective mechanism in association with PTSD and IPTS-based suicidality constructs (Anestis, Bagge, et al., 2011; Anestis, Bender, Selby, Ribeiro, & Joiner, 2011), it is important to further explore these associations among firefighters. Lastly, no studies to date have utilized moderated mediation models to examine associations between PTSD, DT, and suicidality (i.e., ideation/desire, capability for suicide, and suicide risk) among firefighters within the IPTS framework.

### **Study Aims and Hypotheses**

Therefore, the overall goal of the current study was to examine the associations between PTSD, DT, and suicidality utilizing the IPTS framework among a sample of firefighters employing moderated mediation models. To do so, the study examined the following three main aims.

#### **Aim 1: Which firefighters think about (i.e., desire) suicide and why?**



**Aim 1a.** Aim 1a examined the question, “Which firefighters think about (i.e., desire) suicide and why?” Associations among PTSD, perceived emotional DT, and PB were explored among firefighters and examined in context of the IPTS framework. As such, this aim evaluated whether the relationship between PTSD symptom severity and suicide ideation severity was mediated by PB, and whether the mediating effect of PB was moderated by perceived emotional DT. Hypothesis 1: PB will significantly mediate the positive association between PTSD symptom severity and suicide ideation severity. PTSD symptom severity will be associated indirectly with suicide ideation severity through heightened PB. Hypothesis 2: PTSD symptom severity and perceived emotional DT will have a significant, negative interactive effect in relation to PB, such that the positive relationship between PTSD symptom severity and PB will be stronger at lower levels of perceived emotional DT. Hypothesis 3: The hypothesized indirect effect between PTSD symptom severity and suicide ideation severity through PB is conditional on perceived emotional DT. The effect will be stronger at lower levels of perceived emotional DT. Firefighters who report higher levels of PTSD symptom severity and lower levels of perceived emotional DT will have the highest levels of PB, which will lead to greater levels of suicide ideation severity.

All effects are expected above and beyond theoretically relevant covariates, including trauma load (i.e., total number of traumatic event types experienced) and depressive symptom severity. Covariates were selected based on their well-established associations with PTSD, perceived emotional DT, and suicidality among various populations, including firefighters (Anestis et al., 2013; Bartlett et al., 2018; Martin et al., 2017; Van Orden et al., 2008; Vujanovic et al., 2017). Please see Figure 1 for a depiction of a theoretical model for Aim 1a.

**Aim 1b.** Aim 1b also examined the question, “Which firefighters think about (i.e., desire) suicide and why?”. This question was examined in relation to TB as opposed to PB. As such, this aim evaluated whether the association between PTSD symptom severity and suicide ideation severity was mediated by TB, and whether the mediating effect of TB was moderated by perceived emotional DT. Hypothesis 1: TB will significantly mediate the positive association between PTSD symptom severity and suicide ideation severity. PTSD symptom severity will be associated indirectly with suicide ideation severity through heightened TB. Hypothesis 2: PTSD symptom severity and perceived emotional DT will have a significant, negative interactive effect in relation to TB, such that the positive relationship between PTSD symptom severity and TB will be stronger at lower levels of perceived emotional DT. Hypothesis 3: The hypothesized indirect effect between PTSD symptom severity and suicide ideation severity through TB will be conditional on perceived emotional DT. The effect will be stronger at lower levels of perceived emotional DT. Firefighters who report higher levels of PTSD symptom severity and lower levels of perceived emotional DT will have the highest levels of TB, which will lead to greater levels of suicide ideation severity. Aim 1b employed the aforementioned covariates described in Aim 1a. Please see Figure 2 for a theoretical model of Aim 1b.

**Aim 2: Which firefighters are capable of dying by suicide and how?**

Aim 2 examined the question, “Which firefighters are capable of dying by suicide and how?”. Associations between PTSD symptom severity, perceived physical discomfort tolerance, and exposure to PPE among firefighters were examined in context of the IPTS framework. As such, this aim evaluated whether the relationship between PTSD symptom severity and capability for suicide was mediated by perceived physical discomfort tolerance,

and whether the mediating effect of perceived physical discomfort tolerance was moderated by exposure to PPE. Hypothesis 1: Perceived physical discomfort tolerance will significantly mediate the association between PTSD symptom severity and capability for suicide. PTSD symptom severity will be positively, indirectly associated with capability for suicide through higher perceived physical discomfort tolerance. Hypothesis 2: PTSD symptom severity and PPE will have a significant, positive interactive effect in relation to perceived physical discomfort tolerance, such that the positive relationship between PTSD symptom severity and perceived physical discomfort tolerance is stronger at higher levels of PPE. Hypothesis 3: The hypothesized indirect effect between PTSD symptom severity and capability for suicide will be conditional on PPE and stronger at higher levels of PPE. Firefighters who report higher levels of PTSD and a greater number of exposures to PPE will report the highest levels of perceived physical discomfort tolerance, leading to a greater capability for suicide. All effects were expected above and beyond the theoretically chosen covariates in aims 1a and 1b, as well as an additional covariate of suicide ideation (BSS-5 total score). Suicide ideation was included as a covariate in aim 2 for the purposes of making the distinction between suicidal desire (i.e., ideation) and the capability for suicide (e.g., Van Orden et al., 2008). Please see Figure 3 for a depiction of a theoretical model for Aim 2.

**Aim 3: Which firefighters are at greatest risk of attempting and/or dying by suicide and why?**

**Aim 3a.** Aim 3a examined the question, “Which firefighters are at greatest risk of attempting and/or dying by suicide and why?”. Associations between PTSD symptom severity, capability for suicide and PB were examined among firefighters in context of the IPTS framework. As such, this aim evaluated whether the association between PTSD

symptom severity and global suicide risk was mediated by capability for suicide, and whether the mediating effect of capability for suicide was moderated by PB. Hypothesis 1: Capability for suicide will significantly mediate the association between PTSD symptom severity and global suicide risk. PTSD symptom severity will be indirectly associated with global suicide risk through heightened capability for suicide. Hypothesis 2: Capability for suicide and PB will have a significant, positive interactive effect in relation to global suicide risk, such that the positive relationship between capability for suicide and global suicide risk will be stronger at higher levels of PB. Hypothesis 3: The hypothesized indirect effect between PTSD symptom severity and global suicide risk will be conditional on PB and stronger at greater levels of PB. Firefighters who have a higher capability for suicide and who reported greater levels of PB will have the highest global suicide risk. All effects were expected above and beyond the theoretically relevant covariates described in aims 1a and 1b. Please see Figure 4 for a depiction of a theoretical model for Aim 3a.

**Aim 3b.** Aim 3b also examined the question, “Which firefighters are at greatest risk of attempting and/or dying by suicide and why?”. This question was examined in relation to TB as opposed to PB. As such, this aim evaluated whether the association between PTSD symptom severity and global suicide risk was mediated by capability for suicide, and whether the mediating effect of capability for suicide was moderated by TB. Hypothesis 1: Capability for suicide will significantly mediate the association between PTSD symptom severity and global suicide risk. PTSD symptom severity will be indirectly associated with global suicide risk through heightened capability for suicide. Hypothesis 2: Capability for suicide and TB will have a significant, positive interactive effect in relation to global suicide risk, such that the positive relationship between capability for suicide and global suicide risk will be

stronger at higher levels of TB. Hypothesis 3: The hypothesized indirect effect between PTSD symptom severity and global suicide risk will be conditional on TB and stronger at greater levels of TB. Firefighters who have a higher capability for suicide and who reported greater levels of TB will have the highest global suicide risk. All effects were expected above and beyond the theoretically relevant covariates described in aims 1a and 1b. Please see Figure 5 for a depiction of a theoretical model for Aim 3B.

## **Method**

### **Participants**

This study was based upon a subset of data from a larger ongoing project examining strength and resilience characteristics and their impact on overall well-being among firefighters. Participants were comprised of 248 trauma-exposed firefighters. Participants were full- or part-time career or volunteer firefighters, including firefighters who are Emergency Medical Services (EMS) personnel. Participants were recruited from a career fire department as well as combination (i.e., volunteer and career) and volunteer departments in Houston and the surrounding area. To be included in the larger ongoing study, participants had to: be 18 years of age or older, be current firefighters in a career, combination, or volunteer fire department, and consent to participating in the completion of all online questionnaires. Exclusionary criteria were comprised of inability to or unwillingness to provide informed consent for the completion of the online questionnaires. For the current study, participants must have also endorsed at least one PTSD Criterion A traumatic life event (American Psychiatric Association [APA], 2013). Please see Procedures and Results sections for more information.

### **Measures**

**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 whether each listed event “happened to me”, “witnessed it”, “learned about it”, “part of my job”, or “not sure”. The LEC-5 was used to derive the covariate of trauma load (i.e., total number of number of traumatic event types experienced) for all proposed aims.

**PTSD Checklist for DSM-5 (PCL-5; Blevins, Weathers, Davis, Witte, & Domino, 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*. Respondents were asked to keep their worst traumatic event in mind (i.e., PTSD Criterion A event identified on the LEC-5) as they 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 0-80, with higher scores indicating higher symptom severity. The current literature recommends a PTSD diagnostic cut-off score of 33 ( $\kappa[.5] = .58$ ; e.g., Bovin et al., 2015). The PCL-5 has demonstrated good psychometric properties (Blevins et al., 2015). Internal consistency for the PCL-5 in the current study was excellent ( $\alpha = 0.95$ ). The PCL-5 total score was used as a predictor to measure the level of PTSD symptom severity in all proposed aims.

**Interpersonal Needs Questionnaire (INQ; Van Orden, Cukrowicz, Witte, & Joiner Jr., 2012).** The INQ is a 15-item self-report measure that assesses respondents' current (i.e., recent) beliefs regarding the extent to which they feel an unmet need to belong (i.e., TB) and/or feel an unmet need for social competence leading to feeling like a burden on the people in their lives (i.e., PB). Nine items pertain to TB (e.g., "These days, I feel disconnected from other people) and six items measure PB (e.g., "These days, the people in my life would be better off if I were gone). Participants rate the degree to which they feel each item is true on a 7-point Likert scale (1 = *not at all true for me* to 7= *very true for me*). Total scores range from 9-63 for the TB subscale and from 6-42 for the PB subscale. Both subscales of the INQ have demonstrated adequate reliability in previous research (Van Orden et al., 2012). In the current study, internal consistencies for the INQ subscales of PB and TB were excellent ( $\alpha = 0.95$ ;  $\alpha = 0.90$ ). The INQ subscale of PB was utilized as a mediator in study aim 1a, and a moderator and predictor in study aim 3a. The INQ subscale of TB was utilized as a mediator in study aim 1b, and a moderator and predictor in study aim 3b.

**Beck Scale for Suicide Ideation (BSS-5; Beck & Steer, 1991).** The BSS-5 is a 5-item self-report inventory designed to assess the severity of an individual's suicidal ideation or desire to die (Lam, Michalaak, & Swinson, 2004). The five-item screening version of the BSS was implemented to reduce participant burden for non-suicidal patients (Lam, Michalaak, & Swinson, 2004). Each item of the BSS-5 is rated on a 0-2 scale and assesses the most accurate statement for the intensity of past-week suicidal ideation (e.g., "I have no wish to live"). Total scores for the BSS-5 range from 0-10, with higher scores indicating higher levels of suicidal ideation. The BSS has strong psychometric properties among university student, adult, and severe mental illness (e.g., schizophrenia) samples (Batterham

et al., 2015; Chioqueta & Stiles, 2006; Pinninti et al., 2002). In the current study, internal consistency for the BSS-5 was acceptable ( $\alpha = 0.75$ ). The total score of the BSS-5 was used to index suicide ideation severity and was included as an outcome in study aims 1a and 1b, and as a covariate in study aim 2.

**Acquired Capability for Suicide Scale-Fearlessness About Death (ACSS-FAD; Ribeiro et al., 2014).** The ACSS-FAD is a 7-item self-report measure that is designed to index one's FAD and lethal self-injury (e.g., "The fact that I am going to die does not affect me", "The pain involved in dying frightens me"). Respondents indicate, on a 4-point Likert-type scale, the degree to which they think the statement describes them (0 = *not at all like me* to 4 = *very much like me*). Total scores range from 0-28 with higher scores indicating greater FAD. The ACSS-FAD has good psychometric properties, including convergent and discriminant validity (Ribeiro et al., 2014). In the current study, the ACSS-FAD demonstrated acceptable internal consistency ( $\alpha = 0.75$ ). The total ACSS-FAD score was utilized to represent overall FAD (i.e., capability for suicide) and was included as an outcome in study aim 2 and a mediator in study aim 3.

**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 3-18, 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  $\geq 7$  and  $\geq 8$  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; Batterham et al., 2015; Osman et al., 2001). In the current study, the SBQ-R demonstrated acceptable internal consistency ( $\alpha = 0.71$ ). The total score of the SBQ-R was used to represent global suicide risk and was included as an outcome in aim 3.

**Painful and Provocative Events Scale (PPES; Bender, Gordon, Bresin, & Joiner, 2011).** The PPES is a 25-item self-report measure designed to assess for experiences of PPE over the lifetime (e.g., handling guns; witnessing and/or experiencing physical/sexual abuse; being in physical fights). All items are rated on a 5-point Likert scale ranging from 1 (*never*) to 5 (*more than 20 times*), with higher scores indicating greater lifetime experience of PPE. The PPES has been used to examine the IPTS among a variety of samples, including firefighters (Anestis, Bagge, et al., 2011; Bender et al., 2011; Chu, Stanley, et al., 2016; Hawkins et al., 2014). In the current study, the PPES demonstrated acceptable internal consistency ( $\alpha = 0.71$ ). The total score of the PPES was used to index exposure to PPE; this variable was utilized as a moderator and predictor in study aim 2.

**Distress Tolerance Scale (DTS; Simons & 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. It is rated on a 5-point scale (1 = *strongly agree* to 5 = *strongly disagree*) and total scores range from 15 to 75, with lower values indicating lower perceived 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 disorders (Simons & Gaher, 2005). For the proposed study, the DTS total score was used to represent the overall level of perceived DT, as consistent with past literature (Bartlett et al., 2018; Vujanovic et al., 2013). In the current study, the DTS demonstrated excellent internal consistency ( $\alpha = 0.94$ ). This variable was analyzed as a moderator and predictor in aims 1a and 1b.

**Discomfort Intolerance Scale (DIS; Schmidt, Richey, & Fitzpatrick, 2006).** The DIS is a 5-item self-report measure that is designed to assess an individual's tolerance for physical pain or discomfort (e.g., "I have a high pain threshold"). Respondents indicate on a 7-point Likert-type scale the degree to which they think each statement applies to them (0 = *not at all like me* to 6 = *extremely like me*). Total scores range from 0-30 with lower scores indicating a greater tolerance for physical pain or discomfort. The DIS has good psychometric properties in relation to other measures of psychopathology and has been shown to be distinct from measures of emotional distress tolerance (Cogle, Bernstein, Zvolensky, Vujanovic, & Macatee, 2012; Schmidt et al., 2006). In the current study, the DIS demonstrated questionable internal consistency ( $\alpha = 0.69$ ). For the purposes of this study, the total score of the DIS was used to index perceived physical discomfort tolerance and was included as a mediator in study aim 2.

**Overall Depression Severity and Impairment Scale (ODSIS; Bentley et al., 2014).** The ODSIS is a 5-item self-report measure used to assess severity and impairment of depressive symptoms over the past week. Items are scored on a five-point Likert scale ranging from 0 to 4 and total symptom severity scores range from 0-20, with higher scores indicating higher depressive symptom severity. The ODSIS has demonstrated excellent psychometric properties among a variety of populations (e.g., community adult, undergraduate, mental health seeking outpatient) in comparison to other measures of depression (Bentley et al., 2014). The ODSIS demonstrated excellent internal consistency in the current study ( $\alpha = 0.94$ ). The current study utilized the ODSIS total symptom severity score to index depressive symptom severity, which was included as a covariate for all proposed aims.

### **Procedures**

All firefighters were recruited for participation in the parent study through career, combination, or volunteer fire departments in the greater Houston area. A department-wide email was sent to current firefighters in participating combination or volunteer fire departments notifying them of the opportunity to complete an online research survey for a chance to win one of several raffle prizes (e.g., assorted gift cards); current firefighters in the career fire department were notified of the study when accessing their continuing education (CE) online portal. All notifications indicated that the purpose of the survey is to better understand strength and resilience characteristics among firefighters, and how these positive characteristics may influence overall well-being. Firefighters who received an e-mail were given access to the informed consent form and survey through a link accessible in the department-wide e-mail; firefighters being recruited from the career department were given

access through the online 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 delineates all aspects of the study. Those who did not wish to participate and consent to the study were given the option to indicate (by clicking ‘no’) that they did not wish to participate. Participants who indicated that they were interested in participating (by clicking ‘yes’) were directed to the beginning of the survey. Once firefighters electronically signed off on the consent form, they were presented with the online survey in Qualtrics for which they could complete at a time and place of their choosing. The total amount of time required for participation in this study was estimated to be 30-45 minutes. Firefighters could discontinue participation at any time without penalty. The study protocol was approved by the University of Houston Institutional Review Board and approved and endorsed by all participating fire departments.

### **Data Analytic Plan**

All analyses were conducted in IBM SPSS Statistics version 25.0. Preliminary analyses first consisted of an examination of the data for missingness. Less than 5% of missing data across all variables was considered acceptable. Participants who had more than 5% missing data across all variables were handled via list-wise deletion. Second, descriptive statistics and bivariate correlations were conducted for all study variables.

All remaining analyses were conducted using methods described by Hayes (2017) utilizing the SPSS macro PROCESS modeling tool to formally test each mediation and moderated mediation (conditional process) model described in aims 1-3. The SPSS macro PROCESS (Hayes, 2017) can test moderating, mediating, and moderated mediation effects utilizing several models. For the purposes of this study, Model 4 in PROCESS was utilized to

examine hypothesis 1 (simple mediation) in all proposed aims, Model 7 was utilized to examine hypotheses 2 and 3 in Aim 2, and Model 14 was utilized to examining hypotheses 2 and 3 in Aims 3a and 3b. Per Hayes (2017), moderated mediation takes places when the mediation process is dependent on a moderator variable, such that the moderated mediation effect occurs when the mediating process between the independent variable and dependent variable is evident at specific values of the moderator (Balkis & Duru, 2018). Utilizing this approach, confidence intervals are calculated through the use of bootstrapping, improving the precision of parameter estimates and reducing Type 1 error (Gall et al., 2016; Hayes, 2017; Schimmenti et al., 2017). Moreover, the bootstrapping approach does not assume that variables are normally distributed or skewed (Hayes, 2009). These methods were considered appropriate for the proposed study given the relatively low base rate for suicidal behavior. As such, main analyses employed 95% bias-corrected bootstrapped confidence intervals based on 10,000 bootstrap samples, as recommended by Hayes (2015). Per Hayes (2017), for the analysis of indirect effects, if the 95% confidence interval includes 0 then the indirect effect is not significant; if 0 is not included in the 95% confidence interval then the indirect effect is statistically significant. A significance (alpha) level of 0.05 was employed for all analyses, and all tests were two-tailed. Please see below for specific data analytic details for each proposed aim.

**Aim 1a.** Hypotheses for aim 1a were examined as two separate analyses. A simple mediation analysis was conducted to examine the indirect effect of PTSD symptom severity (PCL-5 total score) on suicide ideation severity (BSS-5 total score) through PB (INQ subscale), excluding perceived emotional DT (DTS total score; Hypothesis 1). Hypotheses 2 and 3 were examined as a single test of moderated mediation. The moderated mediation

analyses were used to establish whether an indirect effect was demonstrated between PTSD symptom severity (PCL-5 total score) and suicide ideation severity (BSS-5 total score) through PB (INQ subscale), and whether that effect was conditional on the moderation of perceived emotional DT (DTS total score). Thus, for both analyses, PTSD symptom severity (PCL-5 total score) was entered as a predictor, PB (INQ subscale) as a mediator, and suicide ideation severity (BSS-5 total score) as an outcome. Perceived emotional DT (DTS total score) was evaluated as a moderator of that mediation model. Trauma load (LEC-5 total) and depressive symptom severity (ODSIS total score) were included as covariates in both analyses.

**Aim 1b.** Hypotheses for aim 1b were examined as two separate analyses. A simple mediation analysis was conducted to examine the indirect effect of PTSD symptom severity (PCL-5 total score) on suicide ideation severity (BSS-5 total score) through TB (INQ subscale), excluding perceived emotional DT (DTS total score; Hypothesis 1). Hypotheses 2 and 3 were examined as a single test of moderated mediation. The moderated mediation analysis was used to establish whether an indirect effect was demonstrated between PTSD symptom severity (PCL-5 total score) and suicide ideation severity (BSS-5 total score) through TB (INQ subscale), and whether that effect was conditional on the moderation of perceived emotional DT (DTS total score). Thus, for both analyses, PTSD symptom severity (PCL-5 total score) was entered as a predictor, TB (INQ subscale) as a mediator, and suicide ideation severity (BSS-5 total score) as an outcome. Perceived emotional DT (DTS total score) was evaluated as a moderator of that mediation model. Trauma load (LEC-5 total) and depressive symptom severity (ODSIS total score) were included as covariates in both analyses.

**Aim 2.** Hypotheses for aim 2 were examined as two separate analyses. A simple mediation analysis was conducted to examine the indirect effect of PTSD symptom severity (PCL-5 total score) on capability for suicide (ACSS-FAD total score) through perceived physical discomfort tolerance (DIS total score), excluding PPE (PPES total score; Hypothesis 1). Hypotheses 2 and 3 were examined as a single test of moderated mediation. The moderated mediation analyses were used to establish whether an indirect effect was demonstrated between PTSD symptom severity (PCL-5 total score) and capability for suicide (ACSS-FAD total score) through perceived physical discomfort tolerance (DIS total score), and whether that effect was conditional on the moderation of exposure to PPE (PPES total score). Thus, PTSD symptom severity (PCL-5 total score) was entered as a predictor, perceived physical discomfort tolerance (DIS total score) as a mediator, and capability for suicide (ACSS-FAD total score) as an outcome. PPE (PPES total score) was evaluated as a moderator of that mediation model. Trauma load (LEC-5 total), suicide ideation severity (BSS-5 total score), and depressive symptom severity (ODSIS total score) were included as covariates in both analyses.

**Aim 3a.** Hypotheses for aim 3a were examined as two separate analyses. A simple mediation analysis was conducted to examine the indirect effect of PTSD symptom severity (PCL-5 total score) on global suicide risk (SBQ-R total score) through capability for suicide (ACSS-FAD total score), excluding PB (INQ subscale; Hypothesis 1). Hypotheses 2 and 3 were examined as a single test of moderated mediation. The moderated mediation analyses were used to establish whether an indirect effect was demonstrated between PTSD symptom severity (PCL-5 total score) and global suicide risk (SBQ-R total score) through capability for suicide (ACSS-FAD total score), and whether that effect was conditional on the

moderation of PB (INQ subscale). Thus, PTSD symptom severity (PCL-5 total score) was entered as a predictor, capability for suicide (ACSS-FAD total score) as a mediator, and global suicide risk (SBQ-R total score) as an outcome. PB (INQ subscale) was evaluated as a moderator of that mediation model. Trauma load (LEC-5 total) and depressive symptom severity (ODSIS total score) were included as covariates in both analyses.

**Aim 3b.** Hypotheses for aim 3b were examined as two separate analyses. A simple mediation analysis was conducted to examine the indirect effect of PTSD symptom severity (PCL-5 total score) on global suicide risk (SBQ-R total score) through capability for suicide (ACSS-FAD total score), excluding TB (INQ subscale; Hypothesis 1). Hypotheses 2 and 3 were examined as a single test of moderated mediation. The moderated mediation analyses were used to establish whether an indirect effect was demonstrated between PTSD symptom severity (PCL-5 total score) and global suicide risk (SBQ-R total score) through capability for suicide (ACSS-FAD total score), and whether that effect was conditional on the moderation of TB (INQ subscale). Thus, PTSD symptom severity (PCL-5 total score) was entered as a predictor, capability for suicide (ACSS-FAD total score) as a mediator, and global suicide risk (SBQ-R total score) as an outcome. TB (INQ subscale) was evaluated as a moderator of that mediation model. Trauma load (LEC-5 total) and depressive symptom severity (ODSIS total score) were included as covariates in both analyses.

### **Power Analysis**

To estimate the sample size required for the proposed analyses, power analyses were conducted separately for tests of moderation and mediation. To estimate the sample size for moderation analysis, a power analysis was performed utilizing GPower version 3.1.9.4 (Faul et al., 2008). The following parameters were employed: Type I error ( $\alpha$ ) < 0.05, power (1- $\beta$ )



> 80%, and a small effect size ( $f_2 = 0.08$ ; Cohen, 1988). The projected sample size was 101. To estimate sample size for mediation analyses, we referred to power analysis tables for percentile-based indirect effects to determine power needed to detect a small **a** path (from predictor to mechanisms/mediators) and a small **b** path (from mediators to outcome; Fritz & Mackinnon, 2007). Results revealed that a sample of 124 participants would leave us adequately powered to test mediation (Fritz & Mackinnon, 2007). The average of the estimated sample sizes for moderation and mediation yields a projected sample size of 112 to detect a small effect. Based on recently collected pilot data using comparable samples of firefighters in the Houston area, we expect that at least 10% will be at risk for suicidality (as indexed by an SBQ-R score  $\geq 7$ ), and at least 17% will endorse past year suicidal ideation. To account for all relevant factors, we determined that 200 participants would result in adequate power to test all study hypotheses.

## **Results**

### **Descriptive Statistics**

A summary of participant characteristics is presented in Table 1. Distributions for all study variables approximated normality (skewness  $< |2.25|$ ; (George & Mallery, 2003), with the exception of suicide ideation (BSS-5 total; skewness = 4.26) and PB (INQ subscale; skewness = 5.24). The overall sample included 406 firefighters; among these, 291 (71.7%) consented to participate. In regard to missingness, approximately 11% ( $n = 33$ ) of those who consented were determined to have missing data on key variables of interest and these were handled via list-wise deletion; missing data were determined to be missing completely at random ( $\chi^2 = 115.49$ ,  $df = 111$ ,  $p = .37$ ). Selecting for inclusion criteria (i.e., trauma exposure) indicated that approximately 4% ( $n = 10$ ) of firefighters reported no trauma

exposure. As a result, our final sample consisted of a total of 248 trauma-exposed firefighters ( $M_{age} = 40.23$ ,  $SD = 9.58$ ; 91.9% male; 9.7% volunteer). Approximately 11.3% ( $n = 28$ ) of the sample met criteria for probable PTSD, as indexed by a PCL-5 total score  $\geq 33$ , and approximately 14.1% ( $n = 35$ ) of the sample met criteria for probable suicide risk, as indexed by a SBQ-R total score  $\geq 7$ . Moreover, firefighters reported responding to an average of 31.63 ( $SD = 49.34$ ) suicide-related calls while on the job (Demographics questionnaire).

### **Bivariate Correlations**

Bivariate correlations for all study variables are presented in Table 2. PTSD symptom severity was significantly positively correlated with PB, TB, suicide ideation severity, global suicide risk, and PPE, and was significantly negatively correlated perceived emotional DT; PTSD symptom severity was not significantly correlated with capability for suicide or perceived physical discomfort tolerance. PB was significantly positively correlated with TB, suicide ideation severity, capability for suicide, global suicide risk, and PPE, and was significantly negatively correlated with perceived emotional DT; PB was not significantly correlated with perceived physical discomfort tolerance. TB was significantly positively correlated with suicide ideation severity, global suicide risk, and PPE, and significantly negatively correlated with perceived emotional DT; TB was not significantly correlated with capability for suicide or perceived physical discomfort tolerance. Suicide ideation severity was significantly positively correlated with capability for suicide, global suicide risk, and PPE, and was significantly negatively correlated with perceived emotional DT; suicide ideation severity was not significantly correlated with perceived physical discomfort tolerance. Capability for suicide was significantly positively correlated with PPE and perceived emotional DT, and was not significantly correlated with perceived physical

discomfort tolerance. Global suicide risk was significantly positively correlated with PPE, and significantly negatively correlated with perceived emotional DT; it was not significantly correlated with perceived physical discomfort tolerance. PPE was significantly positively correlated with perceived physical discomfort tolerance, and was not significantly correlated with perceived emotional DT. Trauma load was significantly positively correlated with depressive symptom severity, PTSD symptom severity, TB, and PPE; it was not significantly correlated with PB, suicide ideation severity, capability for suicide, global suicide risk, perceived emotional DT, or perceived physical discomfort tolerance. Depressive symptom severity was significantly positively correlated with PTSD symptom severity, PB, TB, suicide ideation severity, global suicide risk, PPE, and was negatively correlated with perceived emotional DT; it was not significantly correlated with capability for suicide or perceived physical discomfort tolerance.

### **Aim 1a**

A summary of analyses for Aim 1a is presented in Table 3, and the model is illustrated in Figure 1. PB did not significantly mediate the association between PTSD symptom severity and suicide ideation severity utilizing a simple mediation analysis. Utilizing a moderated mediation analysis, there was no significant interaction between PTSD symptom severity and perceived emotional DT in relation to PB. The index of moderated mediation was not significant, indicating that perceived emotional DT did not significantly moderate the association between PTSD symptom severity and suicide ideation severity through PB.

### **Aim1a Post-hoc Analysis**

A post-hoc analysis was used to examine whether perceived emotional DT mediated the association between PTSD symptom severity and PB. Results indicated that perceived emotional DT did not significantly mediate the relationship between PTSD symptom severity and PB ( $b = 0.01$ ,  $SE = 0.01$ ,  $CI [-.0106, .0257]$ ).

### **Aim 1b**

A summary of analyses for Aim 1b is presented in Table 3, and the model is illustrated in Figure 2. TB significantly mediated the association between PTSD symptom severity and suicide ideation severity utilizing a simple mediation analysis. PTSD symptom severity was associated indirectly with suicide ideation severity through heightened TB. Utilizing a moderated mediation analysis, there was a significant, positive interaction between PTSD symptom severity and perceived emotional DT in relation to TB; the positive relationship between PTSD symptom severity and TB was stronger at higher levels of perceived emotional DT. The index of moderated mediation was significant, indicating that the indirect effect between PTSD symptom severity and suicide ideation severity through TB was conditional on perceived emotional DT. The effect was stronger at average and higher levels of perceived emotional DT.

### **Aim 2**

A summary of analyses for Aim 2 is presented in Table 4, and the model is illustrated in Figure 3. Perceived physical discomfort tolerance did not significantly mediate the association between PTSD symptom severity and capability for suicide utilizing a simple mediation analysis. Utilizing a moderated mediation analysis, there was no significant interaction between PTSD symptom severity and PPE in relation to perceived physical discomfort tolerance. The index of moderated mediation was not significant, indicating that

PPE did not significantly moderate the association between PTSD symptom severity and capability for suicide through perceived physical discomfort tolerance.

### **Aim 3a**

A summary of analyses for Aim 3a is presented in Table 5, and the model is illustrated in Figure 4. Capability for suicide did not significantly mediate the association between PTSD symptom severity and global suicide risk utilizing a simple mediation analysis. Utilizing a moderated mediation analysis, there was no significant interaction between capability for suicide and PB in relation to global suicide risk. The index of moderated mediation was not significant, indicating that PB did not significantly moderate the association between PTSD symptom severity and global suicide risk through capability for suicide.

### **Aim 3b**

A summary of analyses for Aim 3b is presented in Table 5, and the model is illustrated in Figure 5. TB did not significantly mediate the association between PTSD symptom severity and global suicide risk utilizing a simple mediation analysis. Utilizing a moderated mediation analysis, there was a significant interaction between capability for suicide and TB in relation to global suicide risk. The positive relationship between capability for suicide and global suicide risk was stronger at higher levels of TB. The index of moderated mediation was not significant, indicating that TB did not significantly moderate the association between PTSD symptom severity and global suicide risk through capability for suicide.

### **Exploratory Analyses**

Exploratory analyses were conducted to examine potential differences among pertinent variables with regard to firefighters identifying as White versus as racial/ethnic minority. Specifically, a dichotomous variable was created to represent White (i.e., non-Hispanic/Latino) versus racial/ethnic minority status (i.e., Hispanic/Latino, Black/African American, 'Other', Asian, Native Hawaiian/Pacific Islander, American Indian/Alaskan Native). A total of 76 (30.6%) firefighters reported identifying as a racial/ethnic minority according to this definition. Approximately 10.5% ( $n = 8$ ) of the racial/ethnic minority subsample met criteria for probable PTSD, as indexed by a PCL-5 total score  $\geq 33$ , and approximately 11.8% ( $n = 9$ ) of this subsample met criteria for probable suicide risk, as indexed by a SBQ-R total score  $\geq 7$ . Among White firefighters, approximately 11.6% ( $n = 20$ ) met criteria for probable PTSD, and approximately 15.1% ( $n = 26$ ) of this subsample met criteria for probable suicide risk utilizing the same cutoff criteria.

Bivariate correlations for all study variables were examined by racial/ethnic minority status and White (non-Hispanic) status (see Tables 6 and 7). The following differences were found with regard to correlations among variables of interest between the two subsamples: trauma load was significantly and positively correlated with depressive symptom severity among White firefighters but was not significantly associated with depressive symptom severity among racial/ethnic minority firefighters; trauma load was significantly and positively correlated with PTSD symptom severity among White firefighters but was not significantly correlated with PTSD symptom severity among racial/ethnic minority firefighters; trauma load was significantly and positively correlated with suicide ideation severity among White firefighters but was not significantly correlated with suicide ideation severity among racial/ethnic minority firefighters; PTSD symptom severity was significantly

and positively associated with PPE among White firefighters but was not significantly correlated with PPE among racial/ethnic minority firefighters; suicide ideation severity was not significantly correlated with capability for suicide among White firefighters but was significantly and positively correlated with capability for suicide among racial/ethnic minority firefighters; and capability for suicide was significantly and positively correlated with perceived emotional DT among White firefighters but not significantly correlated with perceived emotional DT among racial/ethnic minority firefighters.

One-way analyses of covariance (ANCOVA) were then conducted to evaluate statistically significant differences between majority and minority status with regard to PTSD symptom severity, PB, TB, suicide ideation severity, capability for suicide, perceived emotional DT, perceived physical discomfort tolerance, and global suicide risk. A Bonferroni correction was applied to control for family-wise error rate across the eight planned comparisons ( $\alpha = 0.05/8 = 0.006$ ). Covariates included trauma load and depressive symptom severity. An additional covariate of suicide ideation severity was included when evaluating differences between capability for suicide. Please see Table 8 for a summary of descriptive data and between-group differences, as determined by ANCOVA. There were no significant between-group differences noted for any of the aforementioned variables. Effects remained consistent across all variables of interest after running analyses removing covariates from each model (i.e., One-way analysis of variance [ANOVA]).

## **Discussion**

The current study aimed to examine the associations between PTSD, DT, and suicidality utilizing the IPTS framework among firefighters. Hypotheses were partially supported by the data. Results and future implications are discussed below.

## **Aim 1: Which firefighters think about (i.e., desire) suicide and why?**

**Aim 1a examined associations between PTSD symptom severity, perceived emotional DT, and PB in relation to suicide ideation severity.** Results did not support any of the three hypotheses proposed for Aim 1a. Specifically, PB did not significantly mediate the association between PTSD symptom severity and suicide ideation severity. Notably, however, PB was significantly and strongly associated with suicide ideation severity ( $r = .76$ ,  $p < .01$ ) at the bivariate level. This is consistent with a recent meta-analysis which found that at the bivariate level, higher levels of PB are associated with higher levels of suicidal ideation among a variety of populations, including firefighters (Chu, Buchman-Schmitt, et al., 2017). Moreover, although not a hypothesis of the study, a significant and positive, incremental main effect of PB with regard to SI was documented, with a moderate effect size ( $b = 0.15$ ). This is consistent with previous research among firefighters which found that PB was individually associated with higher levels of suicidal ideation (Chu, Buchman-Schmitt, et al., 2016).

While prior research has found that PB significantly mediated associations between risk/protective factors and suicidal ideation among a variety of populations, including firefighters (Gallyer et al., 2018; Hill & Pettit, 2014), this is the first study to examine the mediating effect of PB in regard to the association between PTSD symptom severity and suicide ideation severity, specifically among firefighters. Findings are inconsistent with prior research conducted among trauma-exposed college students demonstrating that higher levels of PB significantly mediated the association between PTSD symptoms and suicide ideation, and that using substances to cope moderated this association (Poindexter et al., 2015). It is possible that the construct of PB might develop and manifest differently among firefighters



in comparison to civilian populations; this notion is expanded upon further below.

Moreover, there was no significant main effect of PTSD symptom severity on PB (path  $a$ ), although PTSD symptom severity was significantly and positively associated with PB at the bivariate level. Given the dearth of research examining how or why PB might manifest in firefighters, it is imperative that future research examine constructs that may be more robustly related with PB and subsequent suicidal ideation among this particularly unique population.

Results also did not support the hypothesis of a significant interactive effect between PTSD symptom severity and perceived emotional DT in relation to PB. Notably, perceived emotional DT was significantly, negatively and moderately associated with PB at the bivariate level ( $r = .24, p < .01$ ), although there was no significant direct effect of perceived emotional DT on PB. The literature examining the role of PTSD and DT with regard to IPTS constructs, such as PB, is extremely limited. Although this is the first study to examine the moderating role of perceived emotional DT with regard to PTSD symptom severity and PB, a study among active duty military personnel found that perceived DT significantly mediated the association between PTSD symptoms and PB (Martin et al., 2018). It is plausible that perceived emotional DT may better serve to explain, as opposed to attenuate, the association between PTSD symptom severity and PB, specifically. Although this could not be examined in main analyses due to the conceptualized moderated mediation model, a post-hoc analysis was conducted utilizing a simple mediation model. Perceived emotional DT did not significantly mediate the relationship between PTSD symptom severity and PB. As previously mentioned, these findings may be the result of insufficient power; however, they might also indicate that PB may develop and manifest differently among firefighters in

comparison to other populations. Additional research is needed to examine the role that perceived emotional DT might play in relation to feelings of PB among firefighters, specifically, experiencing PTSD symptomatology.

Given that findings did not support hypotheses 1 and 2, it is unsurprising that the moderated mediation model proposed by hypothesis 3 was also not significant. Specifically, the indirect effect between PTSD symptom severity and suicide ideation severity through PB was not conditional on perceived emotional DT. There are several important theoretically relevant considerations that may potentially explain these null findings. First, it is important to note that our sample reported higher levels of DT ( $M = 61.51$ ;  $SD = 12.23$ ) 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. This might encapsulate the broad influence of stoicism that is typically reflected within the fire service (Stanley, Boffa, et al., 2018). Indeed, a higher capacity to tolerate distress is a desirable and admirable trait among firefighters (Stanley, Boffa, et al., 2018). While these observations are only descriptive, if replicated among nationally representative samples they might indicate that firefighters either truly manifest heightened DT compared to other populations or may under-report emotional difficulties due to stigma (Haugen et al., 2017) and the perceived expectation of “having it all together”. Therefore, the higher-than-average levels of DT reflected in this sample may limit the variability needed to detect significant effects. Additionally, if firefighters truly manifest heightened levels of emotional DT, it may indicate that perceived emotional DT may be less relevant among firefighters for this reason. Taken together, these findings represent an

important line for future research so as to better understand the emotional tolerance abilities of firefighters.

It is also important to consider whether PB functions differentially across populations. For example, although rates of probable PTSD in this sample (11.3%), as indexed by a score of 33 or higher on the PCL-5, were higher in comparison to lifetime, past-12-month, and past-6-month (8.3%, 4.7%, 3.8%) DSM-5 PTSD prevalence estimates among a nationally representative sample of U.S. adults, average levels of PB ( $M = 7.35$ ,  $SD = 4.35$ ) were observably lower in comparison to those reflected by civilian trauma-exposed adults ( $M = 9.37$ ,  $SD = 7.40$ ; Brake et al., 2019) and trauma-exposed college students ( $M = 10.01$ ,  $SD = 6.68$ ; Poindexter et al., 2015). The construct of PB is theorized to comprise two dimensions: liability (e.g., “I make things worse for the people in my life”) and self-hatred (e.g., “I am useless”; Van Orden et al., 2010). Several risk factors are posited to lead to feelings of liability, including unemployment, incarceration, homelessness, and physical illness (Van Orden et al., 2010). Firefighting is typically highly regarded as a service that selflessly gives back to communities, inadvertently making things arguably “better” for others. Therefore liability, and subsequently self-perceptions of PB, may be less prominent among firefighters in comparison to other populations. This may inadvertently serve to “buffer” more intense self-perceptions of PB, even among firefighters experiencing PTSD symptomatology who perceived themselves as a burden to their families or crew members. Similarly, levels of PB in this sample of firefighters were lower ( $M = 7.35$ ,  $SD = 4.35$ ) in comparison to those found in other samples of firefighters ( $M = 10.07$ – $10.43$ ,  $SD = 7.62$ – $8.07$ ; Chu, Stanley, et al., 2016; Gallyer et al., 2018; Stanley, Hom, et al., 2018). It is important to note that the large majority of firefighters in the current sample reported career (approximately 90%) versus volunteer

service; firefighters in the aforementioned studies cited for comparison reported a larger proportion of volunteer service (~30%; Chu, Stanley, et al., 2016; Stanley, Boffa, et al., 2018). Interestingly, average levels of PB among a sample of career-only firefighters were similar to those seen in our sample ( $M = 7.25$ ;  $SD = 3.66$ ). This highlights the importance of considering potential differences between career and volunteer firefighters as viewed through the IPTS lens. Firefighters with career status may be even less likely to report feelings of PB because those who have a career within the fire service are not only employed, but they are also less likely to be experiencing a severe physical illness that places the burden of their care on others around them. Thus, PB in and of itself may be a variable less pertinent to suicidal ideation among firefighters. Future research is needed to examine the role of PB within the IPTS among firefighters who report varying levels of status in the service (e.g., career, volunteer, retiree).

**Aim 1b examined associations between PTSD symptom severity, perceived emotional DT, and TB in relation to suicide ideation severity.** TB significantly mediated the positive association between PTSD symptom severity and suicide ideation severity. As hypothesized, PTSD symptom severity was indirectly associated with suicide ideation severity through heightened TB. It is important to note, however, that the effect size for the significant mediation was small. Results highlight TB as a potential explanatory factor in the question of why some trauma-exposed firefighters with PTSD symptoms might develop thoughts about suicide. Although previous research among firefighters has examined TB as a mediating factor between other risk factors (i.e., alcohol use) and suicidal ideation among firefighters (Gallyer et al., 2018), this is the first study to examine the indirect effects of PTSD symptom severity on suicidal ideation severity through TB among firefighters,

specifically. Indeed, our findings build upon the current literature by supporting the notion that, among firefighters, feelings of isolation and “not belonging” may have a substantial impact on the development of suicidal ideation (Stanley, Hom, et al., 2018), particularly among firefighters experiencing PTSD symptomatology. Future research should further examine TB and its association with suicidal ideation among firefighters experiencing PTSD symptomatology, as therapeutic interventions designed for firefighters that specifically target perceptions of TB may prove beneficial for preventing and decreasing suicidal ideation.

Results also revealed a significant interactive effect of PTSD symptom severity and perceived emotional DT with regard to TB, although the effect size for the significant interactive effect was small. However, contrary to what was hypothesized, the positive relationship between PTSD symptom severity and TB was stronger at *moderate-high* levels of perceived emotional DT as opposed to *low* levels of perceived emotional DT. However, PTSD and TB were significantly and inversely related to perceived emotional DT at the bivariate level, consistent with prior literature (Anestis et al., 2012; Martin et al., 2018).

These unexpected results lend thought to important conceptual considerations with regard to our variables and population of interest. First, as previously mentioned, levels of self-reported perceived emotional DT among this sample are higher in comparison to non-firefighter samples. This supports the notion that firefighting is a profession in which individuals are, or are at least expected to “seem”, more stoic than their civilian counterparts. Theoretically, this may inadvertently stifle a firefighter’s ability to truly feel and/or express their natural emotions. As such, firefighters experiencing emotional difficulties may intentionally under-report them to keep up with the idealized persona of a firefighter, or because they have become “experts” at numbing their natural emotions to keep up with the

demands of the job. Thus, firefighters experiencing PTSD symptomatology (e.g., disconnectedness, avoidance; American Psychiatric Association, 2013) may isolate themselves more from their crew and family, leading to increased perceptions of TB. This relationship might be further amplified among firefighters who also experience higher levels of emotional numbing (e.g., restricted range of emotion; Anestis et al., 2012), which may reflect as a higher self-reported ability to tolerate emotional distress. Indeed, research has found that PTSD-related numbing symptoms, based on *DSM-5* criteria, are positively associated with TB among military personnel (Pennings et al., 2017). Firefighters who numb their emotions, and who therefore do not report difficulty coping with negative emotions, may subsequently feel less like they belong with those around them due to difficulties connecting emotionally. Moreover, research indicates that emotional numbness is strongly associated with feelings of social exclusion and rejection (Bernstein & Claypool, 2012; DeWall & Baumeister, 2006; Twenge et al., 2001). It is possible that firefighters with PTSD symptomatology who experience negative self-perceptions such as rejection and exclusion may inadvertently experience higher levels of emotional numbing and a greater likelihood of reporting thoughts related to lack of belonging. Findings highlight an important line of future research which might include examining the role of perceived emotional DT *over-tolerance* and TB among firefighters. It is possible that an over-tolerance of perceived emotional DT might serve a unique and detrimental role for firefighters experiencing PTSD symptomatology.

Lastly, there was a significant indirect effect between PTSD symptom severity and suicide ideation severity through TB, which was conditional on perceived emotional DT. However, inconsistent with what was hypothesized, the effect was stronger at *moderate-high*

levels of perceived emotional DT as opposed to *low* levels of perceived emotional DT. Firefighters who reported higher levels of PTSD symptom severity and moderate-to-high levels of perceived emotional DT had the highest levels of TB, which led to greater levels of suicide ideation severity. Results underscore the potent role of belongingness in relation to suicidal ideation among firefighters experiencing PTSD symptomatology, particularly given the null findings with regard to PB. Indeed, camaraderie is inherent within the fire service, and firefighters typically form deep bonds that are centered on support and trust of one another (Chu, Stanley, et al., 2016; Stanley, Hom, et al., 2018). Since TB is theorized to encapsulate dimensions of loneliness (e.g., “I feel disconnected from others”) and an absence of reciprocal care (e.g., “I have no one to turn to”; Van Orden et al., 2010), firefighters who feel more alone and less supported may be at an increased risk for developing suicidal ideation, especially if they experience higher levels of PTSD symptomatology coupled with higher levels of perceived ability to tolerate negative emotions. Findings of Aim1b hold important clinical implications, such as the importance of implementing peer support programs in the fire service to potentially reduce the risk of suicidal ideation. Moreover, firefighters experiencing PTSD symptomatology with particularly high levels of emotional numbing might benefit from treatment programs centered on identifying, labeling, and healthily coping with negative emotions. Such programs (e.g., Skills Training in Affective and Interpersonal Regulation [STAIR]; Hassija & Cloitre, 2015) can provide the skills necessary for firefighters to experience and successfully regulate emotion and access social support.

**Aim 2: Which firefighters are capable of dying by suicide and how?**

**Aim 2 examined associations between PTSD symptom severity, exposure to PPE, and perceived physical discomfort tolerance in relation to capability for suicide.** Results did not support any of the three hypotheses proposed for Aim 2. Specifically, perceived physical discomfort tolerance did not significantly mediate the association between PTSD and capability for suicide. It is also important to note that perceived physical discomfort tolerance was not significantly associated with PTSD symptom severity or capability for suicide at the bivariate level. This is consistent with prior research which found that perceived physical discomfort tolerance, as measured by the Discomfort Intolerance Scale, was not significantly associated with PTSD symptom severity at the bivariate level among trauma-exposed adults (Marshall-Berenz et al., 2010). There was no significant main effect of PTSD symptom severity in relation to perceived physical discomfort tolerance, as well as no significant main effect for perceived physical discomfort tolerance in relation to capability for suicide. These findings may be due to the fact that we did not measure one's actual capacity to tolerate physical distress and discomfort through behaviorally-indexed DT tasks. Indeed, prior research has found that one's actual capacity to tolerate physical distress and discomfort is positively associated with both capability for suicide and capacity to enact lethal harm (Anestis & Joiner, 2012; Ribeiro et al., 2014). It is possible that one's perceived capacity to tolerate physical discomfort is not a reliable and accurate reflection of their actual capacity to do so. This notion may be even more salient for firefighters, specifically, given that the firefighting profession requires firefighters to willingly put themselves in potentially painful, uncomfortable, and harmful situations (e.g., exposure to toxic substances; heavy gear; heat exhaustion/burns). Thus, firefighters might *overreport* their actual ability to tolerate pain and discomfort to fit with the expectation of being a firefighter. No studies to



date have examined behaviorally-indexed measures of DT among firefighters, urging an important future line of research.

Inconsistent with our hypothesis, there was no significant interactive effect between PTSD symptom severity and PPE in relation to perceived physical discomfort tolerance. Although not primary hypotheses of this study, it is important to note that PPE was significantly and positively associated with perceived physical discomfort tolerance at the bivariate level, and it also had a significant and positive main effect on perceived physical discomfort tolerance (path *a*). This is in line with the theoretical conceptualization of how one might acquire the capability for suicide, such that an individual gains an increased tolerance to physical pain and a reduced fear of death as *a result* of exposure to physically painful and/or fear-inducing experiences (i.e., PPE; Van Orden et al., 2010). In addition to the aforementioned limitations of utilizing a self-report measure to assess perceived capacity to tolerate pain, it is also possible that PTSD symptoms might not be positively associated with one's actual capacity to tolerate physical pain and discomfort. Indeed, research has shown that PTSD symptomatology is significantly and negatively associated with both perceived emotional DT *and* behaviorally-indexed DT across a variety of populations, including trauma-exposed community adults, military veterans, individuals with substance use disorders, and psychiatric inpatients (Banducci, Connolly, Vujanovic, Alvarez, & Bonn-Miller, 2017; Vujanovic, Bakhshaie, Martin, Reddy, & Anestis, 2017; Vujanovic, Dutcher, & Berenz, 2017; Vujanovic, Litz, & Farris, 2015). This serves to further highlight the importance of examining the relationship between PTSD symptomatology and pain tolerance utilizing behaviorally-indexed measures of DT among firefighters, a population which is chronically exposed to PPE (Beaton et al., 1998; Meyer et al., 2012).

Lastly, there was no significant indirect effect between PTSD symptom severity and capability for suicide through perceived physical discomfort tolerance conditional on PPE. As previously stated, it is difficult to interpret these null findings given the major limitation regarding the self-reported measure utilized in this study to index physical discomfort and pain tolerance. In addition to methodological limitations, it is also important to consider that findings may accurately reflect firefighters' potentially higher-than-average tolerance to physical discomfort in comparison to non-first responder populations. Indeed, firefighters are required to have high pain and discomfort tolerance by definition of what their occupation demands of them. Therefore, ability to tolerate physical discomfort and pain may not be related to our hypothesized constructs in the same way that they relate among community populations. Given the complexity of the construct, it is imperative that future research continue to examine the relationship of these variables with regard to the capability for suicide among firefighters utilizing prospective studies with behaviorally-indexed measures of DT to replicate and extend these findings.

**Aim 3. Which firefighters are at greatest risk of attempting and/or dying by suicide and why?**

**Aim 3a examined associations between PTSD symptom severity, capability for suicide, and PB in relation to global suicide risk.** Results did not support any of the three hypotheses proposed for Aim 3a. Specifically, capability for suicide did not significantly mediate the association between PTSD symptom severity and global suicide risk. Of note, capability for suicide was also not significantly associated with PTSD symptom severity or global suicide risk at the bivariate level. This is consistent with some research among clinical and non-clinical samples of active duty military personnel (Bryan et al., 2013). Moreover,

although not hypotheses of this study, there was no significant main effect regarding PTSD symptom severity and capability for suicide (path *a*) or capability for suicide and global suicide risk (path *b*). The latter is consistent with previous findings yielded by a meta-analysis, which found that capability for suicide was not significantly related to suicide risk (Chu, Buchman-Schmitt, et al., 2017). As the authors note, the IPTS does not predict a main effect of capability for suicide on suicide risk on its own, but rather that capability plays a significant role in suicide risk/behavior in the context of other interpersonal factors (e.g., TB; Chu, Buchman-Schmitt, et al., 2017). Consistent with previous research among firefighters, PTSD symptom severity had a significant direct effect on global suicide risk (Bartlett et al., 2018).

Inconsistent with our hypothesis, there was no significant interactive effect between capability for suicide and PB in relation to global suicide risk. However, PB was significantly associated with capability for suicide and global suicide risk at the bivariate level, consistent with findings among deployed military personnel (Bryan et al., 2012). Moreover, although not a hypothesis of this study, PB evidenced a significant main effect on global suicide risk. These findings are inconsistent with prior research which found a significant and positive interactive effect between capability for suicide and PB in relation to suicide risk (as measured by the SBQ-R) among two samples of active duty military personnel seeking treatment for traumatic brain injury or mental health concerns (Bryan et al., 2012). It is unclear why our findings were not convergent with prior research. It is possible that, as aforementioned in aim 1a, the effects of PB might reflect differentially among populations. Indeed, research suggests that PB is endorsed less frequently in comparison to TB among civilian populations (Bryan, 2011). For the reasons previously discussed, it is theoretically

possible that PB may be reported even less frequently among firefighters. Thus, this null finding may provide further indication that PB is a less potent risk factor in relation to suicidality among firefighters, specifically, although further replication of this work among larger, more representative samples is necessary before definitive conclusions can be drawn.

Lastly, the indirect effect between PTSD symptom severity and global suicide risk through capability for suicide was not conditional on PB. There are several possible explanations for this finding, the first of which relates to a methodological issue. Indeed, although psychometrically validated and demonstrated to be a gold standard assessment instrument for suicide risk (Batterham et al., 2015), the SBQ-R is limited in that it assesses the simultaneous presence of several distinct aspects of suicidality (e.g., past-year suicide thoughts, lifetime attempts, future likelihood of making a suicide attempt) and may not accurately distinguish the constructs related to capability for suicide (i.e., suicide attempts/behavior). Furthermore, the first SBQ-R item, which assesses past history of suicide attempts, does so in conjunction with suicidal ideation, further highlighting the difficulty of capturing capability-related constructs of suicide. Future studies should address this issue by utilizing standardized clinical interviews and assessing various dimensions of suicidality distinctively (e.g., ideation, plans, behavior, attempts). It is also possible that findings accurately reflect the complex nature of capability, particularly with regard to how it functions differentially among populations. Indeed, capability for suicide might be context dependent (Chu, Buchman-Schmitt, et al., 2017). By the inherent nature of the job, firefighters often possess a heightened capability (e.g., willingness to put oneself in harm's way), which often reflects as admirable qualities (e.g., selflessness, endurance, resilience). However, in the context of psychopathology, such as PTSD, these qualities may quickly turn

from admirable to tragic for some firefighters who may be experiencing trauma-related symptoms such as disconnectedness and depression (e.g., Chu, Buchman-Schmitt, et al., 2017). Regardless, as pondered by previous research, it is plausible that particular qualities that constitute heightened capability may remain protective for some firefighters, even in the midst of suicidal crises, while becoming a significant danger for others (Chu, Buchman-Schmitt, et al., 2017). Additional research utilizing sound methodological measures of suicide risk is needed to examine the role of capability among firefighters experiencing PTSD symptoms.

**Aim 3b examined associations between PTSD symptom severity, capability for suicide, and TB in relation to global suicide risk.** As previously mentioned (see Aim 3a), capability for suicide did not significantly mediate the association between PTSD symptom severity and global suicide risk. Given that this indirect effect was not significant, there was also no significant moderated mediation effect (i.e., the hypothesized indirect effect of capability for suicide in relation to PTSD symptom severity and global suicide risk was not conditional on TB [hypothesis 3]). However, consistent with our second hypothesis, capability for suicide and TB had a significant, positive interactive effect in relation to global suicide risk. The positive relationship between capability for suicide and global suicide risk was stronger among firefighter who reported higher levels of TB. This is consistent with results from a recent meta-analysis which found that capability for suicide and TB interacted positively in relation to suicide attempt history among a variety of populations (Chu, Buchman-Schmitt, et al., 2017). Current findings further support the possibility that TB may function as a greater risk factor for suicide among firefighters in comparison to PB. Indeed, firefighters who possess greater levels of capability for suicide, which may reflect as

“admirable” qualities (e.g., endurance, fearlessness) in the fire service, may be at a particularly increased risk for suicide if they begin to perceive themselves as not belonging or socially connecting with those around them. These findings provide important clinical implications. For example, firefighters could be provided with psychoeducation about the potential risk of TB so that they may be better equipped at identifying communication or behavior that may be indicative of isolation (e.g., “No one understands me”; social disconnection) among crew members. Moreover, clinicians might focus on targeting perceptions of TB among treatment-seeking firefighters, particularly if they describe themselves as more fearless about death.

### **Exploratory Analyses**

Exploratory analyses were conducted to examine potential differences in race/ethnicity among pertinent variables. At the descriptive level, firefighters who endorsed identification with racial/ethnic minority status reported slightly lower levels of PTSD symptom severity, TB, and global suicide risk, and higher levels of PB, suicide ideation severity, capability for suicide, and perceived physical discomfort tolerance in comparison to firefighters who identified as White; levels of perceived emotional DT were similar across the two subsamples. However, utilization of ANCOVA to further probe these descriptive findings revealed no significant between-group differences between study variables. These effects remained consistent after running models without covariates. Research examining these variables among racial/ethnic minorities in comparison to White counterparts is mixed, and in some cases, scarce. For example, among a nationally representative sample of adults, African American adults had the highest lifetime prevalence of PTSD (8.7%), followed by Hispanic and White adults (7.0% and 7.4%), and lastly Asian adults (4.0%; Roberts et al.,

2011). Among firefighters in a national study, specifically, those who reported Native American or Alaskan Native race reported significantly higher levels of career suicidal ideation, plans, attempts, and non-suicidal self-injury in comparison to other racial/ethnic groups (Stanley et al., 2015). In 2017, suicide rates were highest for individuals identifying as American Indian/Alaska Native, followed by those identifying as White (non-Hispanic), Black Non-Hispanic, and Asian/Pacific Islander (Centers for Disease Control and Prevention (CDC), 2017). Similarly, research has shown that African American college students reported lower levels of suicidal ideation in comparison to White college students at the descriptive level (Walker & Bishop, 2005), and that there were no racial differences found in the prevalence of passive or active suicidal ideation among older White and African American adults (Cohen et al., 2008). Potential reasons for these findings among those from racial/ethnic minority backgrounds are discussed further below.

It is also important to note that 10.5% of firefighters who endorsed identification with racial/ethnic minority status in the current subsample met cutoff criteria for probable PTSD, which is slightly lower in comparison to the White subsample (11.6%). Similarly, approximately 11.8% of firefighters who reported racial/ethnic minority status met cutoff criteria for probable suicide risk, as compared to 15.1% of the White subsample. It is difficult to contextualize these findings due to the relatively small sub-sample sizes and the significant dearth of research examining differences in PTSD- and suicide-related variables among non-White firefighters. For example, Arbona and colleagues (Arbona & Schwartz, 2016) found that 11.3% of Hispanic male firefighters demonstrated elevated PTSD risk, based on a cutoff score of 39 utilizing the PTSD Checklist-Civilian Version for *DSM-IV*, whereas 8.4% of African American firefighters demonstrated elevated PTSD risk (Arbona et al., 2016)

utilizing the same cutoff criteria. Moreover, trauma load is differentially related to suicide-related variables among White vs. racial/ethnic minority firefighters at the bivariate level. Between-group differences are not statistically significant but underscore the importance of further investigating the role of traumatic event exposure and other types of stress (e.g., racial discrimination, racial trauma) with regard to anxiety, depression, suicidal ideation. It is imperative that future research examine the unique experiences of firefighters who identify with non-White, racial/ethnic minority backgrounds so that we might better understand and address trauma- and suicide-related risk and resilience factors.

There are several evidence-based, theoretical reasons proposed for why we might expect discrepancies in PTSD and suicide-related variables between racial/ethnic groups. First, individuals from racial/ethnic minority groups might experience differential rates of traumatic exposure/vulnerability and/or other pre-existing conditions (Frueh et al., 1998; Perilla et al., 2002; Roberts et al., 2011). Individuals from racial/ethnic minority groups might also have higher lifetime prevalence estimates of PTSD due to racial/ethnic variation in peritraumatic responses (Alcántara et al., 2013) and due to experiencing racial microaggressions, racial discrimination, and racial trauma, which have been shown to uniquely contribute to PTSD symptoms and total posttraumatic conditions among African Americans (Dale & Safren, 2019; Ellis et al., 2008; Loo et al., 2005). With regard to suicidality, research has indicated that individuals who identify with racial/ethnic minority status may be less likely to seek and receive treatment services, and among those who do, they may be less likely to self-disclose suicidal ideation as readily as White clients for reasons that include perceived stigma of mental illness, mistrust of physicians, perception of racial/ethnic bias in healthcare providers, and generally reduced access to general- and



mental-health facilities in low-income areas (Morrison & Downey, 2000; Nestor et al., 2016; Roberts et al., 2011). These findings suggest that racial/ethnic minorities may disproportionately reflect a group who do not receive mental health services, and those who do may represent ‘hidden’ ideators (Morrison & Downey, 2000). Research has also shown and theorized that perceived racism and acculturative stress play a significant role in later suicide and ideation among racial/ethnic minorities (Walker et al., 2017; Walker, 2007).

There are also potential culturally-influenced protective factors that may explain differential rates of suicide among racial/ethnic minority individuals. For example, research has shown that higher levels of religiosity (e.g., attribution of ownership of life to God) may serve as a protective factor against the development of subsequent suicidal ideation and behavior among racial/ethnic minority populations, including African Americans (Walker et al., 2006; Walker & Bishop, 2005). Moreover, research has indicated that African Americans report a higher number of reasons for living in comparison to White Americans (Morrison & Downey, 2000). The mixed/scarcely research with regard to potential racial/ethnic differences in PTSD and suicidality highlights a continuously important line of research. This research could aid in the development of culturally-sensitive and unique assessment, intervention, and prevention methods for individuals from racial/ethnic minority backgrounds.

### **Additional Findings**

Although not primary aims of the study, there were additional findings worthy of mention. With regard to covariates, trauma load was not significantly associated with any of the proposed outcome variables (i.e., suicide ideation severity, capability for suicide, global suicide risk) at the bivariate level, nor did it have a direct effect on outcome variables within each model. This is in line with prior research among firefighters which found that critical

incidents (e.g., trauma to self, responding to multiple casualties/pediatric death) was not significantly associated at the bivariate level with pertinent IPTS variables such as PB, TB, or FAD (Streeb et al., 2018). It is possible that the mere exposure to traumatic events is not in and of itself indicative of future suicidal symptoms. Rather, the potentially subsequent symptomatology that may result post-trauma exposure (e.g., PTSD symptomatology) might serve as a greater risk factor for subsequent suicidal symptoms. On the other hand, depressive symptom severity was significantly associated with suicide ideation severity and global suicide risk at the bivariate level and demonstrated a significant direct effect on both outcomes in the main models; depressive symptom severity was not associated with capability for suicide at the bivariate level nor did it have a significant direct effect on capability for suicide within the model. This is consistent with prior research which found that capability for suicide was not significantly associated with depressive symptoms at the bivariate level (Ribeiro et al., 2014). Leaders in the IPTS field posit that FAD (i.e., capability) is distinguishable from depressive symptomatology, despite the fact that depressive symptoms may result include thinking about death (Ribeiro et al., 2014). With the exception of capability, these findings highlight depressive symptom severity as a robust variable that has strong associations with suicidality (e.g., ideation, behavior, risk), consistent with previous research among various populations, including firefighters (Bartlett et al., 2018; C. Martin et al., 2017; Yoshimasu et al., 2008). Moreover, approximately 11.3% of firefighters met clinical cut-off levels for probable PTSD based on a score of 33 or higher on the PCL-5. It is important to note that the prevalence of firefighters who met diagnostic 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 & Mallon,

2003; Kilpatrick et al., 2013). Additionally, approximately 14.1% of firefighters met clinical cut-off levels for probable suicide risk based on a cut-off score of 7 or higher on the SBQ-R, which is higher in comparison to those seen in other samples of firefighters (e.g., Stanley, Smith, et al., 2018). These percentages highlight the alarming reality of firefighters being at increased risk for the development of PTSD, and potentially, subsequent suicidal ideation and behavior.

In regard to other pertinent IPTS variables, this sample of primarily career firefighters reported relatively low average scores on the first five items of the BSS ( $M = 0.31$ ,  $SD = 0.95$ ), which may have affected outcomes. Although the overwhelming majority of firefighters reported little- to no-risk on BSS-5 items, it is important to highlight findings of specific BSS-5 items. Approximately 3.6% ( $n = 9$ ) of this sample selected '1' on BSS-5 item one, indicating "I have a weak wish to live", and 0.8% ( $n = 1$ ) selected '2' on BSS-5 item 1, indicating "I have no wish to live". For BSS-5 item two, approximately 5.2% ( $n = 13$ ) selected '1', indicating "I have a weak wish to die", and approximately 2% ( $n = 5$ ) selected '2', indicating "I have a moderate to strong wish to die". Approximately 4.4% ( $n = 11$ ) selected '1' on BSS-5 item three, indicating "My reasons for living or dying are about equal", and approximately 0.4% ( $n = 1$ ) selected '2', indicating "My reasons for dying outweigh my reasons for living". With regard to item four, approximately 2.8% ( $n = 7$ ) selected '1', indicating "I have a weak desire to kill myself", and approximately 0.4% ( $n = 1$ ) selected '2', indicating "I have a moderate to strong desire to kill myself". Lastly, approximately 7.3% of the sample selected '1' for item five, indicating "I would take a chance on life or death if I found myself in a life-threatening situation, and approximately 0.8% ( $n = 2$ ) selected '2' indicating "I would not take the steps necessary to avoid death if I

found myself in a life-threatening situation”. This sample also reported lower levels of PB ( $M = 7.35, SD = 4.35$ ) and TB ( $M = 21.31, SD = 12.01$ ) in comparison to samples that comprised a greater proportion of wildland (PB:  $M = 10.07, SD = 7.62$ ; TB:  $M = 24.38, SD = 12.55$ ; Stanley, Hom, et al., 2018), volunteer (PB:  $M = 10.43, SD = 8.07$ ; TB:  $M = 24.11, SD = 12.42$ ; Chu, Stanley, et al., 2016), and retired (PB:  $M = 10.81, SD = 7.81$ ; TB:  $M = 23.99, SD = 12.61$ ; Gallyer et al., 2018) firefighters. Similarly, this sample of career firefighters also reported lower levels of FAD (i.e., capability;  $M = 16.56, SD = 6.55$ ) in comparison to a study where nearly one-third of their sample reported volunteer or wildland firefighter status ( $M = 19.79, SD = 5.23$ ; Chu, Stanley, et al., 2016). Indeed, this supports prior findings that suggest firefighters with differential status within the fire service, such as volunteer or wildland, might be at higher risk for experiencing suicidal ideation and behaviors in comparison to career firefighters (Stanley et al., 2017; Stanley, Hom, et al., 2018). This issue represents the importance of further research among trauma-exposed firefighters to better understand the pathway to suicidality.

### **Limitations and Future Directions**

Several limitations of the present study are worthy of note. First, this study relied exclusively on self-report, and therefore the effects of method variance and reporting biases cannot be ruled out. While self-report methodology allows for a larger collection of data and provides firefighters with the opportunity to respond anonymously, it is important for future work to implement interview-based and experimental measures assessing cognitive mechanisms in relation to PTSD and IPTS-related variables to increase our understanding of these associations and to reduce under-reporting trends. Similarly, as previously mentioned, this study relied solely on a self-report (i.e., perceived) measure of emotional DT, and the

self-reported measure utilized to reflect perceived ability to tolerate physical discomfort/pain had poor internal consistency ( $\alpha=.69$ ). Although this is consistent with the coefficient alpha values reported for this measure within other samples (e.g., (Pennings & Anestis, 2013; Schmidt et al., 2006), it calls into question the reliability of the measure within this sample. Leading researchers in the study of suicide suggest that self-reported and behaviorally-indexed DT are differentially associated with suicidal ideation and behavior, such that self-reported DT is associated more with suicidal ideation whereas behaviorally-indexed DT is more associated with suicidal behavior (Anestis & Joiner, 2012). Thus, future studies should examine associations between capability for suicide and suicide risk among firefighters utilizing various behaviorally-indexed measures of DT. Second, this study utilized a cross-sectional design, precluding the ability to make inferences about causality among variables. Experimental and prospective longitudinal studies are needed in the future to better understand the temporality of relationships among pertinent variables. Such findings may better illuminate risk and protective factors that lead to or inhibit the development of suicidal ideation and behavior among firefighters. Third, as previously mentioned, although the SBQ-R is considered a gold standard self-report assessment for suicide risk (Batterham et al., 2015), it is limited in that it combines both ideation and behavior. Distinguishing suicidal ideation and behavior is especially important within the context of the IPTS for the purposes of examining the “ideation-to-action” trajectory. Although we utilized the BSS-5 to examine suicidal ideation as a stand-alone outcome in Aims 1a and 1b, we were unable to examine risk for suicide, determined solely by suicidal behaviors (and not in conjunction with suicidal ideation) as done in prior studies (e.g., Van Orden et al., 2008), in Aims 3a and 3b. Moreover, although acceptable, internal consistency for the BSS-5 in this sample was low

( $\alpha=.75$ ), calling into question the applicability of these questions within this particular sample. Future studies might address this issue by utilizing standardized clinical interviews among firefighters to assess and analyze specific dimensions of suicidal desire and behavior (e.g., ideation, desire, plan, behavior, attempts). Fourth, the majority of our sample was comprised of career firefighters. Although these findings provide an important lens into the mental health of career firefighters, they may also limit generalizability to those who serve in a different capacity (e.g., volunteer). Given that research suggests differences in mental health among career and volunteer firefighters, such that volunteer firefighters report significantly elevated levels of depression, PTSD, and suicidal symptoms in comparison to career firefighters (Stanley et al., 2017), it is important that future research examine these variables within the context among the IPTS among non-career personnel. It is possible that self-selection plays a role among those with career status, who may represent a higher functioning and especially resilient portion of the fire service. Moreover, career firefighters' access to services (via health insurance and other benefits) may lead them to have better outcomes with regard to mental health. It is also equally possible that because all career personnel in the current study were active duty, they may have underreported psychiatric symptoms due to fear of breaches in confidentiality that could lead to negative job ramifications (Kleim & Westphal, 2011; Kronenberg et al., 2008). Lastly, the majority of this sample was primarily white/Caucasian male firefighters, highlighting the importance of better understanding the unique experiences and needs of female firefighters and those of various racial and cultural backgrounds. It is possible that our sample lacked racial/ethnic diversity as a result of firefighters from racial/ethnic minority backgrounds not feeling comfortable participating due to perceived discrimination and racism. However, nationally

representative statistics indicate that approximately 83.5% of firefighters are White, making that the most common race or ethnicity in the occupation (*Firefighters | Data USA, 2018*); this is in line with the racial/ethnic composition of firefighters seen within the departments utilized in this study. For the purposes of improving generalizability of findings, future work should also include nationally representative samples of firefighters from multiple geographic regions.

## **Conclusions**

Despite these limitations, this study had several strengths including being the first study to examine associations between PTSD, suicidality, and underlying cognitive mechanisms, such as perceived emotional DT, in the context of the IPTS among firefighters. As such, this study underscores the importance of considering the distinctive impact that these variables (e.g., PB, TB, capability for suicide) might have among a particularly understudied and unique population that is chronically exposed to trauma and potentially harmful situations. For example, findings highlight that perceptions of TB may serve as an especially potent factor with regard to suicidal ideation and behavior, specifically among firefighters. Future research should build upon this preliminary work by investigating these associations among firefighters utilizing more rigorous methodologies and study designs. This line of inquiry can provide important clinical implications for mental health intervention and prevention efforts designed specifically for firefighters, such as the implementation of suicide prevention programs. Moreover, it can shed light on the importance of encouraging and providing peer support groups within the department to reduce the likelihood of a firefighter developing perceptions of feeling “left out”. Moreover, firefighters who endorse identification with racial/ethnic minority status are highly understudied, and it is possible that

they may experience even greater feelings of TB and/or PB that is influenced by racial discrimination or racial trauma. It is only through continued research that a path might be paved in providing firefighters with the knowledge and resources they deserve given their invaluable service to our communities.



## References

- Alcántara, C., Casement, M. D., & Lewis-Fernández, R. (2013). Conditional risk for PTSD among Latinos: A systematic review of racial/ethnic differences and sociocultural explanations. *Clinical Psychology Review, 33*(1), 107–119.  
<https://doi.org/10.1016/j.cpr.2012.10.005>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders*. (5th ed.). American Psychiatric Publishing.
- 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.comppsy.2013.04.005>
- 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., & 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., 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>
- Arbona, C., Fan, W., & Noor, N. (2016). Factor structure and external correlates of posttraumatic stress disorder symptoms among African American firefighters. *Psychology Research and Behavior Management*, 9.  
<https://doi.org/10.2147/PRBM.S113615>
- Arbona, C., & Schwartz, J. P. (2016). Posttraumatic stress disorder symptom clusters, depression, alcohol abuse, and general stress among Hispanic male firefighters. *Hispanic Journal of Behavioral Sciences*, 38(4), 507–522.  
<https://doi.org/10.1177/0739986316661328>
- Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275 suicides: A meta-analysis. *BMC Psychiatry*, 4(1). <https://doi.org/10.1186/1471-244X-4-37>
- Balkis, M., & Duru, E. (2018). *Procrastination, self-downing, self-doubt, and rational beliefs: A moderated mediation model* (pub.1101763197). 96(2), 187–196.  
<https://doi.org/10.1002/jcad.12191>
- 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>

- Bartlett, B. A., Jardin, C., Martin, C., Tran, J. K., Buser, S., Anestis, M. D., & Vujanovic, A. A. (2018). Posttraumatic stress and suicidality among firefighters: The moderating role of distress tolerance. *Cognitive Therapy and Research*, 1–14.
- Batterham, P. J., Ftanou, M., Pirkis, J., Brewer, J. L., Mackinnon, A. J., Beautrais, A., Fairweather-Schmidt, K. 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.  
<http://dx.doi.org/10.1037/pas0000053>
- Baumeister, R. F., DeWall, C. N., Ciarocco, N. J., & Twenge, J. M. (2005). Social exclusion impairs self-regulation. *Journal of Personality and Social Psychology*, 88(4), 589–604. <https://doi.org/10.1037/0022-3514.88.4.589>
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497–529. <https://doi.org/10.1037/0033-2909.117.3.497>
- Beaton, R., Murphy, S., Johnson, C., Pike, K., & Corneil, W. (1998). Exposure to duty-related incident stressors in urban firefighters and paramedics. *Journal of Traumatic Stress*, 11(4), 821–828. <https://doi.org/10.1023/A:1024461920456>
- Beck, A. T., & Steer, R. A. (1991). *Manual for the beck scale for suicide ideation*. Psychological Corporation.
- Bender, T. W., Gordon, K. H., Bresin, K., & Joiner, T. E. (2011). Impulsivity and suicidality: The mediating role of painful and provocative experiences. *Journal of Affective Disorders*, 129, 301–307.

- 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>
- Bentley, K. H., Gallagher, M. W., Carl, J. R., & Barlow, D. H. (2014). Development and validation of the Overall Depression Severity and Impairment Scale. *Psychological Assessment, 26*(3), 815–830. [psych. https://doi.org/10.1037/a0036216](https://doi.org/10.1037/a0036216)
- Berger, W., Coutinho, E. S. F., Figueira, I., Marques-Portella, C., Luz, M. P., Neylan, T. C., Marmar, C. R., & Mendlowicz, M. V. (2011). Rescuers at risk: A systematic review and meta-regression analysis of the worldwide current prevalence and correlates of PTSD in rescue workers. *Social Psychiatry and Psychiatric Epidemiology, 47*(6), 1001–1011. <https://doi.org/10.1007/s00127-011-0408-2>
- Berninger, A., Webber, M. P., Cohen, H. W., Gustave, J., Lee, R., Niles, J. K., Chiu, S., Zeig-Owens, R., Soo, J., Kelly, K., & Prezant, D. J. (2010). Trends of elevated PTSD risk in firefighters exposed to the World Trade Center Disaster: 2001-2005. *Public Health Reports (1974-), 125*(4), 556–566.
- Bernstein, A., Zvolensky, M. J., Vujanovic, A. A., & Moos, R. (2009). Integrating anxiety sensitivity, distress tolerance, and discomfort intolerance: A hierarchical model of affect sensitivity and tolerance. *Behavior Therapy, 40*(3), 291–301.  
<https://doi.org/10.1016/j.beth.2008.08.001>
- Bernstein, M. J., & Claypool, H. M. (2012). Social exclusion and pain sensitivity: Why exclusion sometimes hurts and sometimes numbs. *Personality and Social Psychology Bulletin, 38*(2), 185–196. <https://doi.org/10.1177/0146167211422449>

- Bing-Canar, H., Ranney, R., McNett, S., Tran, J. K., Berenz, E. C., & Vujanovic, A. A. (2019). Alcohol use problems, post traumatic stress disorder, and suicidality among trauma-exposed firefighters. *Journal of Nervous and Mental Disease*, 207(3), 192–198. <https://doi.org/10.1097/NMD.0000000000000947>
- Blevins, C. A., Weathers, F. W., Davis, M. T., Witte, T. K., & Domino, J. L. (2015). The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): Development and Initial Psychometric Evaluation. *Journal of Traumatic Stress*, 28(6), 489–498. <https://doi.org/10.1002/jts.22059>
- Boffa, J. W., Stanley, I. H., Hom, M. A., Norr, A. M., Joiner, T. E., & Schmidt, N. B. (2017). PTSD symptoms and suicidal thoughts and behaviors among firefighters. *Journal of Psychiatric Research*, 84, 277–283. <https://doi.org/10.1016/j.jpsychires.2016.10.014>
- Boffa, J. W., Stanley, I. H., Smith, L. J., Mathes, B. M., Tran, J. K., Buser, S. J., Schmidt, N. B., & Vujanovic, A. A. (2018). Posttraumatic stress disorder symptoms and suicide risk in male firefighters: The mediating role of anxiety sensitivity. *The Journal of Nervous and Mental Disease*, 206(3), 179–186. PubMed. <https://doi.org/10.1097/NMD.0000000000000779>
- Bovin, M. J., Marx, B. P., Weathers, F. W., Gallagher, M. W., Rodriguez, P., Schnurr, P. P., & Keane, T. M. (2015). Psychometric properties of the PTSD Checklist for Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (PCL-5) in veterans. *Psychological Assessment*. <https://doi.org/10.1037/pas0000254>
- Brake, C. A., Adams, T. G., Hood, C. O., & Badour, C. L. (2019). Posttraumatic mental contamination and the Interpersonal Psychological Theory of Suicide: Effects via

- DSM-5 PTSD symptom clusters. *Cognitive Therapy and Research*, 43(1), 259–271.  
<https://doi.org/10.1007/s10608-018-9959-9>
- Brenner, L. A., Betthausen, L. M., Homaifar, B. Y., Villarreal, E., Harwood, J. E. F., Staves, P. J., & Huggins, J. A. (2011). Posttraumatic stress disorder, traumatic brain injury, and suicide attempt history among veterans receiving mental health services. *Suicide and Life-Threatening Behavior*, 41(4), 416–423. <https://doi.org/10.1111/j.1943-278X.2011.00041.x>
- Brown, G. K., Beck, A. T., Steer, R. A., & Grisham, J. R. (2000). Risk factors for suicide in psychiatric outpatients: A 20-year prospective study. *Journal of Consulting and Clinical Psychology*, 68(3), 371–377. <https://doi.org/10.1037/0022-006X.68.3.371>
- Bryan, C. J. (2011). The clinical utility of a brief measure of perceived burdensomeness and thwarted belongingness for the detection of suicidal military personnel. *Journal of Clinical Psychology*, 67(10), 981–992. <https://doi.org/10.1002/jclp.20726>
- Bryan, C. J., Clemans, T. A., & Hernandez, A. M. (2012). Perceived burdensomeness, fearlessness of death, and suicidality among deployed military personnel. *Personality and Individual Differences*, 52(3), 374–379.  
<https://doi.org/10.1016/j.paid.2011.10.045>
- Bryan, C. J., Grove, J. L., & Kimbrel, N. A. (2017). Theory-driven models of self-directed violence among individuals with PTSD. *Current Opinion in Psychology*, 14, 12–17.  
<https://doi.org/10.1016/j.copsyc.2016.09.007>
- Bryan, C. J., Hernandez, A. M., Allison, S., & Clemans, T. (2013). Combat exposure and suicide risk in two samples of military personnel. *Journal of Clinical Psychology*, 69(1), 64–77. <https://doi.org/10.1002/jclp.21932>

- Cacioppo, J. T., & Cacioppo, S. (2014). Social relationships and health: The toxic effects of perceived social isolation. *Social and Personality Psychology Compass*, 8(2), 58–72. PubMed. <https://doi.org/10.1111/spc3.12087>
- Cavanagh, J. T. O., Carson, A. J., Sharpe, M., & Lawrie, S. M. (2003). Psychological autopsy studies of suicide: A systematic review. *Psychological Medicine*, 33(3), 395–405. <https://doi.org/10.1017/S0033291702006943>
- Center for Behavioral Health Statistics and Quality. (2018). *2017 National Survey on Drug Use and Health: Methodological summary and definitions*. Substance Abuse and Mental Health Services Administration. <https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHDetailedTabs2017/NSDUHDetailedTabs2017.pdf>
- Centers for Disease Control and Prevention (CDC). (2017). *CDC WISQARS: Leading causes of death reports*. <https://webappa.cdc.gov/sasweb/ncipc/leadcause.html>
- Cero, I., Zuromski, K. L., Witte, T. K., Ribeiro, J. D., & Joiner, T. E. (2015). Perceived burdensomeness, thwarted belongingness, and suicide ideation: Re-examination of the Interpersonal-Psychological Theory in two samples. *Psychiatry Research*, 228(3), 544–550. <https://doi.org/10.1016/j.psychres.2015.05.055>
- Chioqueta, A. P., & Stiles, T. C. (2006). Psychometric properties of the Beck Scale for suicide Ideation: A Norwegian study with university students. *Nordic Journal of Psychiatry*, 60(5), 400–404. <https://doi.org/10.1080/08039480600937645>
- Chu, C., Buchman-Schmitt, J. M., Hom, M. A., Stanley, I. H., & Joiner, T. E. Jr. (2016). A test of the interpersonal theory of suicide in a large sample of current firefighters. *Psychiatry Research*, 240, 26–33. <https://doi.org/10.1016/j.psychres.2016.03.041>

- Chu, C., Buchman-Schmitt, J. M., Stanley, I. H., Hom, M. A., Tucker, R. P., Hagan, C. R., Rogers, M. L., Podlogar, M. C., Chiurliza, B., Ringer, F. B., Michaels, M. S., Patros, C. H. G., & Joiner Jr., T. E. (2017). The interpersonal theory of suicide: A systematic review and meta-analysis of a decade of cross-national research. *Psychological Bulletin*, *143*(12), 1313–1345. <https://doi.org/10.1037/bul0000123>
- Chu, C., Hom, M. A., Rogers, M. L., Stanley, I. H., Ringer-Moberg, F. B., Podlogar, M. C., Hirsch, J. K., & Joiner, T. E. (2017). Insomnia and suicide-related behaviors: A multi-study investigation of thwarted belongingness as a distinct explanatory factor. *Journal of Affective Disorders*, *208*, 153–162. PubMed. <https://doi.org/10.1016/j.jad.2016.08.065>
- Chu, C., Stanley, I. H., Joiner Jr., T. E., Hom, M. A., & Buchman-Schmitt, J. M. (2016). A test of the interpersonal theory of suicide in a large sample of current firefighters. *Psychiatry Research*, *240*, 26–33. <https://doi.org/10.1016/j.psychres.2016.03.041>
- Cohen, C. I., Colemon, Y., Yaffee, R., & Casimir, G. J. (2008). Racial differences in suicidality in an older urban population. *The Gerontologist*, *48*(1), 71–78. <https://doi.org/10.1093/geront/48.1.71>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed). Lawrence Erlbaum Associates Inc.
- Conner, K. R., Britton, P. C., Sworts, L. M., & Joiner, T. E. (2007). Suicide attempts among individuals with opiate dependence: The critical role of belonging. *Addictive Behaviors*, *32*(7), 1395–1404. <https://doi.org/10.1016/j.addbeh.2006.09.012>
- Cornell, W., Beaton, R., Murphy, S., Johnson, C., & Pike, K. (1999). Exposure to traumatic incidents and prevalence of posttraumatic stress symptomatology in urban firefighters



- in two countries. *Journal of Occupational Health Psychology*, 4(2), 131–141.  
<https://doi.org/10.1037/1076-8998.4.2.131>
- Corrigan, M., McWilliams, R., Kelly, K. J., Niles, J., Cammarata, C., Jones, K., Wartenberg, D., Hallman, W. K., Kipen, H. M., Glass, L., Schorr, J. K., Feirstein, I., & Prezant, D. J. (2009). A computerized, self-administered questionnaire to evaluate posttraumatic stress among firefighters after the world trade center collapse. *American Journal of Public Health*, 99(S3), S702–S709. <https://doi.org/10.2105/AJPH.2008.151605>
- Cougle, J., Bernstein, A., J. Zvolensky, M., A. Vujanovic, A., & J. Macatee, R. (2012). Validation of self-report measures of emotional and physical distress tolerance. *Journal of Psychopathology and Behavioral Assessment*, 35(1), 76–84.  
<https://doi.org/10.1007/s10862-012-9317-2>
- Dale, S. K., & Safren, S. A. (2019). Gendered racial microaggressions predict posttraumatic stress disorder symptoms and cognitions among Black women living with HIV. *Psychological Trauma: Theory, Research, Practice, and Policy*, 11(7), 685–694.  
<https://doi.org/10.1037/tra0000467>
- Davis, M. T., Witte, T. K., & Weathers, F. W. (2014). Posttraumatic stress disorder and suicidal ideation: The role of specific symptoms within the framework of the interpersonal-psychological theory of suicide. *Psychological Trauma: Theory, Research, Practice, and Policy*, 6(6), 610–618. <https://doi.org/10.1037/a0033941>
- DeWall, C. N., & Baumeister, R. F. (2006). Alone but feelings no pain: Effects of social exclusion on physical pain tolerance and pain threshold, affective forecasting, and interpersonal empathy. *Journal of Personality and Social Psychology*, 91(1), 1–15.  
<http://dx.doi.org/10.1037/0022-3514.91.1.1>

- Dhingra, K., Boduszek, D., & O'Connor, R. C. (2015). Differentiating suicide attempters from suicide ideators using the Integrated Motivational–Volitional model of suicidal behaviour. *Journal of Affective Disorders, 186*, 211–218.  
<https://doi.org/10.1016/j.jad.2015.07.007>
- Ellis, B. H., MacDonald, H. Z., Lincoln, A. K., & Cabral, H. J. (2008). Mental health of Somali adolescent refugees: The role of trauma, stress, and perceived discrimination. *Journal of Consulting and Clinical Psychology, 76*(2), 184–193.  
<https://doi.org/10.1037/0022-006X.76.2.184>
- Fässberg, M. M., van Orden, K. A., Duberstein, P., Erlangsen, A., Lapierre, S., Bodner, E., Canetto, S. S., De Leo, D., Szanto, K., & Waern, M. (2012). A systematic review of social factors and suicidal behavior in older adulthood. *International Journal of Environmental Research and Public Health, 9*(3), 722–745. PubMed.  
<https://doi.org/10.3390/ijerph9030722>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2008). *G\*Power Version 3.1.2 [computer software]*. Universität Kiel, Germany.
- Firefighters | Data USA*. (n.d.). Retrieved March 18, 2020, from  
<https://datausa.io/profile/soc/firefighters>
- Forrest, L. N., Bodell, L. P., Witte, T. K., Goodwin, N., Bartlett, M. L., Siegfried, N., Eddy, K. T., Thomas, J. J., Franko, D. L., & Smith, A. R. (2016). Associations between eating disorder symptoms and suicidal ideation through thwarted belongingness and perceived burdensomeness among eating disorder patients. *Journal of Affective Disorders, 195*, 127–135. <https://doi.org/10.1016/j.jad.2016.02.017>

- Franklin, J. C., Hessel, E. T., & Prinstein, M. J. (2011). Clarifying the role of pain tolerance in suicidal capability. *Psychiatry Research, 189*(3), 362–367.  
<https://doi.org/10.1016/j.psychres.2011.08.001>
- Fritz, M. S., & Mackinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science, 18*(3), 233–239. <https://doi.org/doi:10.1111/j.1467-9280.2007.01882.x>
- Frueh, B. C., Brady, K. L., & de Arellano, M. A. (1998). Racial differences in combat-related PTSD: Empirical findings and conceptual issues. *Clinical Psychology Review, 18*(3), 287–305. [https://doi.org/10.1016/S0272-7358\(97\)00087-1](https://doi.org/10.1016/S0272-7358(97)00087-1)
- Fullerton, C. S., McCarroll, J. E., Ursano, R. J., & Wright, K. M. (1992). Psychological responses of rescue workers: Fire fighters and trauma. *American Journal of Orthopsychiatry, 62*(3), 371–378. <https://doi.org/10.1037/h0079363>
- Gall, K., van Zutven, K., Lindstrom, J., Bentley, C., Gratwick-Sarll, K., Harrison, C., Lewis, V., & Mond, J. (2016). Obesity and emotional well-being in adolescents: Roles of body dissatisfaction, loss of control eating, and self-rated health. *Obesity, 24*(4), 837–842. <https://doi.org/10.1002/oby.21428>
- Gallyer, A. J., Dougherty, S. P., Gai, A. R., Stanley, I. H., Hom, M. A., Rogers, M. L., Duffy, M. E., Buchman-Schmitt, J. M., Spencer-Thomas, S., & Joiner, T. E. (2018). Problematic alcohol use and suicidal ideation among firefighters: A multi-study investigation of the explanatory roles of perceived burdensomeness and thwarted belongingness. *Journal of Affective Disorders, 238*, 281–288.  
<https://doi.org/10.1016/j.jad.2018.05.045>

- George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference, 11.0 update*. Allyn and Bacon.  
<http://hdl.handle.net/2027/mdp.39015052541623>
- Gunn III, J. F., Lester, D., Haines, J., & Williams, C. L. (2012). Thwarted belongingness and perceived burdensomeness in suicide notes. *Crisis: The Journal of Crisis Intervention and Suicide Prevention*, 33(3), 178–181. <https://doi.org/10.1027/0227-5910/a000123>
- Gutierrez, P., King, C. A., & Ghaziuddin, N. (1996). Adolescent attitudes about death in relation to suicidality. *Suicide and Life-Threatening Behavior*, 26(1), 8–18.
- Haslam, C., & Mallon, K. (2003). A preliminary investigation of post-traumatic stress symptoms among firefighters. *Work & Stress*, 17(3), 277–285.  
<https://doi.org/10.1080/02678370310001625649>
- Hassija, M., & Cloitre, M. (2015). *STAIR Narrative Therapy: A Skills Focused Approach to Trauma-Related Distress* (Vol. 11). Bentham Science Publishers.
- Haugen, P. T., McCrillis, A. M., Smid, G. E., & Nijdam, M. J. (2017). Mental health stigma and barriers to mental health care for first responders: A systematic review and meta-analysis. *Journal of Psychiatric Research*, 94, 218–229.  
<https://doi.org/10.1016/j.jpsychires.2017.08.001>
- Hawkins, K. A., Hames, J. L., Ribeiro, J. D., Silva, C., Joiner, T., & Cogle, J. R. (2014). An examination of the relationship between anger and suicide risk through the lens of the interpersonal theory of suicide. *Journal of Psychiatric Research*, 50, 59–65.  
<https://doi.org/10.1016/j.jpsychires.2013.12.005>
- Hawley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine : A*

- Publication of the Society of Behavioral Medicine*, 40(2), 218–227. PubMed.  
<https://doi.org/10.1007/s12160-010-9210-8>
- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, 76(4), 408–420.  
<https://doi.org/10.1080/03637750903310360>
- Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research*, 50(1), 1–22. <https://doi.org/10.1080/00273171.2014.962683>
- Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: Guilford.
- Hill, R. M., & Pettit, J. W. (2012). Suicidal ideation and sexual orientation in college students: The roles of perceived burdensomeness, thwarted belongingness, and perceived rejection due to sexual orientation. *Suicide and Life-Threatening Behavior*, 42(5), 567–579. <https://doi.org/10.1111/j.1943-278X.2012.00113.x>
- Hill, R. M., & Pettit, J. W. (2014). Perceived burdensomeness and suicide-related behaviors in clinical samples: Current evidence and future directions. *Journal of Clinical Psychology*, 70(7), 631–643. <https://doi.org/10.1002/jclp.22071>
- Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social Isolation as risk factors for mortality: A meta-analytic review. *Perspectives on Psychological Science*, 10(2), 227–237.  
<https://doi.org/10.1177/1745691614568352>
- Jankovic, J., Bremner, S., Bogic, M., Lecic-Tosevski, D., Ajdukovic, D., Franciskovic, T., Galeazzi, G. M., Kucukalic, A., Morina, N., Popovski, M., Schützwohl, M., & Priebe,

- S. (2013). Trauma and suicidality in war affected communities. *European Psychiatry*, 28(8), 514–520. <https://doi.org/10.1016/j.eurpsy.2012.06.001>
- Joiner Jr., T. E., Van Orden, K. A., Witte, T. K., Selby, E. A., Ribeiro, J. D., Lewis, R., & Rudd, M. D. (2009). Main predictions of the interpersonal–psychological theory of suicidal behavior: Empirical tests in two samples of young adults. *Journal of Abnormal Psychology*, 118(3), 634–646. <https://doi.org/10.1037/a0016500>
- Joiner, T.E. (2005). *Why people die by suicide*. Harvard University Press.
- Joiner, T. E., Van Orden, K. A., Witte, T. K., Selby, E. A., Ribeiro, J. D., Lewis, R., & Rudd, M. D. (2009). Main predictions of the interpersonal-psychological theory of suicidal behavior: Empirical tests in two samples of young adults. *Journal of Abnormal Psychology*, 118(3), 634–646. PubMed. <https://doi.org/10.1037/a0016500>
- Kilpatrick, D. G., Resnick, H. S., Milanak, M. E., Miller, M. W., Keyes, K. M., & Friedman, M. J. (2013). National estimates of exposure to traumatic events and PTSD prevalence using DSM-IV and DSM-5 criteria. *Journal of Traumatic Stress*, 26(5), 537–547. <https://doi.org/10.1002/jts.21848>
- Kleim, B., & Westphal, M. (2011). Mental health in first responders: A review and recommendation for prevention and intervention strategies. *Traumatology*, 17(4), 17–24. <https://doi.org/10.1177/1534765611429079>
- Kronenberg, M., Osofsky, H. J., Osofsky, J. D., Many, M., Hardy, M., & Arey, J. (2008). First responder culture: Implications for mental health professionals providing services following a natural disaster. *Psychiatric Annals*, 38(2), 114–118.

- Krysinska, K., & Lester, D. (2010). Post-traumatic stress disorder and suicide risk: A systematic review. *Archives of Suicide Research, 14*(1), 1–23.  
<https://doi.org/10.1080/13811110903478997>
- Krysinska, K., & Martin, G. (2009). The struggle to prevent and evaluate: Application of population attributable risk and preventive fraction to suicide prevention research. *Suicide and Life-Threatening Behavior, 39*(5), 548–557.  
<https://doi.org/10.1521/suli.2009.39.5.548>
- Lam, R. W., Michalaak, E. E., & Swinson, R. P. (2004). *Assessment Scales in Depression, Mania and Anxiety*. Taylor & Francis Ltd.  
[file:///C:/Users/tassc/Downloads/2005%20\(2\).pdf](file:///C:/Users/tassc/Downloads/2005%20(2).pdf)
- Lamis, D. A., & Malone, P. S. (2011). Alcohol-related problems and risk of suicide among college students: The mediating roles of belongingness and burdensomeness. *Suicide & Life-Threatening Behavior, 41*(5), 543–553. PubMed.  
<https://doi.org/10.1111/j.1943-278X.2011.00052.x>
- 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*(4), 576–600.  
<https://doi.org/10.1037/a0019712>
- Linehan, M. M. (1993). *Skills training manual for treating borderline personality disorder*. Guilford Press.
- Linehan, M. M., Goodstein, J. L., Nielsen, S. L., & Chiles, J. A. (1983). Reasons for staying alive when you're thinking of killing yourself: The Reasons for Living Inventory.

*Journal of Consulting and Clinical Psychology*, 51(2), 276–286.

<https://doi.org/10.1037/0022-006X.51.2.276>

Loo, C. M., Fairbank, J. A., & Chemtob, C. M. (2005). Adverse Race-Related Events as a Risk factor for posttraumatic stress disorder in Asian American Vietnam veterans.

*The Journal of Nervous and Mental Disease*, 193(7), 455–463.

<https://doi.org/10.1097/01.nmd.0000168239.51714.e6>

Lopez-Castroman, J., Jaussent, I., Beziat, S., Guillaume, S., Baca-Garcia, E., Olié, E., & Courtet, P. (2015). Posttraumatic Stress Disorder following childhood abuse increases the severity of suicide attempts. *Journal of Affective Disorders*, 170, 7–14.

<https://doi.org/10.1016/j.jad.2014.08.010>

Malone, K. M., Oquendo, M. A., Haas, G. L., Ellis, S. P., Li, S., & Mann, J. J. (2000).

Protective factors against suicidal acts in major depression: Reasons for living.

*American Journal of Psychiatry*, 157(7), 1084–1088.

<https://doi.org/10.1176/appi.ajp.157.7.1084>

Marshall, G. N., Miles, J. N. V., & Stewart, S. H. (2010). Anxiety sensitivity and PTSD symptom severity are reciprocally related: Evidence from a longitudinal study of physical trauma survivors. *Journal of Abnormal Psychology*, 119(1), 143–150.

<https://doi.org/10.1037/a0018009>

Marshall-Berenz, E. C., Vujanovic, A. A., Bonn-Miller, M. O., Bernstein, A., & Zvolensky, M. J. (2010). Multimethod study of distress tolerance and PTSD symptom severity in a trauma-exposed community sample. *Journal of Traumatic Stress*, 23(5), 623–630.

<https://doi.org/10.1002/jts.20568>



- Martin, C. E., Tran, J. K., & Buser, S. J. (2017). Correlates of suicidality in firefighter/EMS personnel. *Journal of Affective Disorders, 208*, 177–183.  
<https://doi.org/10.1016/j.jad.2016.08.078>
- Martin, C., Vujanovic, A. A., Paulus, D. J., Bartlett, B., Gallagher, M. W., & Tran, J. K. (2017). Alcohol use and suicidality in firefighters: Associations with depressive symptoms and posttraumatic stress. *Comprehensive Psychiatry*. <https://doi.org/doi:10.1016/j.comppsy.2017.01.002>
- Martin, R. L., Bauer, B. W., Ramsey, K. L., Green, B. A., Capron, D. W., & Anestis, M. D. (2018). How distress tolerance mediates the relationship between posttraumatic stress disorder and the Interpersonal Theory of Suicide constructs in a U.S. Military sample. *Suicide and Life-Threatening Behavior, 0(0)*. <https://doi.org/10.1111/sltb.12523>
- May, A. M., & Klonsky, E. D. (2016). What distinguishes suicide attempters from suicide ideators? A meta-analysis of potential factors. *Clinical Psychology: Science and Practice, 23(1)*, 5–20. <https://doi.org/10.1111/cpsp.12136>
- McCammon, S. L. (1996). Emergency medical service workers: Occupational stress and traumatic stress. In D. Paton & J. M. Violanti (Eds.), *Traumatic stress in critical occupations: Recognition, consequences and treatment* (pp. 58–86). Charles C Thomas, Publisher.
- McHugh, R. K., Daughters, S. B., Lejuez, C. W., Murray, H. W., Hearon, B. A., Gorka, S. M., & Otto, M. W. (2011). Shared variance among self-report and behavioral measures of distress intolerance. *Cognitive Therapy and Research, 35(3)*, 266–275.  
<https://doi.org/10.1007/s10608-010-9295-1>

- McHugh, R. K., & Otto, M. W. (2012). Refining the measurement of distress intolerance. *Behavior Therapy, 43*(3), 641–651. <https://doi.org/10.1016/j.beth.2011.12.001>
- Meyer, E. C., Zimering, R., Daly, E., Knight, J., Kamholz, B. W., & Gulliver, S. B. (2012). Predictors of posttraumatic stress disorder and other psychological symptoms in trauma-exposed firefighters. *Psychological Services, 9*(1), 1–15. <https://doi.org/10.1037/a0026414>
- Miner, J. D., & Brush, L. R. (1980). The correlations of attitudes toward suicide with death anxiety, religiosity, and personal closeness to suicide. *Omega: Journal of Death and Dying, 11*(4), 317–324. <https://doi.org/10.2190/YP62-4U57-V8CJ-XYNH>
- Monteith, L. L., Menefee, D. S., Pettit, J. W., Leopoulos, W. L., & Vincent, J. P. (2013). Examining the Interpersonal–Psychological Theory of Suicide in an inpatient veteran sample. *Suicide and Life-Threatening Behavior, 43*(4), 418–428. <https://doi.org/10.1111/sltb.12027>
- Morrison, L. L., & Downey, D. L. (2000). Racial differences in self-disclosure of suicidal ideation and reasons for living: Implications for training. *Cultural Diversity and Ethnic Minority Psychology, 6*(4), 374–386. <https://doi.org/10.1037/1099-9809.6.4.374>
- Nestor, B. A., Cheek, S. M., & Liu, R. T. (2016). Ethnic and racial differences in mental health service utilization for suicidal ideation and behavior in a nationally representative sample of adolescents. *Journal of Affective Disorders, 202*, 197–202. <https://doi.org/10.1016/j.jad.2016.05.021>
- Nock, M. K., Borges, G., Bromet, E. J., Alonso, J., Angermeyer, M., Beautrais, A., Bruffaerts, R., Chiu, W. T., de Girolamo, G., Gluzman, S., de Graaf, R., Gureje, O.,

- Haro, J. M., Huang, Y., Karam, E., Kessler, R. C., Lepine, J. P., Levinson, D., Medina-Mora, M. E., ... 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., Hwang, I., Sampson, N., Kessler, R. C., Angermeyer, M., Beautrais, A., Borges, G., Bromet, E., Bruffaerts, R., de Girolamo, G., de Graaf, R., Florescu, S., Gureje, O., Haro, J. M., Hu, C., Huang, Y., Karam, E. G., Kawakami, N., Kovess, V., ... Williams, D. R. (2009). Cross-national analysis of the associations among mental disorders and suicidal behavior: Findings from the WHO World Mental Health Surveys. *PLoS Medicine*, *6*(8), e1000123–e1000123. PubMed. <https://doi.org/10.1371/journal.pmed.1000123>
- Nock, M. K., & Prinstein, M. J. (2005). Contextual features and behavioral functions of self-mutilation among adolescents. *Journal of Abnormal Psychology*, *114*(1), 140–146. <https://doi.org/10.1037/0021-843X.114.1.140>
- Nock, M. K., Stein, M. B., Heeringa, S. G., Ursano, R. J., Colpe, L. J., Fullerton, C. S., Hwang, I., Naifeh, J. A., Sampson, N. A., Schoenbaum, M., Zaslavsky, A. M., & 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>
- O’Keefe, V. M., Wingate, L. R., Tucker, R. P., Rhoades-Kerswill, S., Sligh, M. L., & Davidson, C. L. (2014). Interpersonal suicide risk for American Indians: Investigating

- thwarted belongingness and perceived burdensomeness. *Cultural Diversity and Ethnic Minority Psychology*, 20(1), 61–67. <https://doi.org/10.1037/a0033540>
- Orbach, I., Feshbach, S., Carlson, G. A., & Ellenberg, L. (1984). Attitudes toward life and death in suicidal, normal, and chronically ill children: An extended replication. *Journal of Consulting and Clinical Psychology*, 52(6), 1020–1027. <https://doi.org/10.1037/0022-006X.52.6.1020>
- Orbach, I., Mikulincer, M., King, R., Cohen, D., & Stein, D. (1997). Thresholds and tolerance of physical pain in suicidal and nonsuicidal adolescents. *Journal of Consulting and Clinical Psychology*, 65(4), 646–652. <https://doi.org/10.1037/0022-006X.65.4.646>
- Orbach, I., Stein, D., Palgi, Y., Asherov, J., Har-Even, D., & Elizur, A. (1996). Perception of physical pain in accident and suicide attempt patients: Self-preservation vs self-destruction. *Journal of Psychiatric Research*, 30(4), 307–320. [https://doi.org/10.1016/0022-3956\(96\)00008-8](https://doi.org/10.1016/0022-3956(96)00008-8)
- 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.comppsy.2012.02.009>

- Pennings, S. M., & Anestis, M. D. (2013). Discomfort Intolerance and the Acquired Capability for Suicide. *Cognitive Therapy and Research*, 37(6), 1269–1275.  
<https://doi.org/10.1007/s10608-013-9548-x>
- Pennings, S. M., Finn, J., Houtsma, C., Green, B. A., & Anestis, M. D. (2017). Posttraumatic stress disorder symptom clusters and the Interpersonal Theory of Suicide in a large military sample. *Suicide and Life-Threatening Behavior*, 47(5), 538–550.  
<https://doi.org/10.1111/sltb.12317>
- Perilla, J. L., Norris, F. H., & Lavizzo, E. A. (2002). Ethnicity, culture, and disaster response: Identifying and explaining ethnic differences in PTSD six months after Hurricane Andrew. *Journal of Social and Clinical Psychology*, 21(1), 20–45.  
<https://doi.org/10.1521/jscp.21.1.20.22404>
- Pietrzak, R. H., Goldstein, R. B., Southwick, S. M., & Grant, B. F. (2011). Prevalence and Axis I comorbidity of full and partial posttraumatic stress disorder in the United States: Results from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Anxiety Disorders*, 25(3), 456–465.  
<https://doi.org/10.1016/j.janxdis.2010.11.010>
- Pinninti, N., Steer, R. A., Rissmiller, D. J., Nelson, S., & Beck, A. T. (2002). Use of the Beck Scale for Suicide Ideation with psychiatric inpatients diagnosed with schizophrenia, schizoaffective, or bipolar disorders. *Behaviour Research and Therapy*, 40(9), 1071–1079. [https://doi.org/10.1016/S0005-7967\(02\)00002-5](https://doi.org/10.1016/S0005-7967(02)00002-5)
- Poindexter, E. K., Mitchell, S. M., Jahn, D. R., Smith, P. N., Hirsch, J. K., & Cukrowicz, K. C. (2015). PTSD symptoms and suicide ideation: Testing the conditional indirect

- effects of thwarted interpersonal needs and using substances to cope. *Personality and Individual Differences*, 77, 167–172. <https://doi.org/10.1016/j.paid.2014.12.043>
- Ribeiro, J. D., Witte, T. K., Van Orden, K. A., Selby, E. A., Gordon, K. H., Bender, T. W., & Joiner, T. E. (2014). Fearlessness about death: The psychometric properties and construct validity of the revision to the Acquired Capability for Suicide Scale. *Psychol Assess*, 26, 115–126.
- Roberts, A. L., Gilman, S. E., Breslau, J., Breslau, N., & Koenen, K. C. (2011). Race/ethnic differences in exposure to traumatic events, development of post-traumatic stress disorder, and treatment-seeking for post-traumatic stress disorder in the United States. *Psychological Medicine*, 41(1), 71–83. <https://doi.org/10.1017/S0033291710000401>
- Saijo, Y., Ueno, T., & Hashimoto, Y. (2008). Twenty-four-hour shift work, depressive symptoms, and job dissatisfaction among Japanese firefighters. *American Journal of Industrial Medicine*, 51(5), 380–391. <https://doi.org/10.1002/ajim.20571>
- Schimmenti, A., Passanisi, A., Caretti, V., La Marca, L., Granieri, A., Iacolino, C., Gervasi, A. M., Maganuco, N. R., & Billieux, J. (2017). Traumatic experiences, alexithymia, and Internet addiction symptoms among late adolescents: A moderated mediation analysis. *Addictive Behaviors*, 64, 314–320. <https://doi.org/10.1016/j.addbeh.2015.11.002>
- 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.

- 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>
- Smith, A. R., Ribeiro, J. D., Mikolajewski, A., Taylor, J., Joiner, T. E., & Iacono, W. G. (2012). An examination of environmental and genetic contributions to the determinants of suicidal behavior among male twins. *Psychiatry Research, 197*(1), 60–65. <https://doi.org/10.1016/j.psychres.2012.01.010>
- Smith, P. N., Cukrowicz, K. C., Poindexter, E. K., Hobson, V., & Cohen, L. M. (2010). The acquired capability for suicide: A comparison of suicide attempters, suicide ideators, and non-suicidal controls. *Depression and Anxiety, 27*(9), 871–877.  
<https://doi.org/10.1002/da.20701>
- Spitzer, E. G., Zuromski, K. L., Davis, M. T., Witte, T. K., & Weathers, F. (2018). Posttraumatic stress disorder symptom clusters and acquired capability for suicide: A reexamination using DSM-5 criteria. *Suicide & Life-Threatening Behavior, 48*(1), 105–115. <https://doi.org/10.1111/sltb.12341>
- Stanley, I. H., Boffa, J. W., Hom, M. A., Kimbrel, N. A., & Joiner, T. E. (2017). Differences in psychiatric symptoms and barriers to mental health care between volunteer and career firefighters. *Psychiatry Research, 247*, 236–242.  
<https://doi.org/10.1016/j.psychres.2016.11.037>
- Stanley, I. H., Boffa, J. W., Smith, L. J., Tran, J. K., Schmidt, N. B., Joiner, T. E., & Vujanovic, A. A. (2018). Occupational stress and suicidality among firefighters: Examining the buffering role of distress tolerance. *Psychiatry Research, 266*, 90–96. PubMed. <https://doi.org/10.1016/j.psychres.2018.05.058>

- Stanley, I. H., Boffa, J. W., Tran, J. K., Schmidt, N. B., Joiner, T. E., & Vujanovic, A. A. (2019). Posttraumatic stress disorder symptoms and mindfulness facets in relation to suicide risk among firefighters. *Journal of Clinical Psychology, 75*(4), 696–709. PubMed. <https://doi.org/10.1002/jclp.22748>
- Stanley, I. H., Hom, M. A., Gai, A. R., & Joiner, T. E. (2018). Wildland firefighters and suicide risk: Examining the role of social disconnectedness. *Psychiatry Research, 266*, 269–274. <https://doi.org/10.1016/j.psychres.2018.03.017>
- 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>
- Stanley, I. H., Smith, L. J., Boffa, J. W., Tran, J. K., Schmidt, N. B., Joiner, T. E., & Vujanovic, A. A. (2018). Anxiety sensitivity and suicide risk among firefighters: A test of the depression-distress amplification model. *Comprehensive Psychiatry, 84*, 39–46. <https://doi.org/10.1016/j.comppsy.2018.03.014>
- Streeb, N., Shoji, K., & Benight, C. C. (2018). The capability for suicide in firefighters. *Suicide and Life-Threatening Behavior, 0*(0). <https://doi.org/10.1111/sltb.12500>
- 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-](https://doi.org/10.1007/s00127-004-0799-4)



- Tomaka, J., Magoc, D., Morales-Monks, S. M., & Reyes, A. C. (2017). Posttraumatic stress symptoms and alcohol-related outcomes among municipal firefighters. *Journal of Traumatic Stress, 30*(4), 416–424. <https://doi.org/10.1002/jts.22203>
- Trout, D. L. (1980). The role of social isolation in suicide. *Suicide and Life-Threatening Behavior, 10*(1), 10–23. <https://doi.org/10.1111/j.1943-278X.1980.tb00693.x>
- Turecki, G., & Brent, D. A. (2016). Suicide and suicidal behaviour. *The Lancet, 387*(10024), 1227–1239. [https://doi.org/10.1016/S0140-6736\(15\)00234-2](https://doi.org/10.1016/S0140-6736(15)00234-2)
- Twenge, J. M., Baumeister, R. F., Tice, D. M., & Stucke, T. S. (2001). If you can't join them, beat them: Effects of social exclusion on aggressive behavior. *Journal of Personality and Social Psychology, 81*(6), 1058–1069. <https://doi.org/10.1037/0022-3514.81.6.1058>
- Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S., Selby, E. A., & Joiner, T. E. (2010). The interpersonal theory of suicide. *Psychology Review, 117*(2), 575–600. <https://doi.org/doi:10.1037/a0018697>
- 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. <http://dx.doi.org/10.1037/0022-006X.76.1.72>
- Van Orden, K. A., Cukrowicz, K. C., Witte, T. K., & Joiner Jr., T. E. (2012). Thwarted belongingness and perceived burdensomeness: Construct validity and psychometric properties of the Interpersonal Needs Questionnaire. *Psychological Assessment, 24*(1), 197–215. <https://doi.org/10.1037/a0025358>

- Venta, A., Mellick, W., Schatte, D., & Sharp, C. (2014). Preliminary evidence that thoughts of thwarted belongingness mediate the relations between level of attachment insecurity and depression and suicide-related thoughts in inpatient adolescents. *Journal of Social and Clinical Psychology, 33*(5), 428–447.  
<https://doi.org/10.1521/jscp.2014.33.5.428>
- 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>
- Vujanovic, A. A., & Bernstein, A. (2011). Traumatic stress. In *Distress tolerance: Theory, research, and clinical applications* (pp. 126–148). US: Guilford Press.
- Vujanovic, A. A., & Zegel, M. (in press). Distress tolerance and posttraumatic stress. In *Emotion in posttraumatic stress disorder*. Guilford Press.
- 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*.
- 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., 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., 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., 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). Springer International Publishing. [https://doi.org/10.1007/978-3-319-08613-2\\_66-1](https://doi.org/10.1007/978-3-319-08613-2_66-1)
- Wagner, D., Heinrichs, M., & Ehler, U. (1998). Prevalence of symptoms of posttraumatic stress disorder in German professional firefighters. *American Journal of Psychiatry*, 155(12), 1727–1732.
- Walker, R., Francis, D., Brody, G., Simons, R., Cutrona, C., & Gibbons, F. (2017). A longitudinal study of racial Discrimination and risk for death ideation in African American youth. *Suicide and Life-Threatening Behavior*, 47(1), 86–102.  
<https://doi.org/10.1111/sltb.12251>
- Walker, R. L. (2007). Acculturation and acculturative stress as indicators for suicide risk among African Americans. *American Journal of Orthopsychiatry*, 77(3), 386–391.  
<https://doi.org/10.1037/0002-9432.77.3.386>
- Walker, R. L., & Bishop, S. (2005). Examining a model of the relation between religiosity and suicidal ideation in a sample of African American and White college students.

- Suicide and Life-Threatening Behavior*, 35(6), 630–639.  
<https://doi.org/10.1521/suli.2005.35.6.630>
- Walker, R. L., Lester, D., & Joe, S. (2006). Lay theories of suicide: An examination of culturally relevant suicide beliefs and attributions among African Americans and European Americans. *Journal of Black Psychology*, 32(3), 320–334.  
<https://doi.org/10.1177/0095798406290467>
- 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)*. [www.ptsd.va.gov](http://www.ptsd.va.gov)
- Yoshimasu, K., Kiyohara, C., Miyashita, K., & The Stress Research Group of the Japanese Society for Hygiene. (2008). Suicidal risk factors and completed suicide: Meta-analyses based on psychological autopsy studies. *Environmental Health and Preventive Medicine*, 13(5), 243–256. <https://doi.org/10.1007/s12199-008-0037-x>
- You, S., Van Orden, K. A., & Conner, K. R. (2011). Social connections and suicidal thoughts and behavior. *Psychology of Addictive Behaviors*, 25(1), 180–184.  
<https://doi.org/10.1037/a0020936>
- Yuodelis-Flores, C., & Ries, R. K. (2015). Addiction and suicide: A review. *The American Journal on Addictions*, 24(2), 98–104. <https://doi.org/10.1111/ajad.12185>
- Zlotnick, C., Franklin, C. L., & Zimmerman, M. (2002). Does “subthreshold” posttraumatic stress disorder have any clinical relevance? *Comprehensive Psychiatry*, 43(6), 413–419. <https://doi.org/10.1053/comp.2002.35900>
- Zuromski, K. L., Davis, M. T., Witte, T. K., Weathers, F., & Blevins, C. (2014). PTSD symptom clusters are differentially associated with components of the acquired

capability for suicide. *Suicide and Life-Threatening Behavior*, 44(6), 682–697.

<https://doi.org/10.1111/sltb.12098>

Table 1  
*Participant Characteristics (N = 248)*

Variable	Mean (SD) / n (%)
Gender <sup>a</sup>	
Male	228 (91.9)
Female	19 (7.7)
Transgender	1 (0.4)
Race/ethnicity <sup>a</sup>	
White	202 (81.5)
Hispanic/Latino	45 (18.1)
Black/African American	12 (4.8)
‘Other’	17 (6.9)
Asian	6 (2.4)
Native Hawaiian/Pacific Islander	1 (0.4)
American Indian/Alaskan Native	10 (4.0)
Age <sup>a</sup>	40.23 (9.58)
Education <sup>a</sup>	
GED (or equivalent)	1 (0.4)
High school	23 (9.3)
Some college	99 (39.9)
Bachelor’s degree	125 (50.4)
Years of service in department <sup>a</sup>	22.03 (110.40)
Volunteer Firefighter Status <sup>a</sup>	24 (9.7)
Romantic Relationship Status <sup>a</sup>	
Married	179 (72.2)
Divorced	13 (5.2)
Living with partner	14 (5.6)
Single	42 (16.9)
Probable PTSD <sup>b</sup>	28 (11.3)
Probable suicide risk <sup>c</sup>	35 (14.1)
Average number of suicide-related calls on the job <sup>a</sup>	31.63 (49.34)
Trauma Exposure (happened to me, witnessed it, and/or part of my job) <sup>d</sup>	
Natural disaster	245 (98.8)
Fire or explosion	245 (98.8)
Transportation accident	246 (99.2)
Serious accident	216 (87.1)
Exposure to toxic substance	200 (80.6)
Physical assault	225 (90.7)
Assault with a weapon	213 (85.9)
Sexual assault	182 (73.4)
Other unwanted or uncomfortable sexual experience	140 (56.5)
Combat or exposure to a war-zone	39 (15.7)
Captivity	40 (16.1)

Life-threatening illness or injury	205 (82.7)
Severe human suffering	186 (75.0)
Sudden violent death	227 (91.5)
Sudden accidental death	223 (89.9)
Serious injury you caused to someone else	63 (25.4)
Any other stressful event or experience	133 (53.6)

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*Note:* a = Demographics questionnaire; b = PTSD Checklist for DSM-5 (PCL-5; diagnostic cut-off of 33); c = Suicide Behaviors Questionnaire – Revised (SBQ-R; diagnostic cut-off of 7); d = Life Events Checklist for DSM-5 (LEC-5)

Table 2. *Bivariate associations and descriptive statistics for study variables.*

Variables	1	2	3	4	5	6	7	8	9	10	11	M	SD	Range
1. LEC-5 Total	-	0.22**	0.20**	0.06	0.20**	-.01	-0.08	0.12	0.34**	0.01	-0.10	12.21	2.83	3-17
2. ODSIS Total		-	0.67**	0.50**	0.63**	0.48**	0.02	0.57**	0.28**	-0.36**	0.02	2.59	3.70	0-19
3. PCL-5 Total			-	0.40**	0.53**	0.33**	-0.02	0.50**	0.22**	-0.45**	-0.03	12.54	14.60	0-66
4. INQ-PB				-	0.54**	0.76**	0.16*	0.61**	0.23**	-0.24**	0.08	7.35	4.35	6-42
5. INQ-TB					-	0.42**	0.04	0.56**	0.22**	-0.29**	0.02	21.31	12.01	9-62
6. BSS-5 Total						-	0.14*	0.51**	0.16**	-0.24**	0.09	0.31	0.95	0-8
7. ACSS-FAD Total							-	0.10	0.17**	0.14*	-0.03	16.56	6.55	0-28
8. SBQ-R Total								-	0.24**	-0.23**	-0.03	4.53	2.01	3-13
9. PPES Total									-	0.03	-0.32**	52.73	9.10	30-83
10. DTS Total										-	-0.40**	61.51	12.23	18-75
11. DIS Total											-	9.10	5.37	0-24

*Note.* LEC-5 Total = Life Events Checklist for the DSM-5 total score; ODSIS Total = Overall Depression Severity and Impairment Scale total scale score; PCL-5 Total = Posttraumatic Stress Disorder Checklist for DSM-5 total score; INQ-PB = Interpersonal Needs Questionnaire, perceived burdensomeness subscale total score; INQ-TB = Interpersonal Needs Questionnaire, thwarted belongingness subscale total scale score; BSS-5 Total = Beck Scale for Suicide Ideation-5 total score; ACSS-FAD Total = Acquired Capability for Suicide Scale-Fearlessness About Death total score; SBQ-R Total = Suicide Behaviors Questionnaire- Revised total score; PPES Total = Painful and Provocative Events Scale total scale score; DTS Total = Distress Tolerance Scale total scale score; DIS Total = Discomfort Intolerance Scale total scale score.

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



Table 3  
*Moderated Mediation Model: Aims 1a and 1b*

<b>Y</b>	<b>Aim 1a</b>	<b>Model R<sup>2</sup></b>	<b>b</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
PB	PTSD → PB (a)	.27	0.02	0.02	0.83	.41	-.0278	.0679
	DT → PB	-	-0.01	0.02	-0.22	.83	-.0506	.0406
	PTSD*DT → PB (intx)	-	-0.00	0.00	-1.52	.13	-.0038	.0005
	Trauma load → PB	-	-0.08	0.09	-0.96	.34	-.2564	.0888
	Depression → PB	-	0.50	0.09	5.67	<.001	.3255	.6720
SI	PB → SI (b)	.60	0.15	0.01	14.91	<.001	.1324	.1727
	PTSD → SI (c')	-	-0.00	0.00	-0.76	.45	-.0097	.0043
	PTSD → PB → SI (a*b)	-	0.01	0.00	-	-	-.0020	.0147
	DT <sub>Low</sub> PTSD → PB → SI (c <sub>1</sub> )	-	0.01	0.01	-	-	-.0030	.0182
	DT <sub>Average</sub> PTSD → PB → SI (c <sub>2</sub> )	-	0.00	0.00	-	-	-.0035	.0093
	DT <sub>High</sub> PTSD → PB → SI (c <sub>3</sub> )	-	0.00	0.01	-	-	-.0136	.0085
	Index	-	-0.00	0.00	-	-	-.0012	.0003
	Trauma load → SI	-	-0.02	0.01	-1.76	.08	-.0520	.0029
	Depression → SI	-	0.04	0.01	2.91	<.01	.0141	.0729
<b>Y</b>	<b>Aim 1b</b>	<b>Model R<sup>2</sup></b>	<b>b</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
TB	PTSD → TB (a)	.45	0.19	0.06	3.35	.001	.0801	.3096
	DT → TB	-	-0.09	0.06	-1.56	.12	-.1956	.0230
	PTSD*DTS → TB (intx)	-	0.01	0.00	3.36	<.001	.0036	.0138
	Trauma load → TB	-	0.22	0.21	1.02	.31	-.1987	.6288
	Depression → TB	-	1.61	0.21	7.63	<.001	1.1943	2.2050
SI	TB → SI (b)	.26	0.02	0.01	2.9303	.0037	.0055	.0279
	PTSD → SI (c')	-	0.00	0.00	0.02	.98	-.0095	.0098
	PTSD → TB → SI (a*b)	-	0.00	0.00	-	-	.0003	.0051
	DT <sub>Low</sub> PTSD → TB → SI (c <sub>1</sub> )	-	0.00	0.00	-	-	-.0011	.0041
	DT <sub>Average</sub> PTSD → TB → SI (c <sub>2</sub> )	-	0.00	0.00	-	-	.0006	.0064

DT <sub>High</sub> PTSD → TB → SI (c <sub>3</sub> )	-	0.01	0.00	-	-	.0011	.0095
Index	-	0.00	0.00	-	-	.0000	.0003
Trauma load → SI	-	-0.04	0.02	-2.26	<.05	-.0801	-.0054
Depression → SI	-	0.09	0.02	4.44	<.001	.0523	.1356

*Note.* \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . The standard error and 95% CI is obtained via bootstrapping with 10,000 resamples. PTSD (X) = PTSD symptom severity (PTSD Checklist for DSM-5 total score); PB (M<sub>1</sub>) = Perceived burdensomeness (Interpersonal Needs Questionnaire- Perceived Burdensomeness Subscale; [Aim 1a]); TB (M<sub>2</sub>) = Thwarted belongingness (Interpersonal Needs Questionnaire- Thwarted Belongingness Subscale; [Aim 1b]); SI (Y) = Suicide ideation severity (Beck Scale for Suicide Ideation - 5 total score); DT (W) = Perceived emotional distress tolerance (Distress Tolerance Scale total score); Depression (covariate) = Depressive symptom severity (Overall Depression Severity and Impairment Scale total score); Trauma Load (covariate) = Total number of traumatic event types experienced (Life Events Checklist-Version 5 total score); LLCI = lower level of a 95% confidence interval; ULCI = upper level of a 95% confidence interval; a = effect of X on M; b = effect of M on Y; intx = interactive effect of X and W on M; c' = direct effect of X on Y, controlling for M; a\*b = indirect effect of X on Y through M, excluding W; c<sub>1</sub> = conditional indirect effect of X on Y at -1SD below the mean of W; c<sub>2</sub> = conditional indirect effect of X on Y at the mean of W; c<sub>3</sub> = conditional indirect effect of X on Y at +1SD above the mean of W; index = index of moderated mediation. All direct, indirect, and conditional direct paths are noted after controlling for the variance accounted for by theoretically relevant covariates, including trauma load and depressive symptom severity.

Table 4  
*Moderated Mediation Model: Aim 2*

<b>Y</b>	<b>Aim 2</b>	<b>Model R<sup>2</sup></b>	<b>b</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
PPDT	PTSD → PPDT (a)	.13	-0.02	0.03	-0.72	.47	-.0803	.0375
	PPE → PPDT	-	-0.21	0.04	-5.43	<.001	-.2891	-.1353
	PTSD*PPE → PPDT (intx)	-	0.0	0.00	-0.00	.99	-.0044	.0044
	Trauma load → PPDT	-	0.02	0.12	0.15	.88	-.2268	.2633
	Depression → PPDT	-	0.16	0.13	1.21	.23	-.0972	.4080
	SI → PPDT	-	0.64	0.40	1.62	.11	-.1395	1.4241
Capability	PPDT → Capability (b)	.03	-0.06	0.08	-0.80	.42	-.2162	.0908
	PTSD → Capability (c')	-	-0.02	0.04	-0.62	.53	-.0994	.0518
	PTSD → PPDT → Capability (a*b)	-	0.00	0.00	-	-	-.0042	.0112
	PPE <sub>Low</sub> PTSD → PPDT → Capability (c <sub>1</sub> )	-	0.00	0.00	-	-	-.0049	.0115
	PPE <sub>Average</sub> PTSD → PPDT → Capability (c <sub>2</sub> )	-	0.00	0.00	-	-	-.0039	.0101
	PPE <sub>High</sub> PTSD → PPDT → Capability (c <sub>3</sub> )	-	0.00	0.00	-	-	-.0055	.0116
	Index	-	0.00	0.00	-	-	-.0005	.0005
	Trauma load → Capability	-	-0.17	0.15	-1.13	.26	-.4727	.1274
	Depression → Capability	-	-0.02	0.16	-0.11	.92	-.3388	.3045
	SI → Capability	-	1.16	0.50	2.31	<.05	.1697	2.1496

*Note.* \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . The standard error and 95% CI is obtained via bootstrapping with 10,000 resamples. PTSD (X) = PTSD symptom severity (PTSD Checklist for DSM-5 total score); PPDT (M) = Perceived physical discomfort tolerance (Discomfort Intolerance Scale total score); Capability (Y) = Capability for suicide (Acquired Capability for Suicide Scale-Fearlessness About Death total score); PPE (W) = Painful and provocative events (Painful and Provocative Events Scale total score); Trauma load (covariate) = Total number of traumatic event types experienced (Life Events Checklist-Version 5 total score); Depression (covariate) = Depressive symptom severity (Overall Depression Severity and Impairment Scale total score); SI (covariate) = Suicide ideation severity (Beck Scale for Suicide Ideation – 5 total score); LLCI = lower level of a 95% confidence

interval; ULCI = upper level of a 95% confidence interval;  $a$  = effect of  $X$  on  $M$ ;  $b$  = effect of  $M$  on  $Y$ ;  $intx$  = interactive effect of  $X$  and  $W$  on  $M$ ;  $c'$  = direct effect of  $X$  on  $Y$ , controlling for  $M$ ;  $a*b$  = indirect effect of  $X$  on  $Y$  through  $M$ , excluding  $W$ ;  $c_1$  = conditional indirect effect of  $X$  on  $Y$  at  $-1SD$  below the mean of  $W$ ;  $c_2$  = conditional indirect effect of  $X$  on  $Y$  at the mean of  $W$ ;  $c_3$  = conditional indirect effect of  $X$  on  $Y$  at  $+1SD$  above the mean of  $W$ ;  $index$  = index of moderated mediation. All direct, indirect, and conditional direct paths are noted after controlling for the variance accounted for by theoretically relevant covariates, including trauma load, suicide ideation severity, and depressive symptom severity.

Table 5  
*Moderated Mediation Model: Aims 3a and 3b*

<b>Y</b>	<b>Aim 3a</b>	<b>Model R<sup>2</sup></b>	<b>b</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
Capability	PTSD → Capability (a)	.01	-0.02	0.04	-0.50	.62	-.0953	.0567
	Trauma load → Capability	-	-0.21	0.15	-1.3536	.18	-.5035	.0933
	Depression → Capability	-	0.11	0.15	0.75	.45	-.1860	.4155
Risk	Capability → Risk (b)	.48	0.01	0.01	0.67	0.51	-.0189	.0383
	PB → Risk	-	0.17	0.03	5.25	<.001	.1090	.2401
	Capability*PB → Risk (intx)	-	0.00	0.00	0.77	.44	-.0048	.0110
	PTSD → Risk (c')	-	0.02	0.01	2.82	<.01	.0075	.0422
	PTSD → Capability → Risk (a*b)	-	-0.00	0.00	-	-	-.0036	.0022
	PB <sub>Low</sub> PTSD → Capability → Risk (c <sub>1</sub> )	-	-0.00	0.00	-	-	-.0018	.0012
	PB <sub>Average</sub> PTSD → Capability → Risk (c <sub>2</sub> )	-	-0.00	0.00	-	-	-.0020	.0015
	PB <sub>High</sub> PTSD → Capability → Risk (c <sub>3</sub> )	-	-0.00	0.00	-	-	-.0014	.0041
	Index	-	-0.00	0.00	-	-	-.0006	.0007
	Trauma load → Risk	-	0.01	0.03	0.26	.79	-.0579	.0757
	Depression → Risk	-	0.13	0.04	3.55	<.001	.0577	.2013
<b>Y</b>	<b>Aim 3b</b>	<b>Model R<sup>2</sup></b>	<b>b</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
3b	PTSD → Capability (a)	.01	-0.02	0.04	-0.50	.62	-.0953	.0567
	Trauma load → Capability	-	-0.21	0.15	-1.35	.18	-.5035	.0933
	Depression → Capability	-	0.11	0.15	0.75	.45	-.1860	.4155
3b	Capability → Risk (b)	.43	0.02	0.01	1.61	.11	-.0054	.0535
	TB → Risk	-	0.05	0.01	4.81	<.001	.0303	.0723
	Capability*TB → Risk (intx)	-	0.00	0.00	2.88	<.01	.0011	.0059
	PTSD → Risk (c')	-	0.03	0.01	2.78	<.01	0.01	0.04
	PTSD → Capability → Risk (a*b)	-	-0.00	0.00	-	-	-.0036	.0022
	TB <sub>Low</sub> PTSD → Capability → Risk (c <sub>1</sub> )	-	0.00	0.00	-	-	-.0045	.0034
	TB <sub>Average</sub> PTSD → Capability → Risk (c <sub>2</sub> )	-	-0.00	0.00	-	-	-.0090	.0068

TB <sub>High</sub> PTSD → Capability → Risk (c <sub>3</sub> )	-	-0.00	0.00	-	-	-.0074	.0052
Index	-	-0.00	0.00	-	-	-.0004	.0003
Trauma load → Risk	-	-0.02	0.04	-0.61	.54	-.0917	.0484
Depression → Risk	-	0.12	0.04	2.90	<.01	.0376	.1976

*Note.* \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . The standard error and 95% CI is obtained via bootstrapping with 10,000 resamples. PTSD (X) = PTSD symptom severity (PTSD Checklist for DSM-5 total score); Capability (M) = Capability for suicide (Acquired Capability for Suicide Scale- Fearlessness About Death total score); Risk (Y) = Global suicide risk (Suicide Behaviors Questionnaire -Revised total score); PB (W<sub>1</sub>) = Perceived burdensomeness (Interpersonal Needs Questionnaire- Perceived Burdensomeness Subscale; [Aim 3a]); TB (W<sub>2</sub>) = Thwarted belongingness (Interpersonal Needs Questionnaire- Thwarted Belongingness Subscale; [Aim 3b]); Trauma load (covariate) = Total number of traumatic event types experienced (Life Events Checklist-Version 5 total score); Depression (covariate) = Depressive symptom severity (Overall Depression Severity and Impairment Scale total score); LLCI = lower level of a 95% confidence interval; ULCI = upper level of a 95% confidence interval; a = effect of X on M; b = effect of M on Y; intx = interactive effect of M and W on Y; c' = direct effect of X on Y, controlling for M; a\*b = indirect effect of X on Y through M, excluding W; c<sub>1</sub> = conditional indirect effect of X on Y at -1SD below the mean of W; c<sub>2</sub> = conditional indirect effect of X on Y at the mean of W; c<sub>3</sub> = conditional indirect effect of X on Y at +1SD above the mean of W; index = index of moderated mediation. All direct, indirect, and conditional direct paths are noted after controlling for the variance accounted for by theoretically relevant covariates, including trauma load and depressive symptom severity.

Table 6

*Bivariate associations and descriptive statistics for study variables among firefighters who endorsed racial/ethnic minority status*

Variables	1	2	3	4	5	6	7	8	9	10	11	M	SD	Range
1. LEC-5 Total	-	0.15	0.20	0.14	0.19	0.08	-0.04	0.23*	0.31**	-0.06	-0.04	11.91	2.96	5-17
2. ODSIS Total		-	0.68**	0.63**	0.70**	0.60**	0.14	0.68**	0.24*	-0.61**	0.22	2.07	3.93	0-19
3. PCL-5 Total			-	0.55**	0.60**	0.48**	0.14	0.57**	0.18	-0.50**	0.19	10.84	14.35	0-56
4. INQ-PB				-	0.66**	0.82**	0.23	0.78**	0.42**	-0.37**	0.07	7.86	6.22	6-42
5. INQ-TB					-	0.51**	0.08	0.66**	0.30**	-0.41**	0.10	20.59	12.95	9-62
6. BSS-5 Total						-	0.23*	0.64**	0.37**	-0.30**	0.13	0.39	1.22	0-8
7. ACSS-FAD Total							-	0.15	0.23*	-0.02	0.01	17.58	6.50	4-28
8. SBQR-Total								-	0.35**	-0.36**	-0.05	4.46	2.24	3-13
9. PPES-Total									-	-0.01	-0.26*	51.79	9.85	33-78
10. DTS-Total										-	-0.48**	61.51	11.95	19-75
11. DIS-Total											-	9.92	6.24	0-23

*Note.* Racial/ethnic minority status was defined as firefighters endorsing identification with the following racial/ethnic minority groups: Hispanic/Latino, Black/African American, 'Other', Asian, Native Hawaiian/Pacific Islander, American Indian/Alaskan Native. LEC-5 Total = Life Events Checklist for the DSM-5 total score; ODSIS Total = Overall Depression Severity and Impairment Scale total scale score; PCL-5 Total = Posttraumatic Stress Disorder Checklist for DSM-5 total score; INQ-PB = Interpersonal Needs Questionnaire, perceived burdensomeness subscale total score; INQ-TB = Interpersonal Needs Questionnaire, thwarted belongingness subscale total score; BSS-5 Total = Beck Scale for Suicide Ideation-5 total score; ACSS-FAD Total = Acquired Capability for Suicide Scale-Fearlessness About Death total score; SBQ-R Total = Suicide Behaviors Questionnaire- Revised total score; PPES Total = Painful and Provocative Events Scale total scale score; DTS Total = Distress Tolerance Scale total scale score; DIS Total = Discomfort Intolerance Scale total scale score. \*p <.05, \*\*p <.01

Table 7

*Bivariate associations and descriptive statistics for study variables among firefighters who endorsed White (i.e., non-Hispanic) racial status*

Variables	1	2	3	4	5	6	7	8	9	10	11	M	SD	Range
1. LEC-5 Total	-	0.24**	0.19*	-0.01	0.20**	-0.06	-0.09	0.06	0.35**	0.04	-0.13	12.34	2.77	3-17
2. ODSIS Total		-	0.66**	0.43**	0.60**	0.41**	-0.03	0.51**	0.29**	-0.24**	-0.08	2.82	3.58	0-15
3. PCL-5 Total			-	0.32**	0.49**	0.27**	-0.08	0.47**	0.23**	-0.44**	-0.13	13.30	14.69	0-66
4. INQ-PB				-	0.48**	0.70**	0.11	0.49**	0.08	-0.16*	0.08	7.12	3.19	6-27
5. INQ-TB					-	0.37**	0.03	0.51**	0.18*	-0.23**	-0.03	21.63	11.59	9-57
6. BSS-5 Total						-	0.08	0.42**	0.02	-0.21**	0.04	0.28	0.80	0-4
7. ACSS-FAD Total							-	0.08	0.15*	0.20**	-0.07	16.10	6.54	0-28
8. SBQ-R Total								-	0.17*	-0.17*	-0.01	4.56	1.90	3-13
9. PPES Total									-	0.05	-0.35**	53.15	8.74	30-83
10. DTS Total										-	-0.36**	61.51	12.38	18-75
11. DIS Total											-	8.74	4.91	0-24

*Note.* LEC-5 Total = Life Events Checklist for the DSM-5 total score; ODSIS Total = Overall Depression Severity and Impairment Scale total scale score; PCL-5 Total = Posttraumatic Stress Disorder Checklist for DSM-5 total score; INQ-PB = Interpersonal Needs Questionnaire, perceived burdensomeness subscale total score; INQ-TB = Interpersonal Needs Questionnaire, thwarted belongingness subscale total scale score; BSS-5 Total = Beck Scale for Suicide Ideation-5 total score; ACSS-FAD Total = Acquired Capability for Suicide-Fearlessness About Death total score; SBQ-R Total = Suicide Behaviors Questionnaire- Revised total score; PPES Total = Painful and Provocative Events Scale total scale score; DTS Total = Distress Tolerance Scale total scale score; DIS Total = Discomfort Intolerance Scale total scale score.

\* $p < .05$ , \*\* $p < .01$

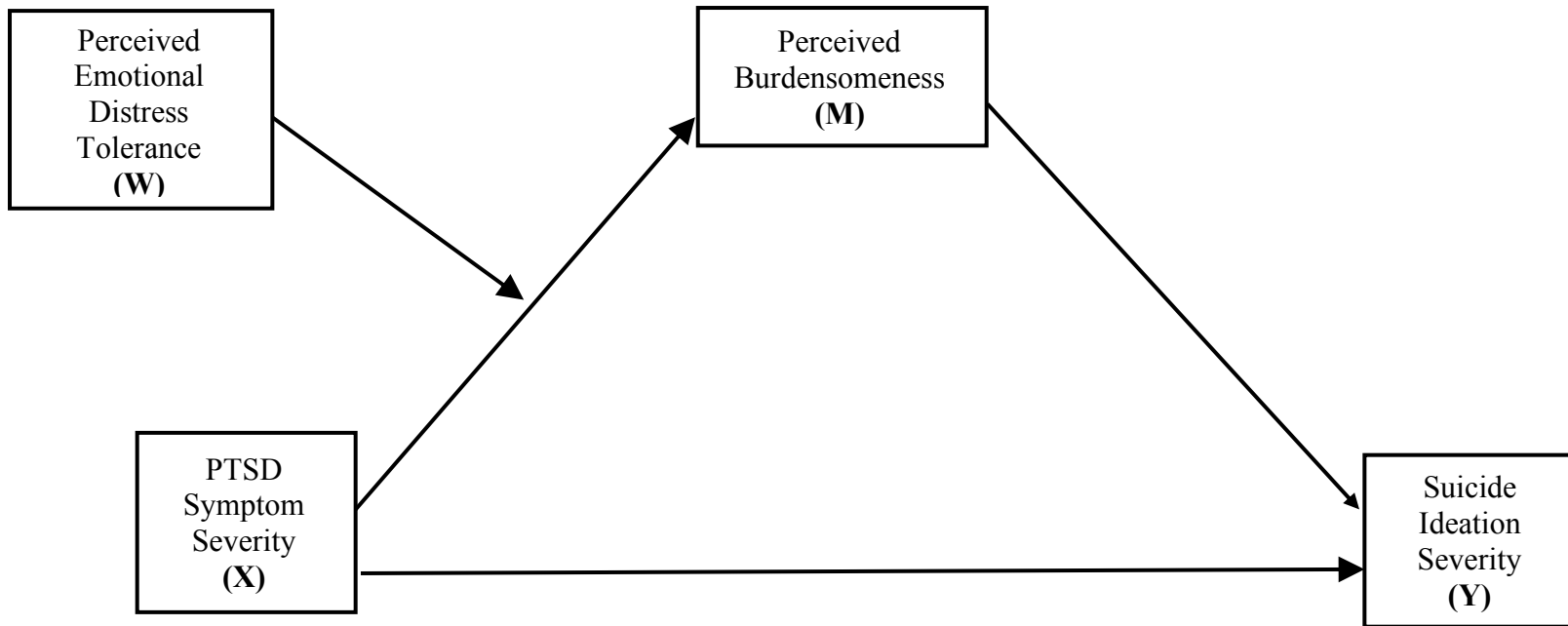


Table 8. *Exploratory Analyses: Comparing Main Variables among White (non-Hispanic) and Racial/Ethnic Minority Status<sup>^</sup>*

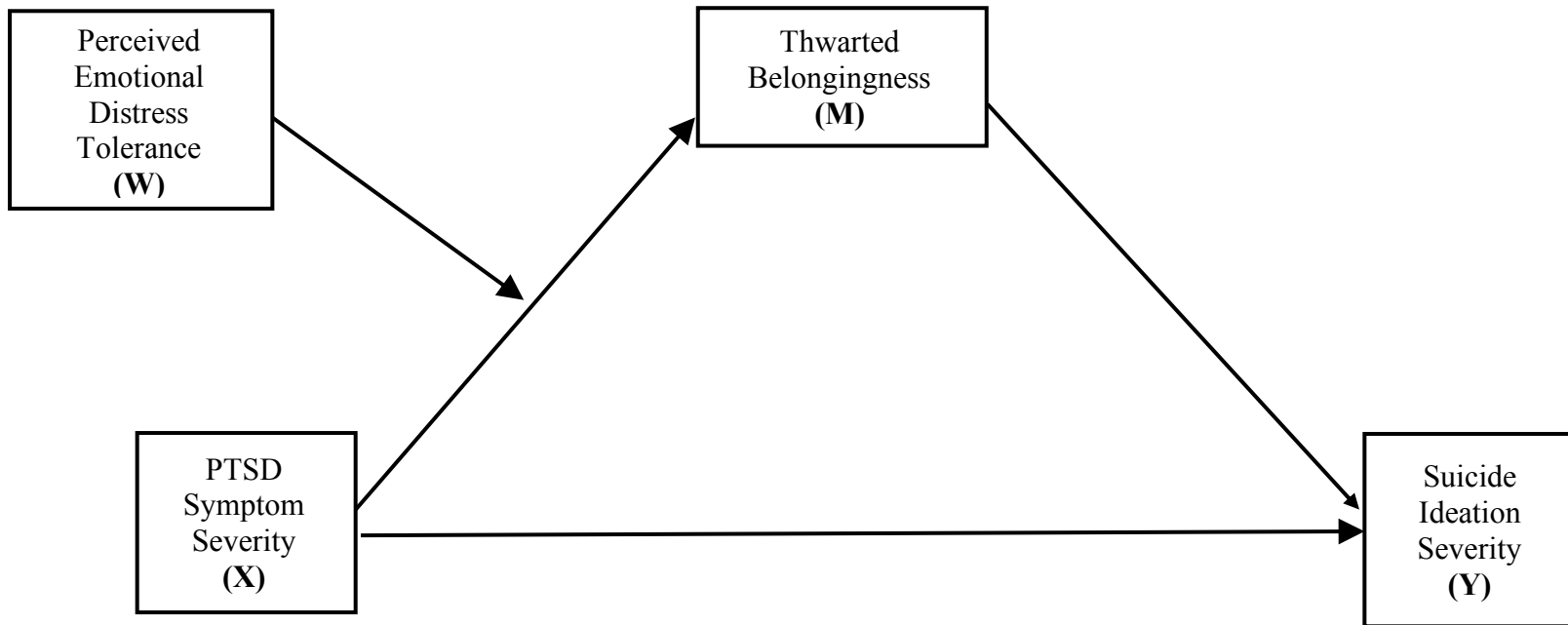
<i>M/n (SD/%)</i>	White (non_Hispanic) ( <i>n</i> =172)	CI (99%)	White (non- Hispanic) Adj Means	Racial/Ethnic Minority Status ( <i>n</i> =76)	CI (99%)	Racial/Ethnic Minority Status Adj Means	ANCOVA			
							<i>df</i>	F-value	<i>p</i> -value	$\eta^2$
<b>PTSD Symptom Severity<sup>1</sup></b>	13.30 (14.60)	[10.50-14.82]	12.66 (.83)	10.84 (14.35)	[9.03-15.54]	12.29 (1.25)	(1, 244)	0.06	ns	.00
<b>PB<sup>2</sup></b>	7.12 (3.19)	[6.25-7.73]	6.99 (.29)	7.86 (6.22)	[7.03-9.27]	8.15 (.43)	(1, 244)	5.00	ns	.02
<b>TB<sup>3</sup></b>	21.63 (11.59)	[19.28-22.98]	21.13 (.71)	20.59 (12.95)	[18.93-24.52]	21.73 (1.08)	(1, 244)	0.21	ns	.001
<b>Suicide Ideation Severity<sup>4</sup></b>	.28 (0.80)	[0.09-0.42]	0.25 (0.06)	0.39 (1.22)	[0.20-0.70]	0.45 (.10)	(1, 244)	2.98	ns	.01
<b>Capability for Suicide<sup>5</sup></b>	16.10 (6.54)	[14.89-17.46]	16.18 (0.50)	17.58 (6.50)	[15.47-19.36]	17.42 (0.75)	(1, 243)	1.89	ns	.01
<b>Global Suicide Risk<sup>6</sup></b>	4.56 (1.90)	[4.16-4.82]	4.49 (0.13)	4.46 (2.24)	[4.13-5.12]	4.62 (0.19)	(1, 244)	0.32	ns	.001
<b>Perceived Physical Discomfort Tolerance<sup>7</sup></b>	8.74 (4.91)	[7.69-9.81]	8.75 (0.41)	9.92 (6.24)	[8.31-11.50]	9.90 (0.62)	(1, 244)	2.42	ns	.01
<b>Perceived Emotional Distress Tolerance<sup>8</sup></b>	61.51 (12.38)	[59.47-64.01]	61.74 (0.87)	61.51 (11.95)	[57.56-64.40]	60.98 (1.32)	(1, 244)	0.23	ns	.001

*Note:* 1 = PTSD Checklist for DSM-5 total score (PCL-5); 2 = Interpersonal Needs Questionnaire- Perceived Burdensomeness Subscale (INQ-PB); 3 = Interpersonal Needs Questionnaire- Thwarted Belongingness Subscale (INQ-TB); 4 = Beck Scale for Suicide Ideation, total of first 5 items (BSS-5); 5 = Acquired Capability for Suicide Scale- Fearlessness About Death total score (ACSS-FAD); 6= Suicide Behaviors Questionnaire- Revised total score (SBQ-R); 7=Discomfort Intolerance Scale total score (DIS); 8=Distress Tolerance Scale total score (DTS). Racial/ethnic minority status was defined as firefighters endorsing identification with the following racial/ethnic minority groups: Hispanic/Latino, Black/African American, ‘Other’, Asian, Native Hawaiian/Pacific Islander, American Indian/Alaskan Native.

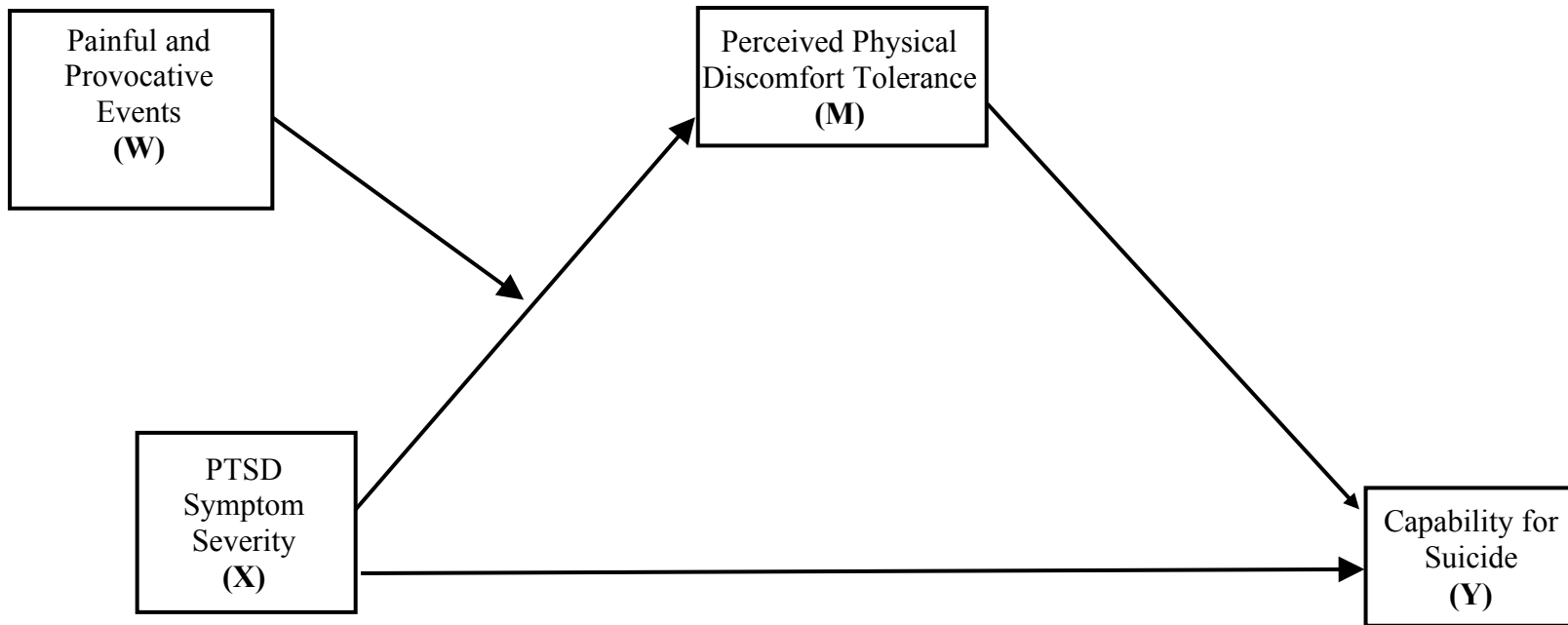
<sup>^</sup>Results remained consistent without the inclusion of covariates.



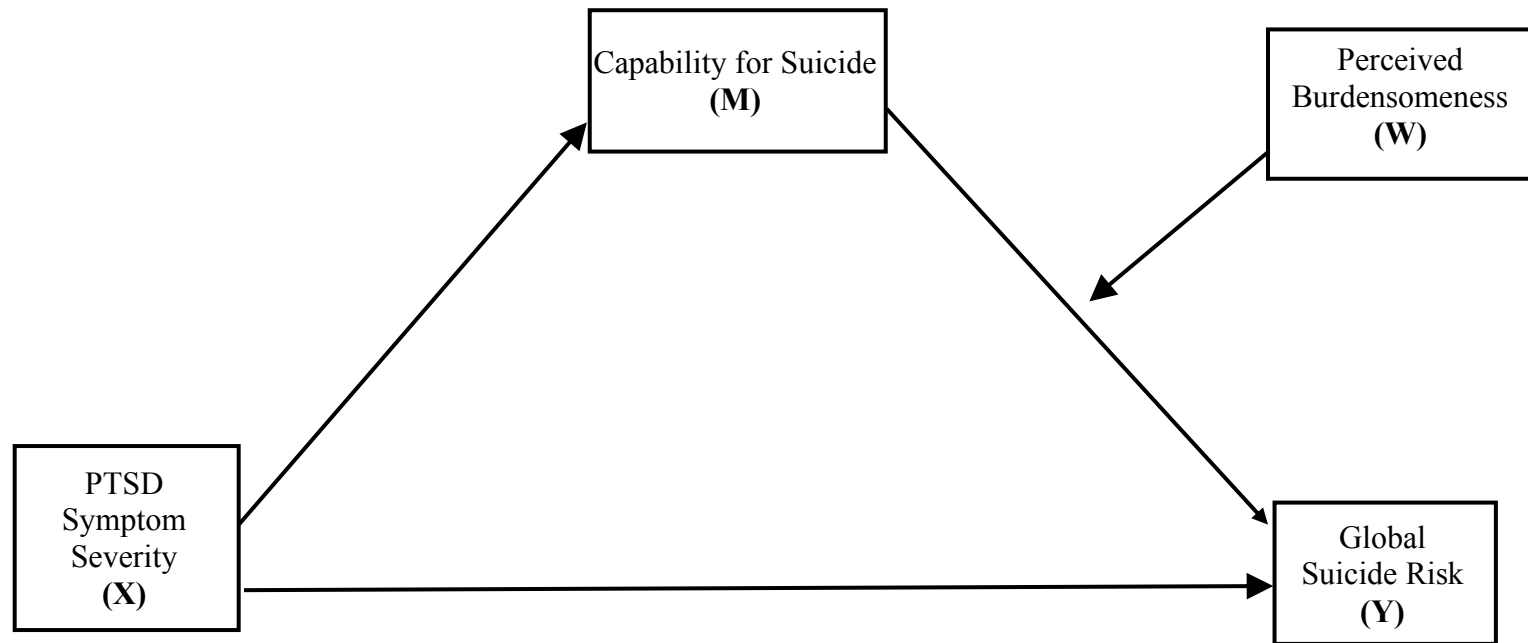
*Figure 1. Theoretical model for Aim 1a.* Hypothesis 1: Indirect effect of PTSD symptom severity (X) on suicide ideation severity (Y) through perceived burdensomeness (M), excluding perceived emotional distress tolerance (W); Hypothesis 2: Interactive (i.e., moderating) effect of PTSD symptom severity (X) and perceived emotional distress tolerance (W) on perceived burdensomeness (M); Hypothesis 3: Conditional indirect effect of PTSD symptom severity (X) on suicide ideation severity (Y) through perceived burdensomeness (M) based on different levels (i.e., -1SD, average SD, +1SD) of perceived emotional distress tolerance (W); PTSD Symptom Severity = Posttraumatic Stress Disorder Checklist for *DSM-5* total score (PCL-5; Blevins et al., 2015); Perceived Emotional Distress Tolerance = Distress Tolerance Scale total score (DTS; Simons & Gaher, 2005); Perceived Burdensomeness = Perceived burdensomeness subscale of the Interpersonal Needs Questionnaire (INQ; Van Orden et al., 2012); Suicide Ideation Severity = Beck Scale for Suicide Ideation, total score of the first five items (BSS-5; Beck & Steer, 1991). All effects expected above and beyond covariates of depressive symptom severity (Overall Depression Severity and Impairment Scale; Bentley et al., 2014) and trauma load (Life Events Checklist-Version 5; Weathers et al., 2013).



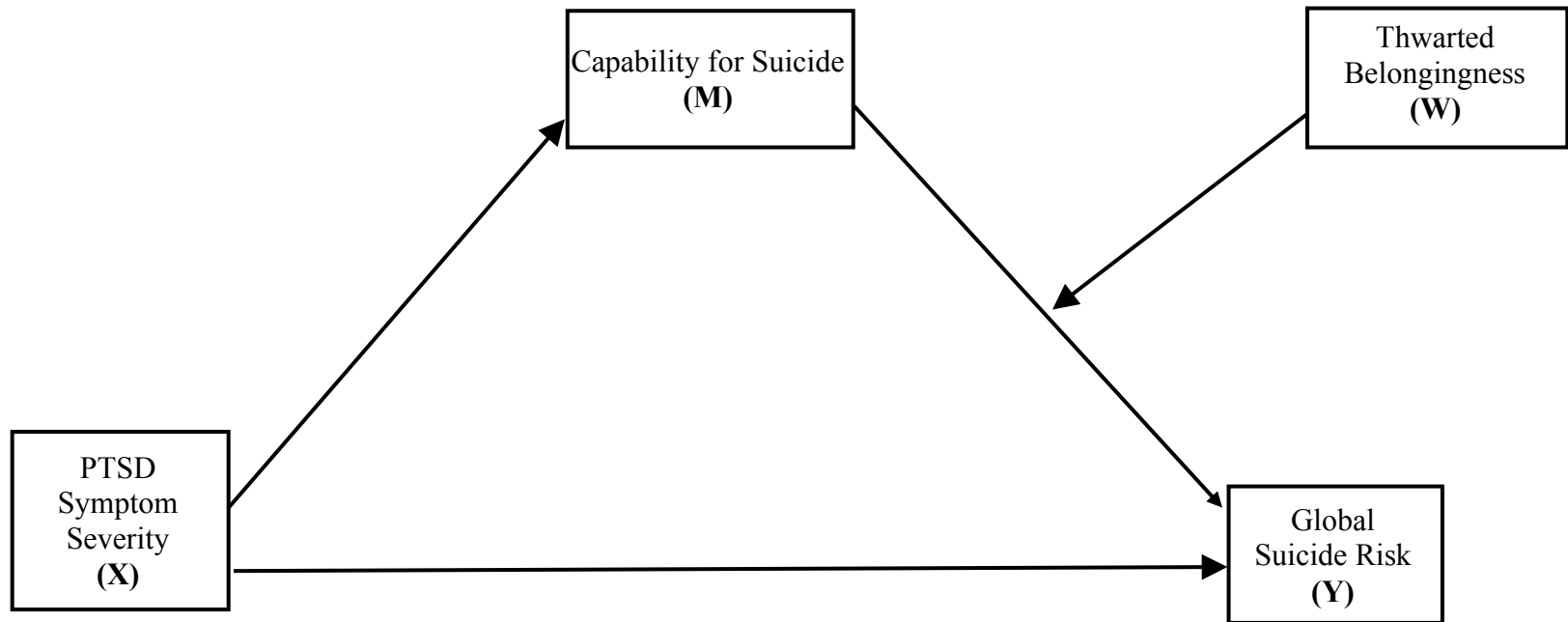
*Figure 2. Theoretical model for Aim 1b.* Hypothesis 1: Indirect effect of PTSD symptom severity (X) on suicide ideation severity (Y) through thwarted belongingness (M), excluding perceived emotional distress tolerance (W); Hypothesis 2: Interactive (i.e., moderating) effect of PTSD symptom severity (X) and perceived emotional distress tolerance (W) on thwarted belongingness (M); Hypothesis 3: Conditional indirect effect of PTSD symptom severity (X) on suicide ideation severity (Y) through thwarted belongingness (M) based on different levels (i.e., -1SD, average SD, +1SD) of perceived emotional distress tolerance (W); PTSD Symptom Severity = Posttraumatic Stress Disorder Checklist for *DSM-5* total score (PCL-5; Blevins et al., 2015); Perceived Emotional Distress Tolerance = Distress Tolerance Scale total score (DTS; Simons & Gaher, 2005); Thwarted Belongingness = Thwarted belongingness subscale of the Interpersonal Needs Questionnaire (INQ; Van Orden et al., 2012); Suicide Ideation Severity = Beck Scale for Suicide Ideation, total score of the first five items (BSS-5; Beck & Steer, 1991). All effects expected above and beyond covariates of depressive symptom severity (Overall Depression Severity and Impairment Scale; Bentley et al., 2014) and trauma load (Life Events Checklist-Version 5; Weathers et al., 2013).



*Figure 3. Theoretical model for Aim 2. Hypothesis 1: Indirect effect of PTSD symptom severity (X) on capability for suicide (Y) through perceived physical discomfort tolerance (M), excluding painful and provocative events (W); Hypothesis 2: Interactive (i.e., moderating) effect of PTSD symptom severity (X) and painful and provocative events (W) on perceived physical discomfort tolerance (M); Hypothesis 3: Conditional indirect effect of PTSD symptom severity (X) on capability for suicide (Y) through perceived physical discomfort tolerance (M) based on different levels (i.e., -1SD, average SD, +1SD) of painful and provocative events (W); PTSD Symptom Severity = Posttraumatic Stress Disorder Checklist for DSM-5 total score (PCL-5; Blevins et al., 2015); Painful and Provocative Events = Painful and Provocative Events Scale total score (PPES; Bender et al., 2011); Perceived Physical Discomfort Tolerance = Discomfort Intolerance Scale total score (DIS; Schmidt et al., 2006); Capability for Suicide = Acquired Capability for Suicide Scale – Fearlessness About Death total score (ACSS-FAD; Ribeiro et al., 2014). All effects expected above and beyond covariates of depressive symptom severity (Overall Depression Severity and Impairment Scale; Bentley et al., 2014), trauma load (Life Events Checklist-Version 5; Weathers et al., 2013), and suicide ideation severity (Beck Scale for Suicide Ideation-5; Beck & Steer, 1991).*



*Figure 4. Theoretical model for Aim 3a.* Hypothesis 1: Indirect effect of PTSD symptom severity (X) on global suicide risk (Y) through capability for suicide (M), excluding perceived burdensomeness (W); Hypothesis 2: Interactive (i.e., moderating) effect of capability for suicide (M) and perceived burdensomeness (W) on global suicide risk (Y); Hypothesis 3: Conditional indirect effect of PTSD symptom severity (X) on global suicide risk (Y) through capability for suicide (M) based on different levels (i.e., -1SD, average SD, +1SD) of perceived burdensomeness (W); PTSD Symptom Severity = Posttraumatic Stress Disorder Checklist for *DSM-5* total score (PCL-5; Blevins et al., 2015); Capability for Suicide = Acquired Capability for Suicide Scale – Fearlessness About Death total score (ACSS-FAD; Ribeiro et al., 2014); Perceived Burdensomeness = Perceived burdensomeness subscale of the Interpersonal Needs Questionnaire (INQ; Van Orden et al., 2012); Suicide Risk = Suicide Behaviors Questionnaire – Revised total score (SBQ-R; Osman et al., 2001). All effects expected above and beyond covariates of depressive symptom severity (Overall Depression Severity and Impairment Scale; Bentley et al., 2014) and trauma load (Life Events Checklist-Version 5; Weathers et al., 2013).



*Figure 5. Theoretical model for Aim 3b.* Hypothesis 1: Indirect effect of PTSD symptom severity (X) on global suicide risk (Y) through capability for suicide (M), excluding thwarted belongingness (W); Hypothesis 2: Interactive (i.e., moderating) effect of capability for suicide (M) and thwarted belongingness (W) on global suicide risk (Y); Hypothesis 3: Conditional indirect effect of PTSD symptom severity (X) on global suicide risk (Y) through capability for suicide (M) based on different levels (i.e., -1SD, average SD, +1SD) of thwarted belongingness (W); PTSD Symptom Severity = Posttraumatic Stress Disorder Checklist for *DSM-5* total score (PCL-5; Blevins et al., 2015); Capability for Suicide = Acquired Capability for Suicide Scale – Fearlessness About Death total score (ACSS-FAD; Ribeiro et al., 2014); Thwarted Belongingness = Thwarted Belongingness subscale of the Interpersonal Needs Questionnaire (INQ; Van Orden et al., 2012); Global Suicide Risk = Suicide Behaviors Questionnaire – Revised total score (SBQ-R; Osman et al., 2001). All effects expected above and beyond covariates of depressive symptom severity (Overall Depression Severity and Impairment Scale; Bentley et al., 2014) and trauma load (Life Events Checklist-Version 5; Weathers et al., 2013).