



PTSD symptoms and suicidal thoughts and behaviors among firefighters



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ABSTRACT

Research into the causes and prevention of suicide has been deemed a national priority, with a recent focus on sectors of the workforce, such as firefighters, who experience occupational hazards that may confer risk for suicide. Elevated levels of posttraumatic stress symptoms (PTSS), which show robust relationships with both suicidal ideation (SI) and suicide attempts, are common among firefighters. However, no study to date has investigated the relationship between PTSS and suicidality among firefighters. The current study therefore aimed to identify the degree to which PTSS were related to a history of SI and prior attempts in a national sample of firefighters ($N = 893$). Results revealed that greater PTSS were associated with greater risk of reporting lifetime SI and prior attempts, after controlling for other known risk factors for suicidality. Exploratory models investigating the unique contributions of individual PTSS clusters to suicidality found that numbing and re-experiencing PTSS were significantly related to SI, but only re-experiencing was related to prior attempts. The theoretical and clinical implications of these relationships, particularly among firefighters, are discussed.

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Each year, over 40,000 individuals in the United States and over 800,000 individuals worldwide die by suicide (Centers for Disease Control and Prevention [CDC], 2016; World Health Organization [WHO], 2014). Beyond the measurable loss of human lives, suicide also has widespread effects on the broader social milieu, including a profound emotional impact on bereaved loved ones (Cerel et al., 2008; Pitman et al., 2014) and annual economic costs (e.g., medical expenditures, loss of work productivity) exceeding \$44 billion in the United States (CDC, 2014). Thus, suicide prevention research has been identified as a national priority (US Department of Health and Human Services Office of the Surgeon General and National Action Alliance for Suicide Prevention, 2012). One avenue for understanding suicide risk and identifying potential preventative targets is investigating concomitant forms of psychopathology.

One psychiatric disorder strongly linked to suicide risk is post-traumatic stress disorder (PTSD). Among the general population, PTSD has been linked to suicidal ideation (SI) and past suicide attempts (Cogle et al., 2009a), a relationship that appears to be

amplified among individuals with comorbid major depressive disorder (MDD; Cogle et al., 2009b; Panagioti et al., 2009). Furthermore, PTSD is predictive of a future suicide attempt among individuals reporting SI (Nock et al., 2009).

While overall posttraumatic stress symptom (PTSS) severity is related to SI (Briere et al., 2015; Marshall et al., 2001; Panagioti et al., 2015) and previous attempts (Panagioti et al., 2009), the literature is equivocal regarding which specific PTSS or symptom clusters may confer unique risk for suicidal behaviors. Current psychiatric nosology (i.e., Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [DSM-5]; American Psychiatric Association, 2013) categorizes PTSD into four distinct symptom clusters that occur in response to a life-threatening or stressful event: (1) re-experiencing; (2) avoidance; (3) negative alterations in cognitions and mood (cf. numbing); and (4) alterations in arousal and reactivity (cf. hyperarousal). To date, only a single study has linked hyperarousal PTSS to suicidality more broadly (Briere et al., 2015), and only two have found avoidance PTSS to relate to previous suicide attempts (Legarreta et al., 2015; Selaman et al., 2014). Re-experiencing PTSS have been associated with SI (Davis et al., 2014), broader suicidal behaviors (Bell and Nye, 2007), and previous suicide attempts (Selaman et al., 2014). Finally, numbing PTSS have been consistently linked to SI (Davis et al., 2014a; Davis et al.,

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2014b; Guerra and Calhoun, 2011; Hellmuth et al., 2012), but just once to previous suicide attempts (Legarreta et al., 2015). Although further work is needed to identify how individual symptom clusters contribute to suicidality, the clinical implications of PTSD's broader relationship to suicidal behaviors is well supported.

Understanding that PTSD confers risk for suicidality, psychosocial moderators, such as occupations in which rates of PTSD may be elevated, are also important to examine. Indeed, research has highlighted the link between PTSD and suicide among military service members (see Pompili et al., 2013 for review) and civilian police officers (Violanti, 2004, 2010; Violanti et al., 2006). Following the call for research to identify occupational groups that may experience disproportionately high rates of suicide (Milner et al., 2013), a recent study demonstrated that protective service occupational workers were at elevated risk for workplace suicides (McIntosh et al., 2016; Tiesman et al., 2015). One specific occupational group included in this sample, outside of military or law enforcement, was firefighters.

Despite an estimated workforce of 1.1 million members in the United States as of 2014 (Haynes and Stein, 2016), significantly less research into rates of PTSD, and particularly suicide, exists among firefighters when compared to military or law enforcement officers. Of those that have investigated PTSD among firefighters, point prevalence rates have been estimated to fall anywhere between 6.5% and 37% (Berninger et al., 2010a; Berninger et al., 2010b; Bryant and Harvey, 1995; Corneil et al., 1999; Haslam and Mallon, 2003; Heinrichs et al., 2005; North et al., 2002; Wagner et al., 1998). These estimates range from being comparable to, if not two to three times higher than, prevalence estimates from the general population (Kessler et al., 2005). Though the higher of these estimates perhaps seem inflated, it is important to consider, and has been noted in previous research (Del Ben et al., 2006), that many of these prevalence rates are based on DSM-IV screening criteria which necessitate symptom response to a singular index trauma. With the addition of PTSD criterion A4 to the DSM-5 (i.e., "repeated or extreme exposure to aversive details of a traumatic event," such as through occupational exposure), future research utilizing these newer diagnostic criteria may reveal even higher rates of PTSD.

Similarly, markedly less is understood about rates of suicide among firefighters as compared to other protective service workers. Though an initial investigation found rates of firefighter suicide deaths comparable to the general population (Musk et al., 1978), more recent evidence suggest higher rates among firefighters (Henderson et al., 2016). Notably, Stanley et al. (2015) conducted a nationwide survey of 1027 current and retired firefighters in the United States, and found high rates of SI (46.8%), plans (19.2%), and attempts (15.5%). These findings align with anecdotal reports from fire departments (e.g., Finney et al., 2015) and national fire service organizations (e.g., Gist et al., 2011): suicide is prevalent within the fire service, and must be addressed. Consequently, researchers and policy statements have called for additional empirical data examining the interplay between PTSD and suicide risk among this unique population (Gist et al., 2011; Stanley et al., 2016).

However, we are unaware of any studies to date that have explored the relationship between PTSS and suicide risk in this population. Given that others first responders and protective service workers (e.g., military service members [cf. Army STARRS; Ursano et al., 2014] and law enforcement [cf. Epidemiology of Police Suicide; Violanti, 1995]) have been the focus of large-scale, funded research into suicide risk and related conditions (i.e., PTSD), examining these relationships among firefighters is paramount to informing suicide prevention efforts among firefighters. Moreover, discrepancies within the literature with regard to specific

symptoms clusters implicated in suicide risk may reflect population-specific considerations, necessitating research among firefighters in particular.

1. The current study

The current study utilizes data from a large, national sample of current firefighters to test the hypothesis that greater current PTSS are significantly related to career SI (i.e., reported to have been present during their firefighting tenure) and history of attempts ('yes' or 'no'). Second, separate exploratory models were tested with re-experiencing, avoidance, numbing, and hyperarousal symptom clusters entered simultaneously to further investigate the ill-understood, unique relationships between specific PTSS clusters and SI and suicide attempt history.

2. Methods

2.1. Participants and procedure

Participants ($N = 893$) were current United States firefighters selected from a larger sample of respondents to a national web-based survey on firefighter behavioral health. Of the original sample ($N = 1027$), 110 (10.7%) participants were excluded because they reported having retired from the fire service, and another 24 (2.3%) individuals were excluded because they did not provide information pertaining to prior suicide attempts. Though current firefighters in this sample were significantly younger and more likely to report SI, plans, and past attempts than retired firefighters (Stanley et al., 2015), no differences were found on depression ($p = 0.33$) or PTSD ($p = 0.85$) symptom measures. Demographic characteristics (Table 1) for the current sample were largely consistent with those reported by the National Fire Protection Association (Haynes and Stein, 2016).

Individuals were invited to participate in the current study through email listserv and social media announcements disseminated by the National Fallen Firefighters Foundation and other national and local firefighter organizations. Prior to enrollment, all participants were required to review a web-based informed consent. Participants then completed a 30-min series of

Table 1
Participant demographics.

Characteristic	Valid%
Gender	
Male	90.9%
Female	9.1%
Age ($M = 37.07$, $SD = 10.78$, Range: 18–76)	
Race/ethnicity	
White/Caucasian	86.9%
Native American/Alaska Native	8.3%
Other (i.e., African American, Asian, 'Other')	4.8%
Education	
Some high school/GED	9.5%
Some college	33.1%
2-Year college	20.0%
4-Year college	27.5%
Post-graduate	9.7%
Department type	
Full-Time	40.8%
Volunteer	29.6%
Hybrid (Full-Time & Volunteer)	28.2%
Other (Military & Wildland)	2.4%
Current military service	
Yes	18.6%
No	81.4%

self-report questionnaires via web-based survey platform. Finally, all participants were presented with a debriefing page that included information for national mental health resources (e.g., National Suicide Prevention Lifeline [1-800-273-TALK]). Participants were given the option of providing their email address to receive a \$10 electronic gift card as compensation for study participation. The University's Institutional Review Board approved all study procedures, which were executed in accordance with the guidelines established by the Declaration of Helsinki.

3. Measures

3.1. Depressive Symptom Inventory—Suicidality Subscale (DSI-SS; Metalsky and Joiner, 1997)

The DSI-SS is a 4-item self-report measure designed to assess the severity of suicidal ideation over the previous two weeks. Individuals respond to each item on a 4-point Likert-scale, with total scores ranging from 0 to 12. Increasing scores represent greater severity of suicidal ideation. For this study, participants were asked to answer questions based on their experiences since becoming a firefighter. Although this measure was not designed to index SI over this extended time frame, inquiring about current SI and conducting follow-up risk assessments presented a logistical challenge beyond a manageable scope. Past research indicates that the DSI-SS has good psychometric properties (Joiner and Rudd, 1996), with particular utility in population-based research (Batterham et al., 2015). The DSI-SS demonstrated excellent internal consistency ($\alpha = 0.91$) in the present study.

3.2. Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977)

This 20-item self-report assessment is used to capture depression symptom severity within the general population. Individuals rate the extent to which they have experienced various depression symptoms (e.g., sadness, loneliness) in the past week (0 = Less than 1 day, 1 = 1–2 days, 2 = 3–4 days, 3 = 5–7 days). Total scores range from 0 to 60, with increasing scores reflecting greater severity of depression symptoms. The CES-D has demonstrated good internal consistency, test-retest reliability, and construct validity across various populations (Radloff, 1977; Devins et al., 1988; Hann et al., 1999). The CES-D demonstrated good internal consistency ($\alpha = 0.83$) in the present study.

3.3. Self-injurious thoughts and behaviors interview-short form (SITBI-SF; Nock et al., 2007)

This 72-item interview is used to assess the nature and timing of past and current suicidal thoughts, plans, and behaviors. In this study, a modified version of the SITBI-SF was used to obtain information regarding participants' self-reported experiences of suicidal ideation and attempts specifically during their firefighting careers. Previous studies have similarly adapted the SITBI-SF for use as a self-report measure (Zetterqvist et al., 2013). The SITBI-SF has been shown to have high internal consistency ($\alpha = 0.84$ – 0.89 ; Nock et al., 2007).

3.4. Posttraumatic stress disorder Checklist-Civilian version (PCL-C; Weathers et al., 1994)

The PCL-C is a 17-item self-report measure designed to assess past-month PTSS severity. Individuals rate the extent to which they

have been bothered by various problems resulting from a stressful experience on a 5-point Likert-style scale from 1 (Not at all) to 5 (Extremely). Scores range from 17 to 85, with greater scores indicating greater PTSS severity. Per the empirically validated cutoff score specific to firefighter samples (Chiu et al., 2011), participants with PCL-C total scores ≥ 39 were considered to have a probable PTSD diagnosis. The PCL-C has been shown to have good psychometric properties as a brief screening instrument for PTSD (Blanchard et al., 1996). In the present sample, the full PCL-C, re-experiencing, avoidance, numbing, and hyperarousal subscales demonstrated good internal consistency (α 's = 0.96, 0.92, 0.81, 0.91, and 0.87, respectively).

4. Results

Analyses were conducted in SPSS version 22, including a missing value pattern analysis that identified less than 6% of values missing. Missing data were handled with multiple imputation using multivariate normal distribution in SPSS. For all analyses, race was collapsed into three categories (i.e., Caucasian, Native American, and Other), due to the low number of individuals identified as Asian, African American, and Other resulting in poor model fit when including a six-category race variable. Descriptive statistics and bivariate correlations for observed variables are available in Table 2. PCL-C scores ($M = 34.28$, $SD = 15.29$) were comparable to previous studies of firefighters (Chiu et al., 2011). Based on the suggested PCL-C cutoff (≥ 39) in a firefighter sample, 284 (31.8%) firefighters were identified as having a probable PTSD diagnosis. Furthermore, 139 (15.6%) reported at least one suicide attempt during their firefighting career.

4.1. Suicide ideation

First, we tested the hypothesized relationship between global PTSS and SI (Table 3) using negative binomial regression. This alternate model is better suited to handle nonlinear, non-negative, and positively skewed data (Gardner et al., 1995), which were observed with the DSI-SS. Race, age, sex, military status, and global depression symptoms were included as covariates. As hypothesized, PTSS were significantly associated with SI ($IRR = 1.026$, $p < 0.001$), such that each one-unit increase on the PCL-C corresponds with an increase in DSI-SS scores by a factor of 1.026. Greater depression symptoms, active duty military status, and Native American racial identity (with those identifying as White used as the comparison group) were also associated with increased incident rates of SI.

A similar negative binomial regression was conducted to test the specificity of PTSS clusters in predicting SI, controlling for the aforementioned set of covariates (Table 3). Single-point increases in PCL-C re-experiencing ($IRR = 1.052$, $p < 0.01$) and numbing ($IRR = 1.063$, $p < 0.001$) symptom subscales were significantly associated with 1.052 and 1.063 factor increases on the DSI-SS, respectively. PCL-C avoidance and hyperarousal symptoms were not significantly related to SI. Of the covariates, greater depression symptoms, and Native American compared to White racial identity were associated with increased incident rates of SI.

4.2. Suicide attempts

Similar to SI, separate logistic regression models were tested with the symptom and demographic variables predicting prior suicide attempts (Table 4). As hypothesized, in the first model examining global PTSS, single-point increases on the PCL-C were significantly associated with 5.2% higher odds of previously attempting suicide ($AOR = 1.052$, $p = 0.01$). Of the covariates, age,

Table 2
Descriptive statistics and bivariate correlations for symptom data.

Variable	1	2	3	4	5	6	7	8
1. DSI-SS	–							
2. CES-D	0.60*	–						
3. PCL-C Total	0.60*	0.86*	–					
4. Re-experiencing	0.56*	0.76*	0.91*	–				
5. Avoidance	0.51*	0.71*	0.87*	0.82*	–			
6. Numbing	0.60*	0.85*	0.93*	0.78*	0.77*	–		
7. Hyperarousal	0.49*	0.79*	0.91*	0.75*	0.71*	0.80*	–	
8. Attempt history	0.53*	0.54*	0.57*	0.59*	0.55*	0.58*	0.42*	–
<i>M</i>	2.19	15.52	34.28	9.30	3.84	9.69	11.23	0.16
<i>SD</i>	2.39	12.14	15.29	4.65	2.16	5.09	4.86	0.36
<i>Skewness</i>	0.65	0.81	0.92	1.09	0.98	0.92	0.73	1.90
<i>Kurtosis</i>	–0.63	–0.17	–0.21	0.27	–0.21	–0.41	–0.24	1.63

Note. Bivariate correlations estimated following multiple imputation in SPSS. DSI-SS, Depressive Symptom Inventory–Suicidality Subscale total score; CES-D, Center for Epidemiologic Studies Depression Scale; PCL-C, PTSD Check List–Civilian version total score; Re-experiencing, avoidance, Numbing, Hyperarousal-corresponding PCL-C subscale total scores; Attempt History, reported absence (0) or presence (1) of a prior suicide attempt; * $p < 0.001$.

Table 3
Negative binomial regression models with incidence rate ratios for (1) total PTSD symptoms and (2) individual PTSD symptom clusters predicting suicidal ideation.

	Suicidal ideation		
	IRR	95% CI	<i>p</i>
<i>Total PTSD symptoms</i>			
Race			
Other v Native American	1.032	0.594, 1.797	0.97
White v Native American	1.631	1.120, 2.378	0.01
White v Other	0.655	0.419, 1.024	0.06
Age	1.004	0.996, 1.013	0.35
Sex	0.897	0.664, 1.213	0.48
Military status	1.336	1.000, 1.787	0.04
CES-D	1.027	1.014, 1.040	<0.001
PCL-C total	1.026	1.015, 1.037	<0.001
<i>PTSD symptom clusters</i>			
Race			
Other v Native American	1.155	0.642, 2.078	0.63
White v Native American	1.719	1.134, 2.606	0.01
White v Other	0.673	0.430, 1.055	0.08
Age	1.004	0.995, 1.014	0.34
Sex	0.853	0.625, 1.163	0.31
Military status	1.094	0.787, 1.522	0.58
CES-D	1.024	1.01, 1.038	0.001
Re-experiencing	1.052	1.014, 1.091	0.01
Numbing	1.063	1.023, 1.104	0.001
Avoidance	1.000	0.931, 1.074	0.97
Hyperarousal	0.990	0.958, 1.023	0.56

Note. All reported effects estimated following multiple imputation in SPSS. IRR, incident rate ratio; 95% CI, 95% confidence interval of incident rate ratio; Suicidal Ideation defined as Depressive Symptom Inventory–Suicidality Subscale score; CES-D, Center for Epidemiologic Studies Depression Scale; PTSD total symptoms derived from PTSD Check List–Civilian version total score; PTSD symptom clusters derived from PCL-C.

Native American racial identity (with White racial identity as the comparison group), active duty military, and greater depression symptoms were also associated with increased odds of a previous attempt.

In the second model testing the specificity of PTSS clusters in the prediction of previous attempts (Table 4), single-point increases in PCL-C re-experiencing symptoms were significantly associated with 15.4% higher odds of a previous attempt ($AOR = 1.154$, $p = 0.01$). PCL-C numbing symptoms demonstrated a non-significant trend ($AOR = 1.126$, $p = 0.07$), and PCL-C avoidance symptoms were nonsignificant ($AOR = 1.118$, $p = 0.36$). Although PCL-C hyperarousal symptoms were significantly associated with previous attempts, the negative direction of the effect within the

Table 4
Logistic regression models with adjusted odds ratios for (1) total PTSD symptoms and (2) individual PTSD symptom clusters regressed on prior suicide attempts.

	Prior suicide attempt		
	AOR	95% C.I.	<i>p</i>
<i>Total PTSD symptoms</i>			
Race	2.035	0.946, 4.379	0.07
Age	0.956	0.923, 0.991	0.01
Sex	0.635	0.205, 1.966	0.43
Military status	19.17	9.61, 38.24	<0.001
CES-D	1.055	1.006, 1.107	0.03
PCL-C total	1.052	1.015, 1.091	0.01
<i>PTSD symptom clusters</i>			
Race	2.190	0.925, 5.182	0.07
Age	0.955	0.92, 0.992	0.02
Sex	0.903	0.276, 2.959	0.87
Military status	11.91	5.52, 25.69	<0.001
CES-D	1.061	1.009, 1.115	0.02 ^a
Re-experiencing	1.154	1.034, 1.288	0.01
Numbing	1.126	0.991, 1.279	0.07
Avoidance	1.118	0.882, 1.418	0.36
Hyperarousal	0.865	0.765, 0.978	0.02 ^a

Note. All reported effects estimated following multiple imputation in SPSS. AOR, adjusted odds ratio; 95% CI, 95% confidence interval of odds ratio; CES-D, Center for Epidemiologic Studies Depression Scale; PTSD total symptoms derived from PTSD Check List–Civilian version total score; PTSD symptom clusters derived from PCL-C.
^a Observed significance thought to be due to statistical suppression. See explanation in text.

model ($B = -0.13$, $AOR = 0.865$, $p = 0.02$) was discrepant with the expected and observed bivariate relationship ($r = 0.42$), suggesting this effect was due to statistical suppression¹ (Nathans et al., 2012). Increases in age and active duty military status were also associated with greater odds of a previous attempt.

5. Discussion

Results of this study supported hypotheses that within a large, national sample of current firefighters, current PTSS would be significantly associated with SI and suicide attempts during their firefighting careers, beyond depression symptoms and other known risk variables (i.e., military status, race, sex, and age). Results

¹ When PCL-C hyperarousal symptoms were removed from the model, CES-D depression symptoms were no longer a significant predictor ($AOR = 1.04$, $p = 0.10$, 95%CI [0.99, 1.09]), suggesting hyperarousal symptoms were artificially inflating the amount of variance in suicide attempts accounted for by depression symptoms.

of exploratory PTSS cluster analyses suggested that re-experiencing and numbing symptoms are uniquely related to career SI in current firefighters, even after accounting for hyperarousal and avoidance symptoms; however, only re-experiencing symptoms were significantly related to prior suicide attempts in this sample. Given the nature of their occupation involves exposure to potentially stressful or traumatic events, that firefighters experience elevated PTSS is not unexpected; a reality captured in the most recent iteration of the DSM, including PTSD criterion A4 pertaining to “repeated or extreme exposure to aversive details” of traumatic events (APA, 2013). Further, as research implicates PTSD in suicidal behaviors (Panagioti et al., 2009), the results of the current study provide evidence for this relationship among firefighters, specifically.

What might account for the association between PTSD and suicidality in this sample? Several broad theoretical models may be applicable to the nature of this relationship. For instance, vulnerability-stress models of suicidal behavior (Nock et al., 2013; Van Orden et al., 2010) suggest that SI may develop in part due to traumatic experiences and/or psychiatric disorders (of which the development of the latter can be influenced by the former). Moreover, recurrent exposure to painful or fear-inducing situations is implicated in the acquired capability to attempt suicide, a critical component of the interpersonal theory of suicide (Van Orden et al., 2010; O'Connor, 2011), and unremitted PTSS are evidenced to predict the transition from SI to non-lethal attempts (Nock et al., 2009).

Evaluating the present study within this vulnerability-stress framework, and more specifically the interpersonal theory of suicide, the emergence of numbing PTSS as a unique predictor of SI is notable. Numbing PTSS (e.g., loss of interest or enjoyment) appear to reflect anhedonic symptoms of depression. Indeed, Kashdan et al. (2006) suggest that anhedonic depression symptoms are distinct from global depressive symptoms, and uniquely related to Numbing PTSS. This distinction between numbing and depression symptoms has garnered strong support previously (Asmundson et al., 2004; Blanchard et al., 1998; Feeny et al., 2000). Numbing PTSS similarly relate to the perceived burdensomeness (i.e., a perception that one's death will be worth more than one's life) and thwarted belongingness (cf. loneliness) constructs of the interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010). Accordingly, numbing PTSS (Davis et al., 2014b), in particular the detachment/estrangement symptom (Davis et al., 2014a) are suggested to be uniquely and directly related to passive SI, above and beyond depressive symptoms.

Prior research also supports the emergence of PTSD re-experiencing symptoms as a unique predictor of SI (Bell and Nye, 2007; Davis et al., 2014b) and prior attempts (Selaman et al., 2014), which is consistent with findings from our current sample. As noted, inherent in firefighting is the potential for recurrent occupational exposure to both emotionally and physically painfully (i.e., traumatic) experiences. This parallels research indicating that PTSD re-experiencing symptoms are positively associated with more frequent and intensely negative combat experiences (Bryan et al., 2015). Further, work in combat veterans suggests that re-experiencing symptoms are particularly instrumental in the acquired capability for suicide (Bryan and Anestis, 2011). Thus, the compounding effect of traumatic experiences, in addition to unwanted intrusive reminders of these events, may gradually habituate one to the idea and experience of physiological pain and the fear of death resulting the in capability to attempt suicide (Selby et al., 2010). Although at least one study contradicts this notion (Zuromski et al., 2014), it is important to consider the generalizability of these findings may not include analog samples, but instead relate more strongly to occupations for which frequent recurrent trauma is the norm (i.e., protective services, such as

military or firefighting).

5.1. Clinical implications

The clinical implications for conceptualizing PTSD as a contributing factor to suicidality are clear. Whereas the clinical emphasis for the management of suicide risk is on safety planning (Stanley and Brown, 2012), key additional targets for reducing suicidal behaviors include psychiatric disorders (e.g., PTSD). Pharmacotherapies have proven effective in reducing global PTSS, and in turn global depression symptoms and quality of life (Stein et al., 2006); however, evidence for the effect of these reductions on SI is lacking. On the other hand, several studies have demonstrated that PTSD-specific psychological treatments (i.e., cognitive processing therapy [CPT] and prolonged exposure [PE]) are efficacious in reducing SI via PTSS reduction throughout treatment and up to 10 years later (Cox et al., 2016; Gradus et al., 2013; Harned et al., 2012). In concert, Gallagher and Resick (2012) identified reductions in feelings of hopelessness during CPT as a mechanism through which PTSS remitted, a construct central to theories pertaining to suicide (Abramson et al., 1989; Beck, 1986; Joiner, 2005). However, because these treatments require recalling and reprocessing an index trauma, there are concerns that the stress of this component may increase suicidality; therefore, current guidelines indicate that these treatments are not recommended for actively suicidal patients (Foa et al., 2009). Considering that evidence suggests subsequent benefits across these two overlapping conditions, further research may wish to explore the degree to which active suicidal ideation is contraindicated to initiate PTSD treatment.

In addition to direct psychological intervention, tertiary factors such as social support are known to moderate the relationship between PTSD and suicidality (Panagioti et al., 2014). Specific to firefighters, self-report (Jeannette and Scoboria, 2008; Regehr, 2009) and anecdotal (Haslam and Mallon, 2003) evidence suggests that social support protects against PTSS. Furthermore, there is evidence to suggest that social support attenuates the association between occupational stress and SI among firefighters (Carpenter et al., 2015). Considering these results in the context of thwarted belongingness and perceived burdensomeness as they relate to suicidality, the importance of encouraging social support as a protective factor against the development of SI cannot be overlooked. Prior research also suggest that firefighters prefer a combination of social support and direct psychological intervention as incidents increase in severity (Jeannette and Scoboria, 2008). However, additional treatment studies of PTSD among first responders, and specifically firefighters, are needed before empirically-informed approaches to treatment can be recommended (Haugen et al., 2012).

5.2. Limitations and future directions

The current study is not without limitations. Due to methodological restrictions, the current data do not allow for inferences about the temporal relationship between PTSS and subsequent suicidality. Thus, replication of these results leveraging a prospective design and evaluation of recent (e.g., past two weeks) SI is necessitated. Moreover, we are only able to discuss the relationship between self-reported, DSM-IV PTSS and not a clinical diagnosis of PTSD based on updated symptom criteria, per se. Although PTSS data did not include information about any one specific event, the nature of the fire service often involves repeated exposure to various traumatic events; therefore, these conclusions assume PTSS in response to repeated occupational exposure, though it is likely a subset of individuals may have responded to this questionnaire with a non-occupational index trauma in mind (Bryant and Harvey,

1996). The data collected also reflect a convenience sample that is subject to differential response biases. Though we cannot conclude that the reported results are generalizable to the fire service at large, the rates of PTSS were comparable to previous studies (Chiu et al., 2011). As with most research exploring suicide attempts, the current results reflect only a self-reported history of attempts, and findings may not extend to the prediction of future suicide attempts. Lastly, although participation was voluntary and anonymous, rates of self-reported suicidality and PTSS may potentially have been attenuated due to the potential for being deemed unfit for duty.

Despite these limitations, the current study offers initial insights into the relationship between two serious mental health issues within an important workforce sector. Future research may further explore military status as a moderator of this relationship, given the strength of that relationship to suicidality in the present sample. Likewise, it is recommended that future research aim to better understand the development and directionality of these conditions. Subsequent intervention studies should seek to mitigate the impact of occupational stress on first responders.

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